European Commission

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EURYDICE REPORT

Digital education at school in Europe 2026

Bridging gaps in access, teaching and learning

School education

Erasmus+

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Digital education at school in Europe 2026

Bridging gaps in access, teaching and learning

2026

Foreword

At the heart of education lies a commitment to help every young person grow, learn and realise their potential. Perhaps the biggest challenge in education is to find ways to teach the joy of learning. Once things go from being 'too hard' to simply 'new,' then students are by definition more open to discovery. If that becomes a reflex, the joy of discovery becomes lifelong. And with the digital revolution, learning to embrace the 'new' is a journey already begun.

Instilling this reflex, this joy of the new, in young people's education is more important than ever. Digital connection is an integral part of young people's everyday experience, offering new ways to learn and create. Our responsibility is to ensure that education equips them to navigate this environment with confidence, safety, critical thinking and a strong sense of purpose.

Across Europe, supporting the digital transformation of education remains a shared priority. This Eurydice report provides an analysis of how education systems are integrating digital technologies in schools and supporting teachers and learners in the process.

Drawing on comparative evidence and international data from the International Computer and Information Literacy Study 2023, it examines how these layers of digital education should interlock, including school planning, access and equity, quality assurance, curriculum and assessment, and teacher support. It also considers the growing role of artificial intelligence and other emerging technologies in shaping education systems.

The findings highlight both progress and remaining challenges. Access to connectivity, devices and digital platforms has improved in many education systems, and digital technologies are becoming more embedded in teaching and learning. At the same time, not all learners benefit equally. Differences in resources and support continue to influence how digital education is experienced in practice. Ensuring that all learners can benefit from digital education remains essential for both quality and fairness across Europe.

Teachers can often feel like they are on the frontline of change. Surrounded on one side by clear evidence of how digital competence has become a 'must have,' and on the other compelled to navigate the social consequences of digital learning. They must teach new skills while promoting critical thinking, creativity and responsible participation in a digital society. And the development of artificial intelligence will further compound these challenges.

This report recognises the realities and provides direction for policymakers and educators. Continuous professional development can only evolve within a supportive ecosystem. Education must remain human-centred, transparent and grounded in trust.

At European level, these developments are supported by the Digital Education Action Plan (2021–2027) and the Union of Skills. Looking ahead, with the forthcoming 2026 Education Package I will present a vision of future-proofing school education in the age of AI and ensure that schools use innovative digital educational tools meaningfully to empower pupils and teachers. This becomes even more urgent in light of the recent PISA results.

By strengthening the evidence base, informing policy and encouraging cooperation, this report contributes to a shared ambition: ensuring that digital education is taught so that innovation continues to translate into meaningful learning that benefits all.

Roxana Mînzatu
Executive Vice-President for Social Rights
and Skills, Quality Jobs and Preparedness

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Codes and abbreviations

Country codes

EU / EU-27	European Union / 27 Member States of the European Union		
BE	Belgium	CY	Cyprus
BE fr	Belgium – French Community	LV	Latvia
BE de	Belgium – German-speaking Community	LT	Lithuania
BE nl	Belgium – Flemish Community	LU	Luxembourg
BG	Bulgaria	HU	Hungary
CZ	Czechia	MT	Malta
DK	Denmark	NL	Netherlands
DE	Germany	AT	Austria
EE	Estonia	PL	Poland
IE	Ireland	PT	Portugal
EL	Greece	RO	Romania
ES	Spain	SI	Slovenia
FR	France	SK	Slovakia
HR	Croatia	FI	Finland
IT	Italy	SE	Sweden

European Education Area and candidate countries			
BA	Bosnia and Herzegovina	MK	North Macedonia
CH	Switzerland	NO	Norway
IS	Iceland	RS	Serbia
LI	Liechtenstein	TR	Türkiye
ME	Montenegro		

Other codes

:	not available
NA	not applicable

Abbreviations

AI	artificial intelligence
AR	augmented reality
CPD	continuing professional development
CIL	computer and information literacy
DigComp	Digital Competence Framework for Citizens
DigCompEdu	Digital Competence Framework for Educators
EACEA	European Education and Culture Executive Agency
EdTech	educational technology
GDPR	General Data Protection Regulation
ICILS	International Computer and Information Literacy Study
ICT	information and communications technology
IEA	International Association for the Evaluation of Educational Achievement
ISCED	International Standard Classification of Education
IT	information technology
ITE	initial teacher education
OECD	Organisation for Economic Co-operation and Development
PISA	Programme for International Student Assessment
pp	percentage point
STEM	science, technology, engineering and mathematics
SELFIE	Self-reflection on Effective Learning by Fostering the Use of Innovative Educational Technologies
TALIS	Teaching and Learning International Survey
UNESCO	United Nations Educational, Scientific and Cultural Organization
VR	virtual reality

Executive summary

Over recent decades, digital technologies have become an integral part of education systems, transforming how learning is delivered, accessed and organised. As societies and economies become increasingly digital, education systems are expected to equip learners with digital competences while creating learning environments that effectively, safely and inclusively integrate digital technologies into teaching and learning, including by supporting learners' and teachers' digital wellbeing.

At the European level, supporting the digital transformation in education remains a key policy priority. The Digital Education Action Plan (2021–2027) sets out a common vision of high-quality, inclusive and accessible digital education, focusing on the development of digital education ecosystems and digital competences (European Commission, 2020b). These priorities are reinforced by broader initiatives, including the Union of Skills Communication and the STEM Education Strategic Plan (European Commission, 2025b, 2025e), which highlight the importance of digital skills for competitiveness, resilience and inclusion. This approach is supported by two Council recommendations ([1]) ([2]), which emphasise the importance of a strategic and system-level approach to digital education, including key enabling conditions and the development of digital competences across all levels of education. At the same time, recent EU policy developments, including the Artificial Intelligence (AI) Act ([3]) and the European Commission's 2026 guidance package for teachers highlight growing attention to the safe, ethical, inclusive and pedagogically meaningful use of digital technologies and AI in education.

Despite these policy initiatives, challenges remain. Evidence from the International Computer and Information Literacy Study (ICILS) 2023 shows that a substantial share of students do not have at least basic levels of digital competences (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2024). In addition, findings from the 2025 Flash Eurobarometer 'Future needs in digital education' identify concerns related to unequal access, infrastructure quality, digital wellbeing and teacher preparedness (European Commission, 2025f).

Based on data collected from 38 education systems through the Eurydice Network, this report provides an in-depth analysis of how European education systems support the integration of digital technologies into education and empower teachers and students to unlock their full potential and opportunities. The analysis is complemented by quantitative evidence from ICILS 2023 covering 24 European education systems (22 for the section on teachers) ([4]).

1 Council Recommendation of 23 November 2023 on the key enabling factors for successful digital education and training (OJ C, C/2024/1115, 24.1.2024, ELI: http://data.europa.eu/eli/C/2024/1115/oj).

2 Council Recommendation of 23 November 2023 on improving the provision of digital skills and competences in education and training (OJ C, C/2024/1030, 23.1.2024, ELI: http://data.europa.eu/eli/C/2024/1030/oj).

3 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) (OJ L, 2024/1689, 12.7.2024, ELI: http://data.europa.eu/eli/reg/2024/1689/oj).

4 ICILS data on the Flemish Community of Belgium, Czechia, Denmark, Germany, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Hungary, Malta, Austria, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, Norway and Serbia are covered in the analysis. ICILS data on Luxembourg and Bosnia and Herzegovina are included in the analysis for students and schools but excluded from the section on teachers due to concerns regarding the representativeness of the sample. The same applies to the Netherlands for all ICILS data (see Statistical tables).

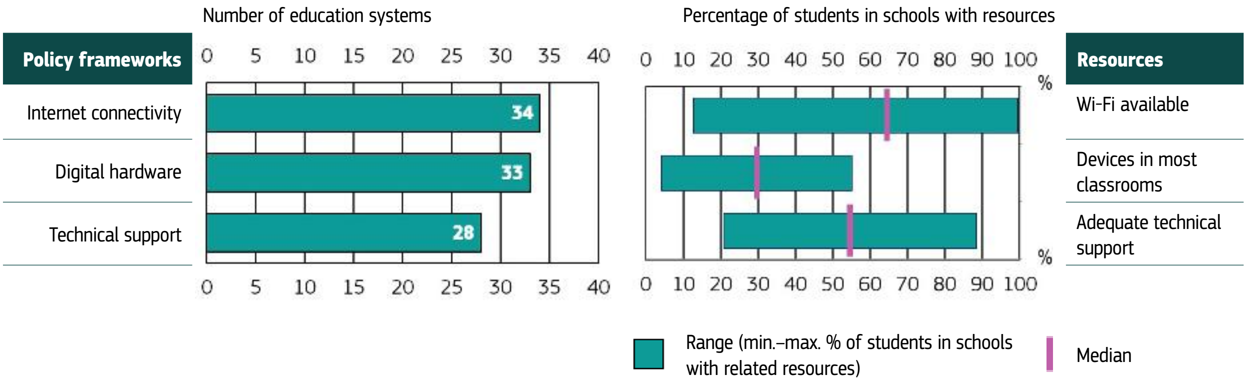
The report addresses core aspects of the digital transformation of schools – including access to digital technologies, school planning and quality assurance, digital equity and inclusion, curricular approaches and assessment frameworks, as well as teachers' preparedness and main challenges to integrate digital technologies into teaching and learning. Emerging technologies, including AI, are examined across all these areas.

Digital transformation is widely addressed in top-level policy frameworks, but implementation conditions vary across education systems

The majority of European education systems have established top-level policy frameworks supporting the integration of digital technologies in schools. These frameworks typically address key components such as connectivity, digital hardware, software environments, interoperability and technical support. Although governance arrangements differ – reflecting varying distributions of responsibility between national, regional and local authorities – most systems define responsibilities and set out provisions to support the use of digital technologies in teaching and learning. However, the existence of such frameworks does not necessarily ensure comparable conditions across all schools.

Overall, the findings point to a consistent pattern: policy development has advanced rapidly, but the implementation of policies in schools is complex and the outcomes are variable. Evidence from the ICILS 2023 indicates that although access to digital infrastructure is widespread, the conditions for its effective use remain uneven. In many systems, digital devices are available mainly through shared resources such as computer labs, while classroom-level access remains more limited. Connectivity is not always stable and technical support is often insufficient, which may hinder the integration of digital technologies into teaching and learning (see Figure 1). Differences are also observed in the availability of software and digital environments. While commonly used software tools and digital learning resources are widely available, more integrated digital environments – such as learning management systems and school platforms – as well as support services show greater variation across education systems.

Figure 1: Infrastructure and technical support: policy frameworks, ISCED 24, 2024/2025 and school-level implementation, 2023



Source: Eurydice.

Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Wi-Fi available: Wi-Fi is made available to both students and teachers.
Devices in most classrooms: Digital devices used by students are located in most classrooms (80 % or more).
Adequate technical support: According to ICT coordinators, technology use is not or only minimally hindered by insufficient vtechnical support.

These findings highlight the importance of ensuring that infrastructure is not only available, but also reliable, maintained and effectively supported through adequate technical expertise and service provision. The wide variation in school-level availability of resources across education systems further suggests that the presence of policy frameworks does not necessarily translate into similar implementation conditions in schools.

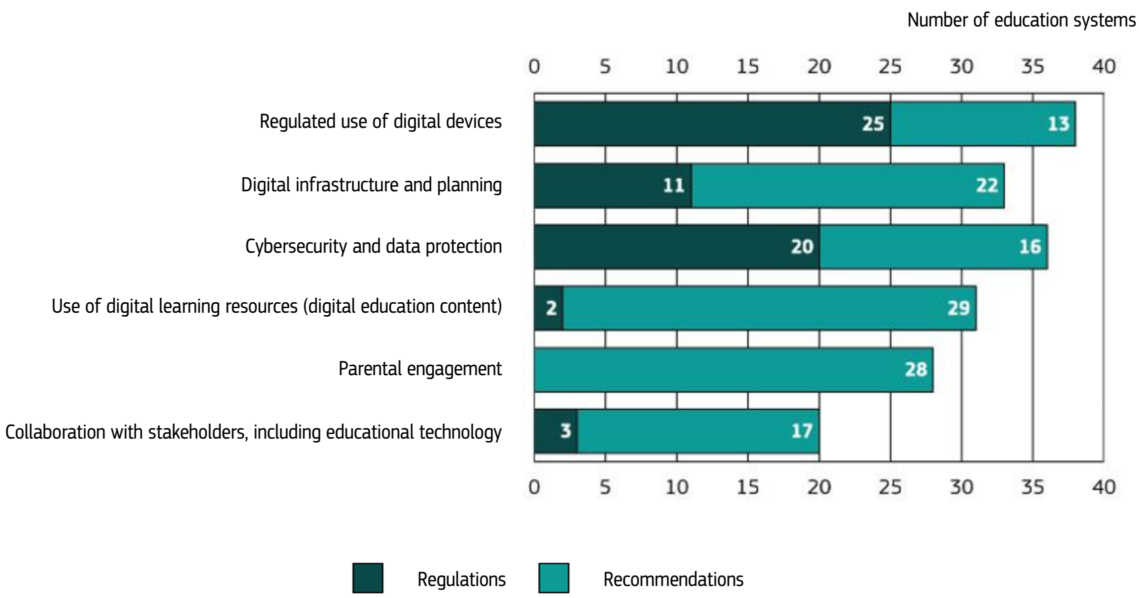
Requirements for, and guidance on, school digital planning are widespread, but quality assurance lags behind

Approximately one quarter of education systems require schools to adopt a dedicated digital plan or to integrate digital objectives into broader school development planning, while most others rely on non-binding guidance, self-assessment tools or optional planning frameworks. Evidence from the ICILS 2023 indicates that around two thirds of students attend schools with an information and communications technology (ICT) plan, most of which are perceived as supporting effective use, while a smaller share of students is in schools without a plan or where planning is not considered effective. This points to differences in both coverage and perceived effectiveness across systems.

Although digital planning is increasingly recognised as a key component of school development, it is not yet systematically embedded across all schools, and the existence of a plan does not always translate into structured follow-up, monitoring or evaluation of its impact on teaching and learning practices.

Policy approaches differ across domains of digital education (see Figure 2). Binding regulations are most common in areas related to operational safeguards, particularly the regulation of digital device use and cybersecurity and data protection, where compliance obligations are clearly defined. In contrast, areas more closely linked to pedagogical practice, such as digital learning resources, parental engagement and collaboration with external stakeholders, are more often addressed through non-binding recommendations. This reflects differences in how policy approaches are formulated, with operational aspects more often subject to binding requirements, and pedagogical aspects more frequently addressed through guidance.

Figure 2: Education systems that regulate or offer guidance on aspects of school digital planning, ISCED 24, 2024/2025



Source: Eurydice.

The majority of education systems report at least one body or agency responsible for supporting digital education in schools. However, the extent to which these governance structures are informed by systematic monitoring, evaluation and quality assurance varies considerably. In many systems, digital education is not yet fully integrated into school evaluation frameworks, limiting the capacity to assess the effectiveness of policies and to ensure continuous improvement.

Overall, these findings point to a growing alignment of governance and planning structures, but also highlight a persistent gap between planning, implementation and evaluation. Strengthening the links between school-level planning, support structures and quality assurance processes appears to remain a key challenge for the effective and sustained integration of digital technologies into education.

Variations in schools' access to digital resources are not systematically associated with their socioeconomic composition

While the provision of digital technologies is rarely universal within European education systems, schools' socioeconomic composition does not explain these differences between schools in a systematic manner. In addition, where differences between schools based on these fundamental characteristics are significant, there is a rather mixed pattern across Europe. While socioeconomically disadvantaged schools have more limited access to certain digital resources in most countries, they are better equipped in others.

At the same time, the digital competences of students in schools with a more disadvantaged socioeconomic mix are significantly lower than those of their peers in more affluent schools in almost all European countries. Given that infrastructure differences based on school composition are much less widespread, this digital literacy score gap cannot be explained by the (lack of) access to digital resources alone. While the availability of digital infrastructure in schools seems to be an essential condition for improving digital competences, disadvantaged schools and students face multiple challenges that cannot be reduced to or solved only by access to technology.

Almost all European education systems include digital competence in their lower-secondary education curricula, usually combining cross-curricular and subject-based approaches

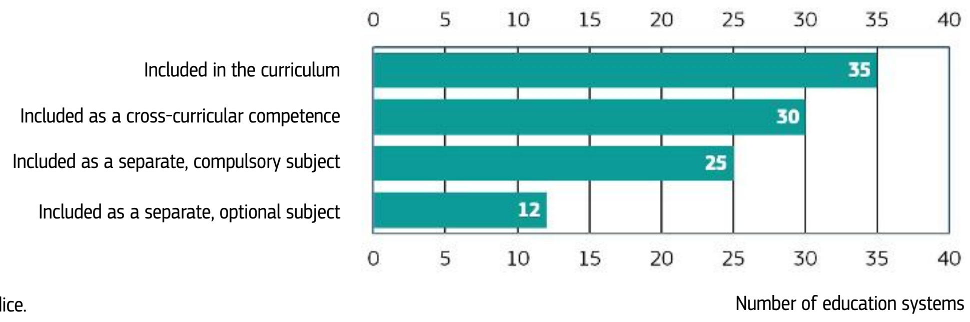
Digital competences are widely integrated into national curricula for lower-secondary education, with most education systems employing multiple approaches to achieve effective integration (see Figure 3).

The cross-curricular approach – integrating digital competences across many or all subjects and school activities – is the most prevalent way of teaching digital competence. While some countries consider digital competence a key competence or an educational aim, others emphasise specific elements, such as digital and media literacy or ICT skills.

Alongside the cross-curricular way of teaching digital competence, around three quarters of education systems (29 out of 38) have a dedicated subject focused on digital competences. The separate subject is compulsory for all students in 25 education systems. Eight of them offer also a separate optional subject. In 12 education systems, digital competence is taught as a standalone optional subject. In four of these systems, this is the only subject-based approach available for developing digital skills. Both compulsory and optional subjects dedicated to the development of digital competences are often associated with the teaching of informatics.

In nearly all education systems where top-level authorities determine the starting point for compulsory digital education, instruction on digital competence for all students starts at the primary education level.

Figure 3: Education systems that include digital competence in their curricula, ISCED 24, 2024/2025



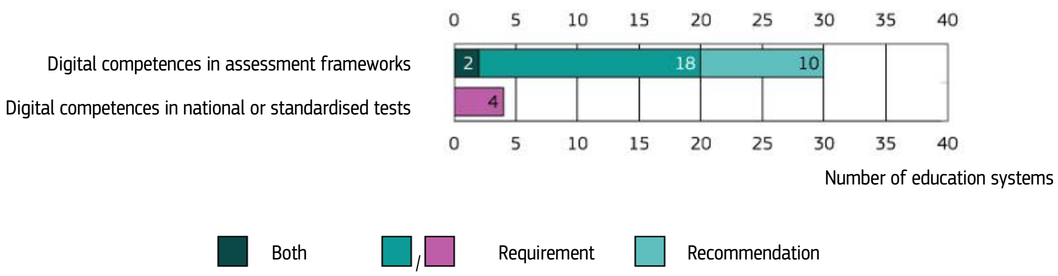
Source: Eurydice.

Most European education systems either require or recommend the evaluation of students' digital competences, although the use of national or standardised tests to assess digital competences is uncommon

Most European education systems either require or recommend the evaluation of students' digital competences (see Figure 4). While top-level steering documents typically outline fundamental assessment principles and specify digital competences along with evaluation criteria, the methods for implementing these assessments are often determined by regional authorities, individual schools or teachers.

Nevertheless, only a few countries evaluate digital competences within national or standardised tests in lower-secondary education (see Figure 4). Consequently, in most countries, students' digital competences are expected to be assessed as part of the learning process, yet there is no mechanism for comparing the achievements of students across the country or ensuring that all students have developed the same competences.

Figure 4: Education systems that include digital competences in their assessment frameworks, ISCED 24, 2024/2025

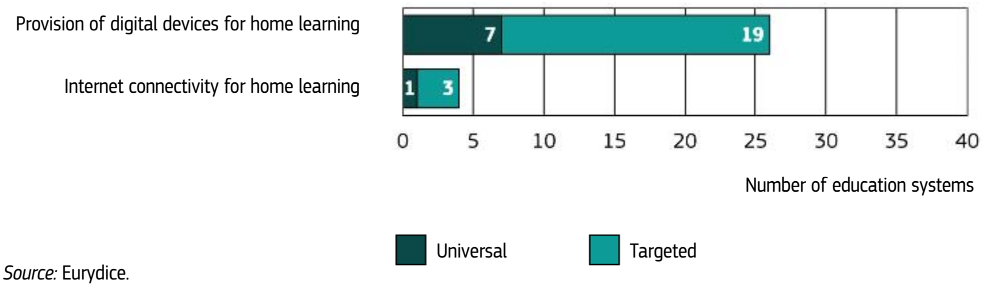


Source: Eurydice.

Students' socioeconomic backgrounds significantly influence digital competences and the opportunities to learn outside school

The acquisition of digital skills extends beyond formal education, with 2023 ICILS data showing that skills like the management of privacy settings are predominantly acquired outside school settings. Students from disadvantaged socioeconomic backgrounds, who may lack access to informal learning opportunities, therefore risk missing out on developing essential skills if these are not explicitly taught in schools. In addition, students from lower socioeconomic backgrounds are more likely to have difficulties in doing their schoolwork at home due to internet quality problems or a lack of access to digital devices. The majority of European education systems try to mitigate these disadvantages through top-level measures or frameworks supporting internet connectivity at home, enabling students to borrow digital devices from schools or making it possible for families to buy digital devices at a lower price (see Figure 5). Some education systems aim for universal provision of digital devices for home use, which generally translates into a much more extensive distribution of portable devices to students.

Figure 5: Education systems supporting internet connectivity and/or the provision of digital devices for home learning, ISCED 24, 2024/2025



Source: Eurydice.

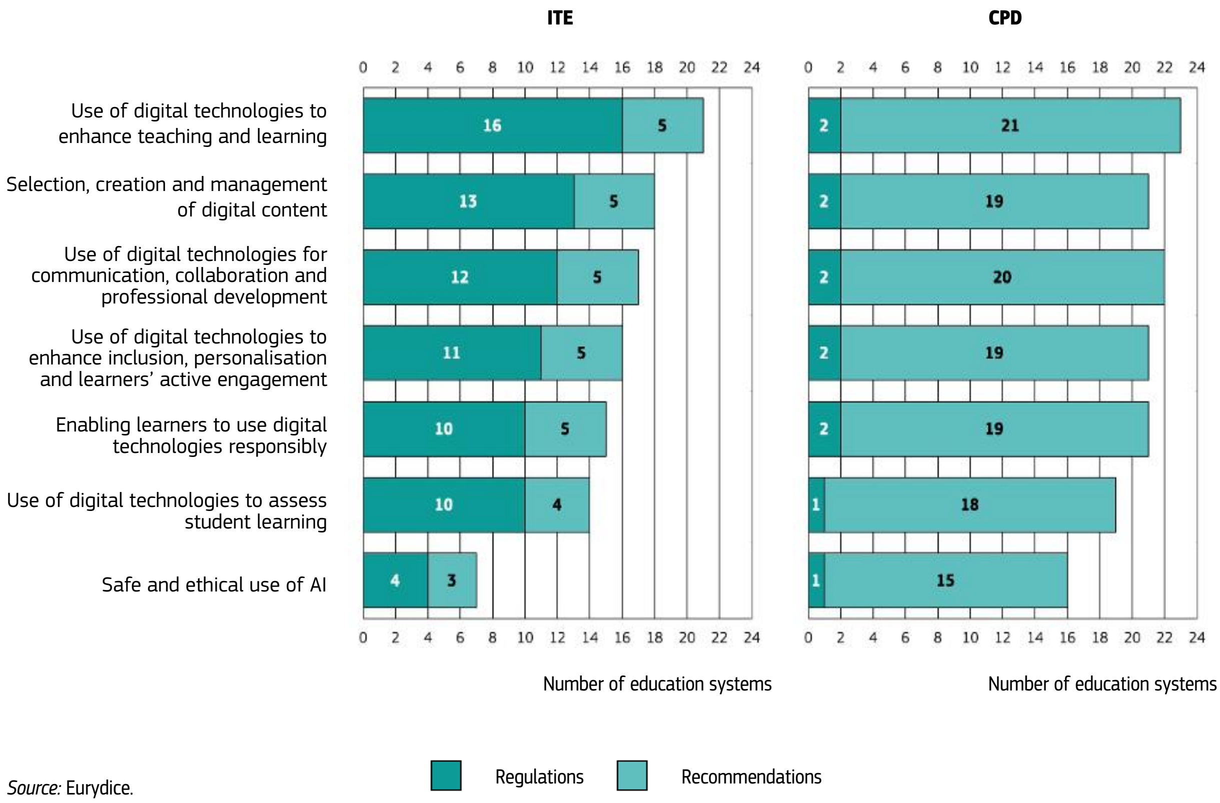
Most education systems define the digital competences that teachers need to develop

Nearly two thirds of the education systems outline digital competences for entry-level teachers, usually in initial teacher education (ITE) regulations or mandatory competence frameworks (see Figure 6). The areas more often covered are the use of digital technologies to enhance teaching and learning; the selection, creation and management of digital content; and the use of digital technologies for communication, collaboration and professional development.

Enabling students to use digital technologies responsibly and the use of digital technologies in assessment are covered less often, while the safe and ethical use of AI is included only in a few education systems.

Nearly two thirds of the education systems outline digital competences for in-service teachers and their professional development, usually as guidelines or recommended competence frameworks. Although not mandatory, digital competence frameworks for continuing professional development (CPD) tend to be more comprehensive than those for ITE, usually covering most key areas. The safe and ethical use of AI is the least commonly addressed.

Figure 6: Education systems laying out specific digital competences for ITE and CPD, ISCED 24, 2024/2025



Source: Eurydice.

Teachers more typically develop their digital competences through continuing professional development than during their initial teacher education

According to ICILS, only a modest proportion of teachers had digital competences included in their ITE. However, this proportion is significantly higher among younger teachers, which suggests that teacher education programmes are increasingly placing greater emphasis on digital competences. ITE programmes tend to focus on general and subject-specific approaches to using ICT to enhance teaching, while giving less attention to other key areas, such as supporting students' capabilities to evaluate the reliability of online information and managing social problems arising from digital communication (see Figure 7).

Figure 7: Digital competences included in ITE and CPD according to teachers, 2023

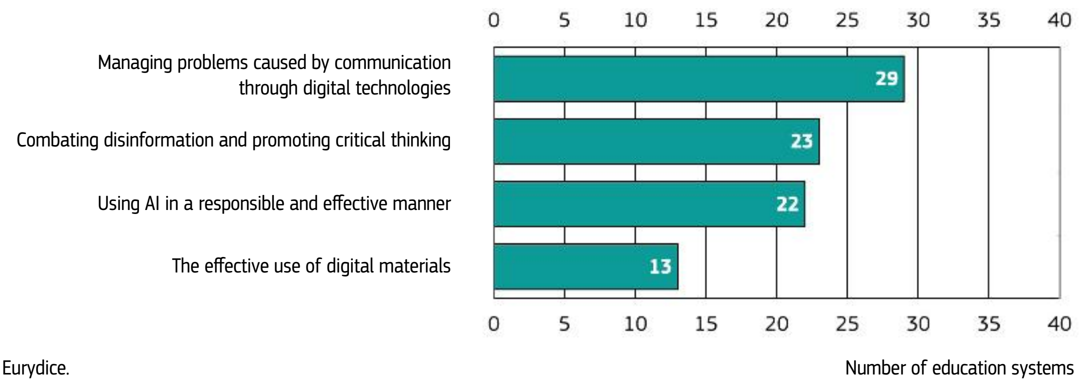
Source: Eurydice, based on IEA, ICILS 2023 database.

A larger proportion of teachers develop their digital competences through CPD. Engagement in CPD related to subject-specific digital learning and integrating digital technologies into teaching is widespread, while it is more limited in other areas, such as managing social problems associated with digital communication, supporting students' critical evaluation of online information and using visual coding platforms. It is precisely in these three areas that teachers report larger self-perceived development gaps. Despite finding these competences necessary, teachers may not engage in relevant CPD for reasons such as time constraints, competitive priorities or an inadequate CPD offer.

Education systems are increasingly developing guidelines for teachers on the responsible and safe use of digital technologies and artificial intelligence

Three quarters of education systems have developed guidelines to help teachers manage problems that students face when using digital technologies to communicate with others, while close to two thirds of systems have issued guidance on countering disinformation and promoting the responsible and ethical use of AI (see Figure 8). The growing emphasis on digital wellbeing in policy discussions is reflected in the fact that one third of systems now provide teachers with guidelines on evaluating and selecting digital content and balancing its use with analogue alternatives.

Figure 8: Education systems that provide guidelines for teachers on emerging issues associated with the use of digital technologies, ISCED 24, 2024/2025

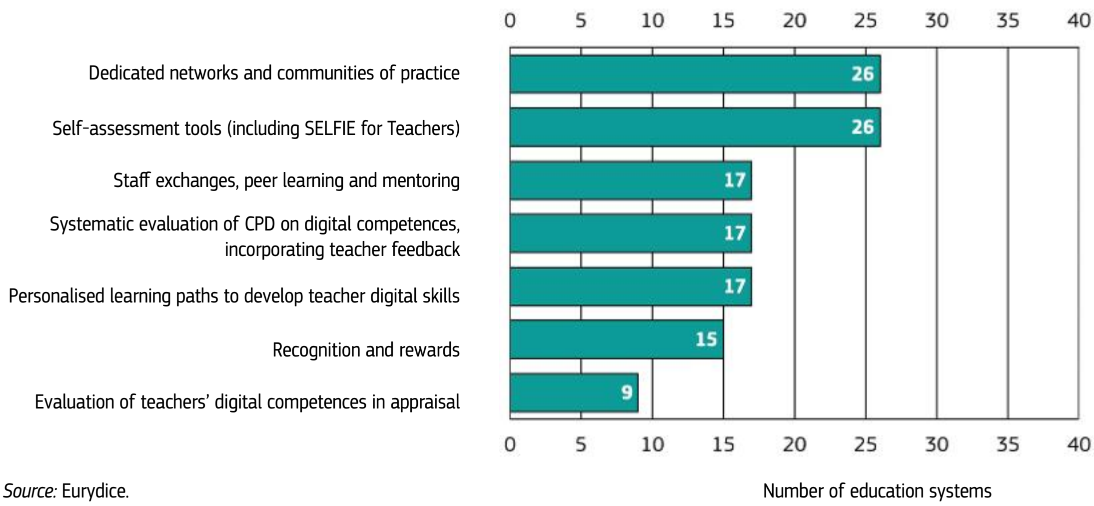


Source: Eurydice.

Self-assessment tools for teachers and peer networks are common across European education systems

In more than two thirds of the education systems, teachers can enhance their digital competences and the integration of digital technologies into their teaching practices through dedicated networks and communities of practice (see Figure 9). The same number of systems offer self-assessment tools (usually Self-reflection on Effective Learning by Fostering the Use of Innovative Educational Technologies (SELFIE) for Teachers) to enable teachers to monitor their progress and identify areas for improvement. Individualised, on-the-job training opportunities such as peer learning or mentoring, personalised learning paths and recognition systems are less widespread. Digital competences are assessed in teacher appraisals in only nine education systems.

Figure 9: Education systems that have adopted specific measures to promote the continued development of teacher digital competences, ISCED 24, 2024/2025

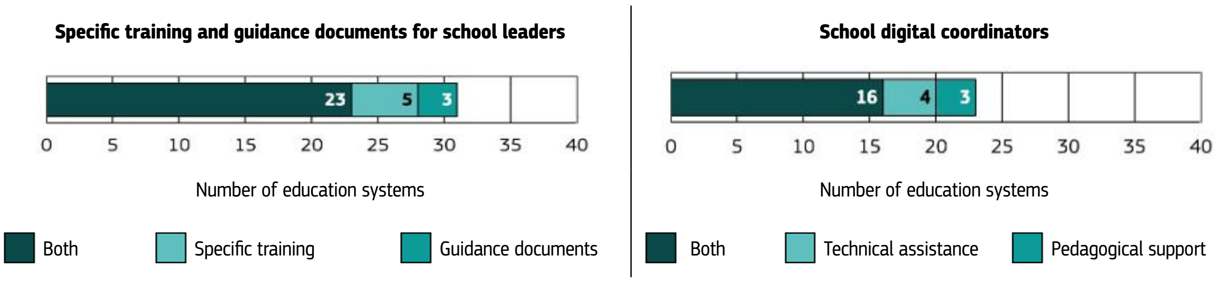


Source: Eurydice.

Education systems typically offer school leaders tailored continuing professional development and guidance on digital technology integration and often appoint digital coordinators in schools

Fostering digital school leadership can support teachers in developing their digital competences and integrating digital technologies into teaching. The provision of tailored CPD opportunities and guidance documents for school leaders – covering areas such as digital leadership, strategic planning and the effective integration of digital technologies – is widespread across Europe (see Figure 10). Additionally, almost two thirds of the education systems regulate the appointment of school digital coordinators, who can offer technical assistance and pedagogical support to teachers. However, according to ICILS, teachers may sometimes encounter problems related to the functioning of ICT equipment and the lack of adequate technical support.

Figure 10: Education systems offering tailored training and guidance for school leaders and providing for the appointment of digital coordinators in schools, ISCED 24, 2024/2025



Source: Eurydice.

Time constraints, professional development gaps and perceived risks may hinder the integration of digital technologies into teaching

According to ICILS, teachers usually have access to sufficient digital content but often lack the time or the necessary expertise to prepare lessons that incorporate digital technologies. However, knowing well how to prepare lessons that incorporate digital technologies is a strong predictor of the daily use of digital technologies in teaching.

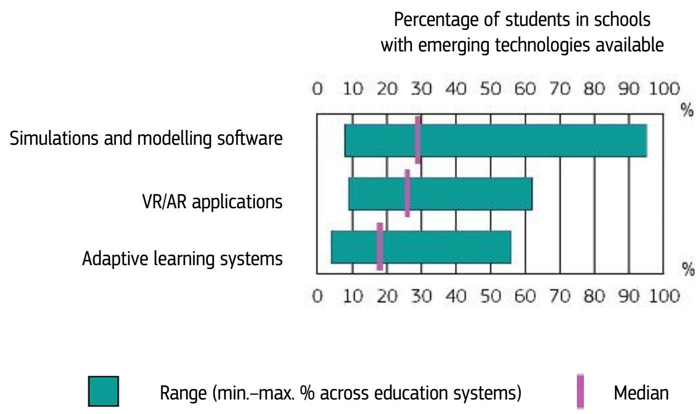
The use of digital technologies in teaching and learning also depends on teachers' perceptions of the associated risks and benefits. Teachers usually recognise their potential to improve access to information sources, student motivation and personalised learning. However, they also express significant concerns about students copying material without proper attribution and the potential negative effects on students' writing skills and attention spans.

Artificial intelligence is gaining prominence in education policy, yet access to emerging technologies in schools remains limited and variable across education systems

AI and other emerging technologies are becoming an increasingly important dimension of digital education across Europe. Integrating AI into education systems reflects a transformative shift that will potentially reshape many aspects of teaching, learning, and system governance in the years ahead. Nearly two thirds of the education systems now refer to AI and emerging technologies in top-level policy documents. In some cases, AI is embedded within broader digital education strategies, while in others it is addressed through guidance, professional support or pilot initiatives.

However, its rapid development and uneven adoption raise challenges about the capacity of education systems to harness its potential and mitigate its risks. The 2023 ICILS evidence complements this policy picture by showing that access to emerging technologies – such as simulations and modelling software, virtual reality (VR) and augmented reality (AR) applications, and adaptive learning systems – remains limited and variable across education systems (Figure 11).

Figure 11: Availability of emerging technologies in schools, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Simulations and modelling software: Simulations and modelling software are made available to both students and teachers.

VR/AR applications: VR and/or AR applications are made available to both students and teachers.

Adaptive learning systems: Adaptive learning systems are made available to both students and teachers.

One third of the education systems have integrated AI-related competences into their lower-secondary education curricula

Reflecting the rapid advancement of technologies, the national curricula of around one third of the education systems include AI-related competences. Varying in detail, these competences typically involve key elements such as understanding AI-driven technologies, recognising their benefits and risks, developing the ability to use and design these technologies, and addressing safety and ethical considerations. AI-related learning outcomes are usually integrated into subjects specifically dedicated to digital education.

Teachers' lack of preparation and their scepticism hinder the use of AI in education

Only seven education systems explicitly incorporate the area of safe and ethical use of AI into their digital competence frameworks for ITE, while 16 systems include this area in competence frameworks for CPD. Findings from the 2024 Teaching and Learning International Survey (TALIS) survey suggest that, while teachers frequently engage in CPD related to digital tools and resources, participation in AI-specific training remains low. Meanwhile, education systems are increasingly developing guidelines on the responsible and effective use of AI in teaching and learning, with such guidelines already adopted in more than half of the education systems. Even if teachers generally acknowledge the benefits of using digital technologies in teaching, TALIS shows that they are more sceptical about the educational benefits of AI.

Introduction

Digital education is an essential policy area at both the European and national levels. In an era of rapid technological advancement, there is a growing demand for information on national approaches and measures to bolster digital learning in educational systems. This report, which focuses on lower secondary education (ISCED 24), presents a comprehensive mapping of digital transformation in education systems, illuminating strategies and practices across Europe.

Policy context

Digital technology is transforming all aspects of our lives – communication, work and learning. At the European level, this is managed through the Commission's Digital Education Action Plan (2021–2027), which sets out a vision of high-quality, inclusive and accessible digital education in Europe, aiming to support the adaptation of the education and training systems of EU Member States to the digital age (European Commission, 2020b). It outlines two strategic priorities: fostering a high-performing digital education ecosystem and enhancing digital skills and competences. Central to these priorities is the digital transformation of education and training systems to ensure they are fit for the digital age. The plan advocates for robust infrastructure, connectivity and digital tools that enable innovative teaching and learning practices. It also promotes the development of digital competences that support the safe, responsible and effective use of digital technologies, including aspects related to digital wellbeing and online safety. These objectives are further reinforced by the Union of Skills Communication, which emphasises the importance of strengthening basic, digital, STEM and transversal competences to support competitiveness, innovation and social inclusion across Europe (European Commission, 2025e).

The Digital Education Action Plan's objectives are also supported by two Council recommendations, which together offer a structured, comprehensive approach to enhancing digital education across Member States. The Council Recommendation on the key enabling factors for successful digital education and training ([5]) underscores the importance of a strategic approach to digital education and skills. It calls for robust digital infrastructure, including adequate connectivity, resources and digital capacity in schools, to ensure that all students have equal access to digital tools. It also underlines the importance of training and supporting teachers. The Council Recommendation on improving the provision of digital skills and competences in education and training ([6]) advocates for a cohesive national strategy on digital skills that extends across all levels of education. It promotes an age-appropriate, cross-curricular approach, beginning with early childhood education, moving through primary and secondary education and advancing progressively, ensuring that digital literacy is embedded across subjects.

These priorities are closely aligned with the objectives of the European Education Area, which sets the ambitious goal of reducing the proportion of low achievers in computer and information literacy to less than 15 % by 2030 ([7]). Two competence frameworks have been developed to help support this goal. First, the Digital Competence Framework for Citizens (DigComp) (last update DigComp 3.0, Cosgrove and Cachia, 2025) provides a model for describing the knowledge, skills and attitudes that are needed to be digitally competent in daily life and for participation in society.

Second, the Digital Competence Framework for Educators (DigCompEdu) outlines the digital skills that educators need to effectively integrate technology into their teaching practices. This framework emphasises not only the technical and safety aspects

5 Council Recommendation of 23 November 2023 on the key enabling factors for successful digital education and training (OJ C, C/2024/1115, 24.1.2024, ELI: http://data.europa.eu/eli/C/2024/1115/oj).

6 Council Recommendation of 23 November 2023 on improving the provision of digital skills and competences in education and training (OJ C, C/2024/1030, 23.1.2024, ELI: http://data.europa.eu/eli/C/2024/1030/oj).

7 Council Recommendation of 23 November 2023 on improving the provision of digital skills and competences in education and training (OJ C, C/2024/1030, 23.1.2024, ELI: http://data.europa.eu/eli/C/2024/1030/oj). The target applies to grade 8 students and pertains to lower-secondary education.

of digital competences but also the importance of fostering creativity and innovation, encouraging both learners and educators to explore and build on the opportunities that new technologies provide. This framework is much needed, as, according to the OECD's Teaching and Learning International Survey (TALIS 2018), only 39 % of teachers in the EU feel adequately prepared to use digital technologies (OECD, 2019).

International research further highlights the growing importance of digital education for equipping learners with the competences needed to participate in an increasingly digital society. The Organisation for Economic Co-operation and Development's (OECD) Digital Education Outlook (OECD, 2023d) shows that digital skills are becoming indispensable across all sectors and that countries that prioritise digital competences within their education systems are better equipped to prepare students for the future of work. In addition, success in digital education requires synergy in high-quality infrastructure, innovative pedagogical methods and the embracing of new digital tools (OECD, 2023c; Boeskens and Meyer, 2025).

Moreover, the rapid development of artificial intelligence (AI) highlights an urgent need for competence development among teachers and throughout the entire school system. Equipping educators with the skills to harness AI technologies is crucial to adapt to tools that bring both opportunities and challenges to modern classrooms (Cabrera, Punie and Vuorikari, 2018). The purposeful integration of emerging technologies, such as AI, creates new possibilities for personalised learning, enhanced information access and modern pedagogical approaches. Personalised learning powered by AI allows educators to tailor educational experiences to individual students' needs, enabling them to progress at their own pace and receive targeted support in areas where they face challenges. These systems can identify learning gaps, suggest specific interventions and provide real-time feedback, fostering improved academic outcomes and student engagement. AI-driven tools also offer enhanced access to information in multiple languages and formats and at different levels of complexity, enabling inclusivity by addressing diverse learning needs (Ayeni *et al.*, 2024).

Reflecting the growing importance of AI literacy in education, the United Nations Educational, Scientific and Cultural Organization (UNESCO) developed an AI competency framework for students to support educators in preparing learners to become responsible users and co-creators of AI through the integration of AI learning objectives into curricula (UNESCO *et al.*, 2024). More recently, an AI literacy framework for primary and secondary education provides a structured approach to the development of learners' AI-related competences (OECD, 2025a).

The increasing importance of AI in the digital economy has led the EU to introduce the AI Act [8], a comprehensive regulatory framework designed to ensure the safe and ethical deployment of AI technologies across various sectors, including education. The Council conclusions on teachers in the era of AI further underline the importance of supporting teachers in developing AI-related competences and using AI in a safe, ethical, inclusive and pedagogically meaningful way [9]. In addition, the European Commission's 2026 guidance package for teachers highlight growing attention to the safe, ethical, inclusive and pedagogically meaningful use of digital technologies and AI in education. The package addresses the ethical use of AI and data, digital education content, tackling disinformation and promoting digital literacy, as well as guidance on the teaching of informatics (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2025b, 2026c, 2026b, 2026a).

The Erasmus+ programme plays an important role in fostering digital education by supporting teacher mobility, digital skills training, the exchange of best practices, and the development of digital pedagogical approaches and innovative practices that improve the quality of teaching and learning. The Member States are bolstering these efforts by using the EU's Recovery and Resilience Facility to provide targeted support for the digital transformation of education systems, with a particular focus on addressing the needs of vulnerable and socioeconomically disadvantaged students.

Key definitions and concepts

In the realm of digital education, various terms have gained widespread currency at the European level. Key terms include 'digital education', 'digital literacy' and 'digital competence', each interrelated and in some aspects overlapping, but still embodying specific educational objectives. Digital education aims

8 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) (OJ L, 2024/1689, 12.7.2024, ELI: https://eur-lex.europa.eu/eli/reg/2024/1689/oj).

9 Council conclusions on teachers in the era of artificial intelligence (AI) (OJ C, C/2026/2826, 26.5.2026, ELI: http://data.europa.eu/eli/C/2026/2826/oj).

to empower students with the digital competences necessary to thrive in an increasingly digital world, while also leveraging technology to improve educational outcomes, increase accessibility and foster innovative learning environments. Digital literacy pertains to the ability to access, analyse and communicate information effectively using digital technologies. Digital competence is about the confident, critical and responsible use of and engagement with digital technologies in learning, at work and for participation in society.

The term 'digital ecosystem' is increasingly used in policy debate and occupies a central space in this report. It is an umbrella concept that encompasses a wide array of interconnected digital environments, components and entities that together form a cohesive system enabling digital activities and interactions. In the context of this report, 'digital ecosystem' refers to a well-integrated environment where digital infrastructure, tools, content and pedagogical practices come together to enhance teaching and learning. It includes reliable connectivity, secure platforms, high-quality digital resources and professional development opportunities for educators. The ecosystem also ensures accessibility, inclusion and collaboration among schools and stakeholders, including those in industry, to foster innovation and digital competence among students. The Glossary for this report provides further details and clarifications.

Content and structure of the report

In alignment with the policy objectives pursued in the EU, this report undertakes an analysis of the digital transformation of schools, teaching and learning. AI and other emerging technologies are examined across all these areas.

The digital transformation of schools depends on a set of system-level conditions, including top-level policy frameworks, infrastructure provision, school planning and quality assurance. Together, these elements shape the extent to which digital technologies can be effectively integrated into teaching and learning and made accessible to all learners.

Chapter 1 examines governance and digital infrastructure arrangements in schools. It analyses top-level frameworks supporting connectivity, hardware, software, interoperability and technical support, exploring how governance arrangements relate to schools' access to core digital resources. It also addresses AI and other emerging technologies, comparing national approaches to their integration and to the development of ethical and data protection safeguards, as well as examining school-level availability and implementation conditions.

Chapter 2 primarily focuses on the extent to which education systems ensure equal access to digital technologies. It discusses students' access to digital technologies at home and at school, examining differences between students from different socioeconomic backgrounds and between schools with differences in socioeconomic composition and urban/rural location. It highlights how and to what extent education systems provide support for disadvantaged students to access digital technologies and aim to reduce differences between more advantaged and disadvantaged schools. The chapter also considers the potential use of digital technologies to create equity/inclusion in education, primarily focusing on measures to ensure that students with special needs have access to assistive technologies.

Chapter 3 examines how European education systems organise school-level digital planning, assign responsibilities and embed digitalisation within quality assurance frameworks. It explores how schools are guided in developing digital plans and how governance arrangements and support structures guide digital education at the school level. It also examines mechanisms for monitoring implementation, providing feedback and supporting continuous improvement within school development processes.

As for teaching and learning, the report provides detailed insights on curricular approaches and assessment frameworks for digital education and on teachers' preparedness, challenges and attitudes in relation to the integration of digital technologies into teaching.

Chapter 4 explores the development of digital competence within general lower-secondary education programmes. It investigates how digital competences are incorporated into national curricula and identifies the required starting grade for teaching digital skills. It also provides an overview of competence areas included in national curricula, with a particular focus on the digital skills related to understanding and using technologies driven by AI. The analysis also considers where students are most likely to acquire certain ICT and internet-related skills, either in the classroom or outside school. The second part of the chapter explores top-level assessment frameworks to identify whether they include any requirements or recommendations regarding the assessment of students' digital competences. In particular, it looks at the existence of national/standardised tests assessing the digital competences of lower-secondary education students.

Chapter 5 offers a comprehensive analysis of strategies aiming to strengthen teachers' digital competences through ITE, high-quality continuing professional development (CPD) and supportive institutional environments. It investigates the integration of digital competences into regulatory frameworks and guidelines for ITE across European countries, while also assessing the interplay between the development of these skills during ITE and teachers' engagement in CPD. The chapter assesses existing digital competence frameworks for CPD, patterns in teacher participation across different competence areas and patterns in their self-perception of professional development gaps. It also investigates support mechanisms that foster teachers' digital growth, alongside strategies to enhance digital leadership in schools. Finally, it identifies key enablers of and obstacles to the adoption of digital technologies in teaching and considers teachers' views on the key challenges and benefits of the use of such technologies in education.

Methodology and data sources

This report is based primarily on qualitative data on policies and measures, collected from the Eurydice Network on 38 education systems. These include those of the 27 Member States and Bosnia and Herzegovina, Switzerland, Iceland, Liechtenstein, Montenegro, North Macedonia, Norway, Serbia and Türkiye. All contributors are acknowledged in the report's conclusions. The reference year for data collection is the 2024/2025 school year.

The Eurydice indicators are derived from national regulations and official education documents, including curricula and guidelines. Comparative insights are complemented with examples from specific education systems. The primary focus is on lower secondary education (ISCED 24) in public schools. In countries such as Belgium, Ireland and the Netherlands, government-dependent private schools are also considered. Previous Eurydice reports in the field include *Digital education at school in Europe* (European Commission / EACEA / Eurydice, 2019) and *Informatics education at school in Europe* (European Commission / EACEA / Eurydice, 2022).

Eurydice data have been complemented with secondary analysis of data from the latest edition of the International Computer and Information Literacy Study (ICILS), published in November 2024, and with 2023 as the reference year. The ICILS data provide indicators for 24 European education systems and are gathered from surveys of schools, teachers and students ([10]). Chapter 5 also integrates key insights from the 2024 Teaching and Learning International Survey (TALIS), offering a multifaceted perspective on challenges and opportunities in relation to fostering teachers' digital readiness.

Combining ICILS survey data with Eurydice data aims to enrich the analysis by providing pointers as to how policy choices may relate to patterns observed in the survey data. It is important to acknowledge, however, that ICILS survey data cannot be directly correlated with the policy information presented in the report. This is for two reasons. First, it is difficult to establish direct relationships between top-level policies and survey outcomes, as many other contextual factors would need to be factored into the analysis. Second, there is a significant time gap between the two data collections, with the 2023 ICILS survey preceding the Eurydice data collection (2024/2025). Both digital infrastructure and policies in this field are changing quickly, potentially rendering some comparisons less meaningful.

10 ICILS data on the Flemish Community of Belgium, Czechia, Denmark, Germany, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Hungary, Malta, Austria, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, Norway and Serbia are covered in the analysis. ICILS data on Luxembourg and Bosnia and Herzegovina are included in the analysis for students and schools but excluded from the section on teachers due to concerns regarding the representativeness of the sample. The same applies to the Netherlands for all ICILS data (see the Statistical tables).

Chapter 1: Top-level governance for digital technologies in schools

Digital transformation across European societies places new demands on education systems, including on how schools can access and use digital technologies. The Union of Skills Communication (European Commission, 2025e) highlights the need to equip Europe's workforce with competences relevant to the digital and green transition, situating digital skills and readiness within the broader EU competitiveness agenda. The STEM Education Strategic Plan (European Commission, 2025b) links information and communication technologies (ICT) and digital readiness to innovation capacity and participation in scientific and technological fields, underscoring the role of digital technologies in preparing students for future labour market and research demands. These priorities are reflected in the 2023 Council Recommendation on key enabling factors for successful digital education and training ([11]), which highlights the importance of digital infrastructure, institutional capacity, leadership and coordinated governance arrangements in supporting the effective use of digital technologies in education and training. Together, these policy initiatives underline the importance of ensuring that schools have access to the technological, organisational and institutional conditions needed to use digital technologies effectively.

At the international level, research indicates that digital transformation in schools depends not only on device availability but also on stable infrastructure, coherent governance, secure environments and system-wide coordination (Vanderlinde and van Braak, 2011; Voogt *et al.*, 2015; OECD, 2021). More recent Organisation for Economic Co-operation and Development (OECD) analysis highlights the importance of alignment across policy dimensions such as infrastructure, platforms, regulation and institutional capacity (OECD, 2023b, 2025b). Similarly, the Eurydice report *Digital Education at School in Europe* shows that most education systems have adopted national or strategic frameworks for digital education, pointing to widespread policy engagement with digital transformation across Europe (European Commission / EACEA / Eurydice, 2019).

Against this background, Chapter 1 examines how European education systems govern the technological foundations of digital education in schools. Section 1.1 analyses top-level frameworks supporting connectivity, hardware, software, interoperability and technical support, drawing on Eurydice data complemented by 2023 ICILS indicators to explore how governance arrangements relate to schools' access to core digital resources. Section 1.2 focuses on AI and other emerging technologies, examining top-level policy approaches to their integration, ethical and data protection safeguards, and school-level availability. Together, these sections provide an overview of how system-level governance works to structure the digital environment in which teaching and learning take place.

1.1. Top-level governance of access to and use of digital technologies in schools

Digital technologies have become an important feature of school life across Europe. In response, nearly all education systems have adopted top-level policy frameworks – such as strategies, action plans, technical standards or formal guidance – to shape schools' access to digital infrastructure, platforms and related services. When considering the five policy aspects examined in this chapter as a whole, all education systems except Bosnia and Herzegovina report at least one top-level framework. While these policies typically aim to ensure reliable connectivity, sufficient devices, appropriate software and adequate technical assistance, their scopes and levels of integration vary. This variation reflects differences in governance traditions and in the timing and organisation of digital education reforms across

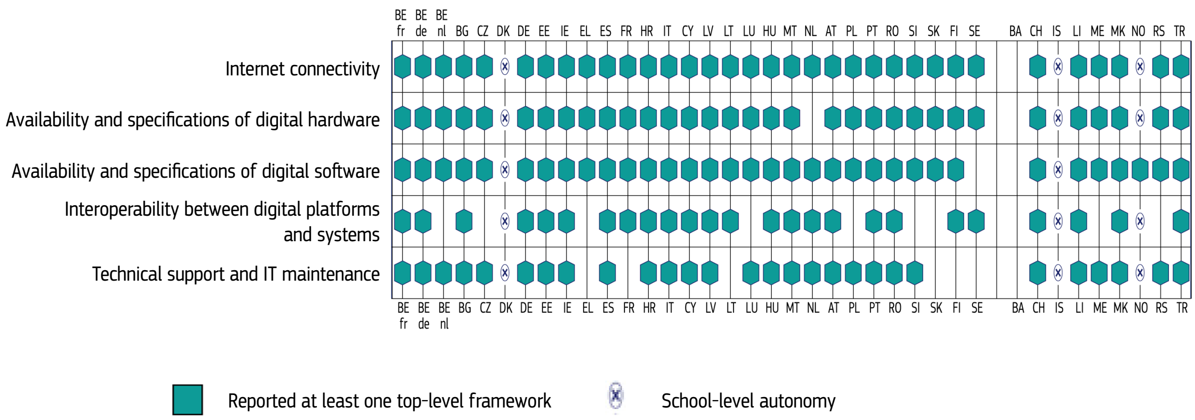
11 Council Recommendation of 23 November 2023 on the key enabling factors for successful digital education and training (OJ C, C/2024/1115, 24.1.2024, ELI: http://data.europa.eu/eli/C/2024/1115/oj).

education systems. In some highly decentralised systems, such as Denmark, Iceland and Norway, the absence of an education-specific framework for particular aspects reflects governance arrangements in which responsibilities for digital infrastructure and services are largely delegated to municipalities or schools rather than defined through a single national policy framework.

In this chapter, the term 'top-level policy framework' refers to an official policy document adopted by national or regional authorities that sets out objectives, principles or requirements in a specific policy area (e.g. connectivity, hardware provision or technical support). Such documents may take the form of strategies, action plans, programmes, recommendations or technical guidelines and standards. Education systems may rely on several instruments operating in parallel, each addressing a different dimension of digital provision. As a result, the presence of a top-level framework is assessed separately for each policy aspect, and systems may be covered in some areas but not in others. Policy coherence therefore depends not only on the existence of such frameworks but also on how they are aligned and implemented across levels of governance.

This report focuses on the five aspects most frequently addressed by top-level authorities: internet connectivity, availability and specifications of digital hardware, availability and specifications of digital software, interoperability between platforms and systems, and technical support and information technology (IT) maintenance (Figure 1.1). Together, these dimensions form a shared policy baseline for the development of sustainable digital learning environments and provide a common analytical structure for comparing national approaches.

Figure 1.1: Key aspects of top-level frameworks supporting access to and the use of digital technologies in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory note

Empty cells indicate that no top-level framework was reported.

Across education systems, coverage of these five aspects varies in both scope and level of integration within top-level policy frameworks. Most education systems address four or all five areas within their top-level policy frameworks, indicating that digital infrastructure is addressed through system-level policies rather than isolated measures. Internet connectivity is one of those addressed most frequently (34 systems). Policies concerning the availability and technical specifications of digital software are also reported in 34 systems, while those concerning digital hardware are reported in 33 systems. Technical support and IT maintenance are addressed in 28 systems. By contrast, interoperability between digital platforms and systems is addressed in fewer education systems (25). This pattern suggests that, compared with other aspects of digital infrastructure, interoperability is addressed less frequently at the top level, reflecting differing policy priorities and stages of digital system development.

For the purpose of the comparative analysis, the report identifies governance models reflecting how responsibilities for implementation and oversight are distributed across levels of authority. These models represent an analytical synthesis of the information provided through the Eurydice data. Governance arrangements are examined separately for each policy aspect (connectivity, hardware, software, interoperability and technical support), as responsibilities may differ across these areas within the same education system. This approach allows the analysis to capture variations in governance structures across policy domains that might not be visible if a single overall model were applied to each system.

The subsequent sections examine each policy area in more detail and, where possible, relate policy design to 2023 ICILS evidence on school-level provision. Chapter 2 explores whether patterns of infrastructure availability vary based on schools' location and socioeconomic composition.

1.1.1. Speed and reliability of internet connectivity

Reliable internet access is a key condition for the effective integration of digital technologies into teaching and learning. Across Europe, most education systems address school connectivity through top-level policy frameworks, although the degree of regulatory detail and operational involvement varies. Overall, 34 systems report some form of policy guidance or regulatory arrangement covering school connectivity, indicating that internet access is recognised as an area of system-level responsibility rather than solely a local or technical concern.

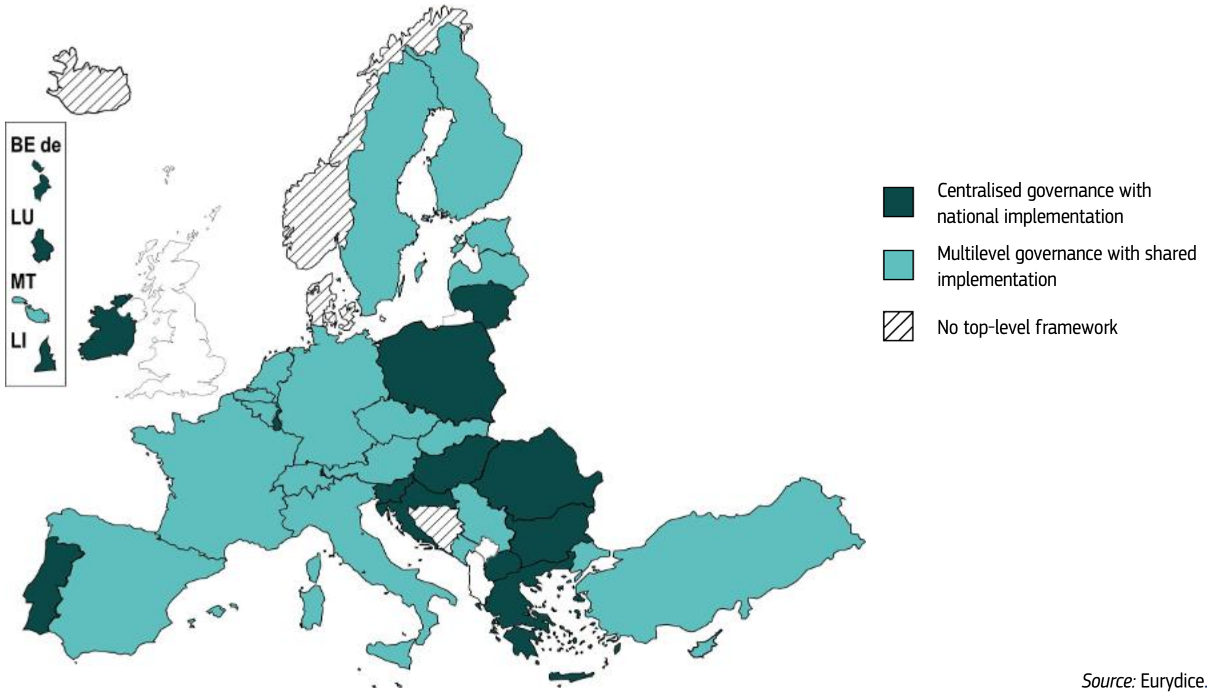
For analytical clarity, Figure 1.2 distinguishes two governance models based on how responsibility for funding, implementation and oversight is distributed across levels of authority: (1) centralised governance with national implementation and (2) multilevel governance with shared implementation. These groupings reflect differences in how responsibilities are exercised across governance levels. Systems with no top-level framework (including school-level autonomy and fully decentralised systems) are discussed separately as a contextual grouping.

In 14 education systems, school connectivity is governed through centralised arrangements in which national authorities define technical standards, provide funding and often coordinate procurement and monitoring. Connectivity is treated as a system-level infrastructure service, typically delivered through national agencies or centrally managed programmes. The German-speaking Community of Belgium ensures fully managed fibre internet connectivity and secure in-school infrastructure in all secondary schools through its IT reform for education ([12]). Ireland's schools broadband programme centrally procures filtered, high-speed connections for all schools, while Greece relies on the Greek School Network as a national service provider of connectivity and digital services. Croatia similarly integrates connectivity into its strategic framework for the digital maturation of schools and the school system (2030) (see country example), and Portugal embeds connectivity within its action plan for the digital transition ([13]). In Poland, connectivity is supported through the National Educational Network (Ogólnopolska Sieć Edukacyjna – OSE), a government programme implemented nationally by the NASK National Research Institute (see country example). Comparable centrally coordinated approaches are also reported in Bulgaria, Lithuania, Luxembourg, Hungary, Romania, Slovenia, Liechtenstein and North Macedonia, where top-level authorities or national agencies retain a leading role in defining requirements and steering implementation.

12 German-speaking Community of Belgium, IT reform for education.

13 Portugal, Action plan for the digital transition (PATD).

Figure 1.2: Governance models for internet connectivity in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory notes

The governance categories presented in the figure reflect how responsibilities for implementation and oversight of school connectivity are distributed across levels of authority.
A **top-level framework** is considered present where school connectivity is addressed within an education policy document issued by top-level authorities.
Centralised governance with national implementation: The national authority defines technical standards, provides funding and coordinates or oversees implementation at the national level.
Multilevel governance with shared implementation: National authorities set the strategic direction and funding frameworks, while regional or local authorities are responsible for operational implementation.
No top-level framework: No education-specific policy framework on school connectivity is reported. Connectivity may therefore be organised locally or addressed through broader public digital infrastructure policies, including fully decentralised systems.

These centralised approaches tend to reduce the administrative burden for schools and allow governments to align connectivity, cybersecurity and platform provision within a single policy architecture. However, these models may also require sustained public investment and strong coordination capacity to ensure consistent service quality across geographically and socially diverse regions.

Centrally managed broadband provision

In **Ireland**, the Schools broadband programme centrally provides filtered high-speed connectivity to all schools as part of the national Digital strategy for schools to 2027 [14]. The national education and research network is managed and operated by Advancing Services for Irish Education, Research and Academia (Asiera), formerly the Higher Education Authority Network (HEAnet), on behalf of the Department of Education and Youth, and is supported by a nationally procured service desk responsible for incident resolution, technical support and performance monitoring. The programme is complemented by grant schemes enabling schools to upgrade their internal Wi-Fi and network infrastructure, ensuring that centrally provided broadband connectivity is effectively integrated at school level.

In **Croatia**, the Strategic framework for the digital maturation of schools and the school system (2030) [15] defines national connectivity standards and objectives for bandwidth expansion. Implementation is guided by national targets and monitoring arrangements, reinforcing connectivity as a shared system responsibility rather than an institutional concern.

In **Poland**, school connectivity is supported through the Nationwide Education Network (Ogólnopolska Sieć Edukacyjna (OSE)), a government programme established by the Act of 27 October 2017 on the National Education Network [16]. The

14 Ireland, Schools broadband programme and Digital strategy for schools to 2027.
15 Croatia, Strategic framework for the digital maturation of schools and the school system in the Republic of Croatia (2030).
16 Poland, Act of 27 October 2017 on the National Education Network.

programme is implemented nationally by the NASK National Research Institute on behalf of the Ministry of Digital Affairs. The OSE provides schools with free high-speed broadband connectivity, together with integrated cybersecurity services protecting users from harmful content, malware and network attacks. The programme also supports the development of digital competences through educational materials and training initiatives related to cybersecurity and safe internet use. Schools may apply to join the network in accordance with a national deployment schedule prepared by the OSE operator.

A larger group of 20 systems combines national steering with decentralised implementation. Under this model, central authorities set strategic direction and funding frameworks, while responsibility for operational delivery rests with regional, municipal or local actors. This approach is evident in Belgium (French and Flemish Communities), where national or community funding is combined with the decentralised management of infrastructure. In the French Community of Belgium, distinct plans exist for external connectivity ([17]) and internal networks ([18]). The Flemish Community's *Digisprong* strategy ([19]) similarly combines national funding with procurement support. In Czechia, the school connectivity and security standard provides guidance to schools on the technical requirements for connectivity and network security ([20]). In Germany, *DigitalPakt Schule* (Digital Pact for schools) allocates federal resources for implementation by the federal states (*Länder*) (see country example). Spain finances broadband centrally but relies on the autonomous communities for implementation ([21]), while, in France, sub-national authorities (*départements*/*régions*) are responsible for infrastructure under nationally defined technical guidelines. Comparable shared responsibility arrangements are reported in Italy (see country example), Estonia, Cyprus, Latvia, Malta, Austria, Slovakia, Switzerland, Montenegro, Serbia and Türkiye, where national policies or frameworks set overall directions or provide support, while implementation responsibilities are distributed across regional or local authorities. These shared responsibility arrangements allow flexibility but may also result in a variation in investment and technical capacity across regions.

In several systems within this group, connectivity is delivered primarily at the local level within broad national frameworks. The Netherlands, Finland and Sweden all benefit from sustained national investment in broadband infrastructure, while procurement, maintenance and service management are carried out by local authorities or schools' organising bodies. In Finland, for example, municipalities play the main role in providing connectivity within a general national digital infrastructure framework supporting digital education and training ([22]). Similarly, in Sweden, the National digitalisation strategy for the school system (2023–2027) highlights the importance of equal access to and use of digital tools, while connectivity provision and management are largely organised at the municipal level ([23]).

Regional implementation under national technical and service standards

In **Germany**, the top-level Strategy on 'Education in the digital world' ([24]) sets the expectation that all schools offer reliable high-speed internet access and secure internal networks, but implementation is shared across governance levels. The *Länder* and municipalities are responsible for upgrading and maintaining school connectivity, supported by federal funding through the initiative *DigitalPakt Schule*, which finances broadband expansion, Wi-Fi installation, digital devices and related digital infrastructure. Funding also supports projects implemented within individual *Länder* as well as joint cross-*Länder* projects aimed at developing shared digital education infrastructure.

In **Italy**, the *Piano scuole connesse* (Connected schools plan) ([25]) within the National Recovery and Resilience Plan, has covered 97.5 % of Italian schools by connecting the remaining 10 000 school buildings, providing at least 1 Gbps symmetric bandwidth. The plan goes beyond installation: it covers multi-year management and maintenance services, ensuring schools do not face hidden costs. Implementation remains regional, but technical requirements and service obligations are defined at the national level.

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17 French Community of Belgium, *Circulaire n° 9280 du 14/06/2024 – Procédure d'octroi d'une subvention relative à la prise en charge des coûts de connectivité externe des établissements scolaires en Fédération Wallonie-Bruxelles* (Circular No. 9280 of 14/06/2024 – Procedure for granting a subsidy to cover the external connectivity costs of schools in the French Community of Belgium).

18 French Community of Belgium, *Le plan connectivité Wi-Fi* (Wi-Fi Connectivity Plan).

19 Flemish Community of Belgium, '*Digisprong* vision note – ICT plan for high-quality digital education under the "Flemish resilience" recovery plan'. In May 2025, the Flemish Government adopted the *Digiplan* 2025–2029 as a successor to *Digisprong*. The plan builds on previous investments and introduces new priorities, including strengthened teacher professional development, enhanced digital learning environments, updated infrastructure models, and the integration of digital competences into attainment targets. Implementation starts after the reference year.

20 Czechia, School connectivity and security standard.

21 Spain, Connected schools initiative to provide Spanish schools with ultra-fast broadband.

22 Finland, Target state of digitalisation in early childhood education and care, pre-primary, primary and lower secondary education.

23 Sweden, National digitalisation strategy for the school system (2023-2027).

24 Germany, Strategy of the Standing Conference of the Ministers of Education and Cultural Affairs on Education in the digital world (2016).

25 Italy, *Piano scuole connesse* (Connected schools plan) and *Scuole voucher* dashboard for school broadband connectivity.

Denmark, Iceland and Norway operate under strongly decentralised implementation arrangements. Denmark and Norway address school connectivity within broader education policy frameworks, whereas in Iceland school connectivity is primarily governed through national telecommunications policies rather than through education-specific policy frameworks.

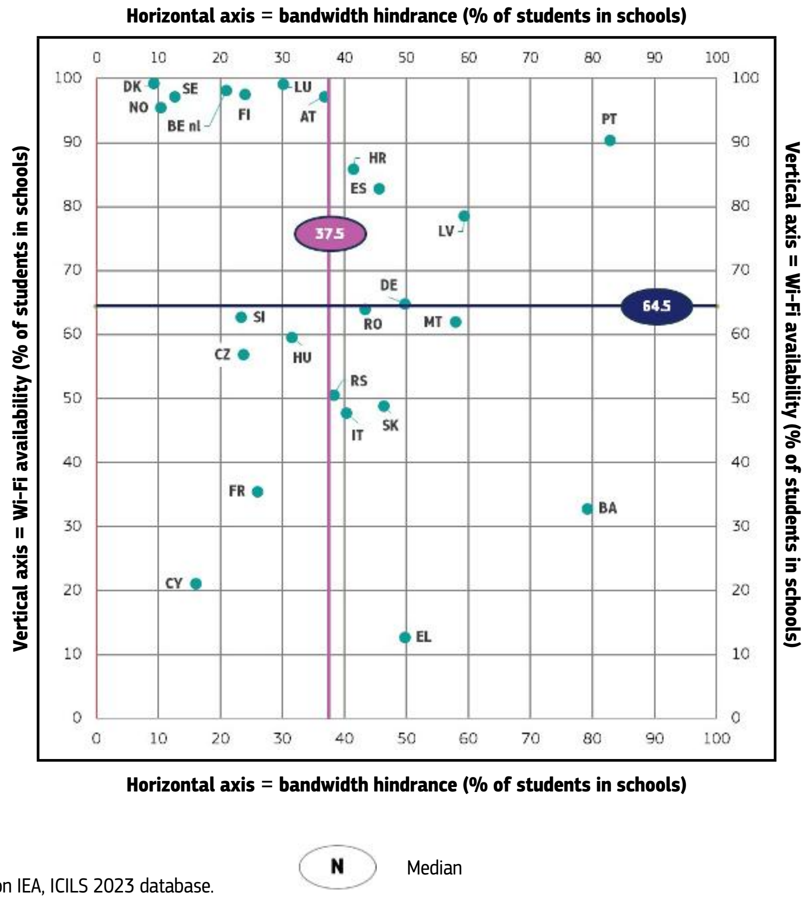
The ICILS 2023 provides insight into how governance approaches translate into school-level connectivity conditions. Figure 1.3 presents two indicators reported by ICT coordinators: the availability of Wi-Fi for both teachers and students, and the extent to which insufficient internet bandwidth hinders teaching and learning. By combining these two measures, the figure shows not only whether connectivity is in place but also whether it supports teaching and learning without major constraints. Across participating education systems, the median share of students attending schools where Wi-Fi is available to both teachers and students is around 65 %; in half of the education systems, at least 38 % of students attend schools where insufficient bandwidth hinders teaching and learning to some extent. These median values suggest variation across education systems in both connectivity provision and reported bandwidth constraints.

Differences are observable across governance arrangements, although variation within each group remains substantial. In fully decentralised systems such as Denmark and Norway, Wi-Fi availability exceeds 95 %, while reported bandwidth hindrance remains below 11 %. These systems combine very high access with comparatively stable network performance, suggesting that contextual conditions beyond education governance may play a role.

Among systems characterised by centralised coordination and national implementation, performance is more mixed. Luxembourg combines near-universal Wi-Fi availability (99 %) with relatively low levels of reported hindrance (30 %), whereas Portugal records high coverage (90 %) alongside the highest reported bandwidth limitation among participating systems (83 %). Other centrally coordinated systems tend to cluster around the medians for both indicators. Greece, by contrast, combines very low Wi-Fi availability (13 %) with comparatively high levels of bandwidth-related hindrance (50 %), pointing to persistent implementation challenges.

In systems with multilevel governance and shared implementation responsibilities, outcomes vary widely. The Flemish Community of Belgium and Austria report very high Wi-Fi availability (98 % and 97 %, respectively) with moderate bandwidth constraints (21 % and 37 %, respectively). Germany, Spain and Latvia are closer to the international medians. France and Cyprus report comparatively low Wi-Fi availability but relatively limited bandwidth-related hindrance, while Italy and Slovakia combine lower availability with more frequent bandwidth-related obstacles. Finland and Sweden stand out within this group by combining very high Wi-Fi availability with comparatively low reported hindrance, indicating that favourable outcomes are also achievable under multilevel governance.

Figure 1.3: Relationship between Wi-Fi availability and bandwidth hindrance in schools, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are depicted based on two indicators derived from the 2023 ICILS ICT coordinator questionnaire. Availability of Wi-Fi is based on variable II3G04B, corresponding to question Q4B ('Are the following technology infrastructure resources made available by your school to teachers and students? – Wi-Fi'). Bandwidth hindrance is based on variable II3G14B, corresponding to question Q14B ('To what extent is the use of ICT in teaching and learning at your school hindered by each of the following obstacles? – Insufficient internet bandwidth or speed').

Percentages represent the share of students attending schools where Wi-Fi is available to both teachers and students (II3G04B) and where insufficient internet bandwidth or speed is reported as hindering the use of ICT in teaching and learning 'to some extent' or 'a lot' (II3G14B). Results are weighted using student sampling weights (TOTWGTS), so that estimates reflect the student population rather than the number of schools.

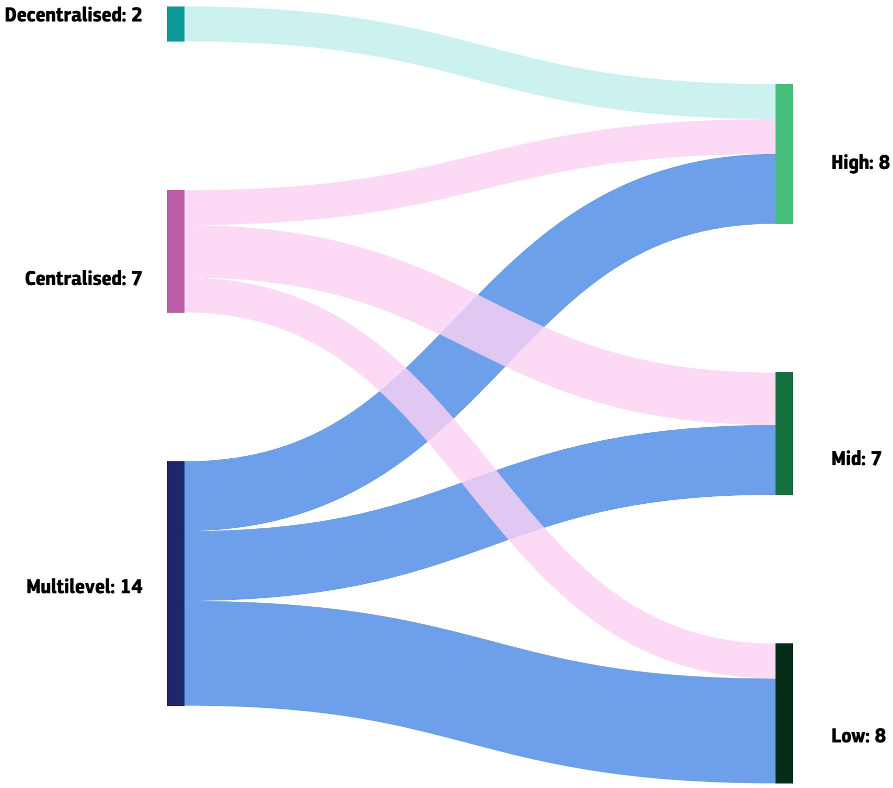
Median values across participating education systems are shown to summarise the distribution (64.5 % for Wi-Fi availability and 37.5 % for bandwidth-related hindrance). Exact percentages and standard errors are provided in the Statistical tables.

Country-specific note

Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

Figure 1.4 visualises the relationship between governance arrangements and school-level Wi-Fi availability by linking governance models to three levels of Wi-Fi access. It shows that education systems are distributed unevenly across Wi-Fi availability categories. Both fully decentralised systems, Denmark and Norway, fall into the high-availability group. Among systems with centralised governance, outcomes range from very high availability (Luxembourg, Portugal) to mid-range availability (Croatia, Romania, Slovenia) and low availability (Greece, Hungary), suggesting that centralised governance arrangements do not necessarily translate into uniformly high access levels. Systems with multilevel governance display the widest variation: some achieve high coverage (Flemish Community of Belgium, Austria, Finland, Sweden), while others fall in the mid-range (Germany, Spain, Latvia, Malta) or low category (Czechia, France, Italy, Cyprus, Slovakia, Serbia). Overall, the figure shows that governance structure alone does not determine connectivity outcomes and that access levels reflect differences in implementation conditions across systems.

Figure 1.4: Relationship between Wi-Fi availability in schools and governance model, 2023



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	High Wi-Fi access (≥ 90 % of students are in schools where Wi-Fi is available)	Mid-range Wi-Fi access (60–89 % of students are in schools where Wi-Fi is available)	Low Wi-Fi access (< 60 % of students are in schools where Wi-Fi is available)
Fully decentralised / school autonomy	DK, NO		
Centralised governance with national implementation	LU, PT	HR, RO, SI	EL, HU
Multilevel governance with shared implementation	BE nl, AT, FI, SE	DE, ES, LV, MT	CZ, FR, IT, CY, SK, RS

Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory note

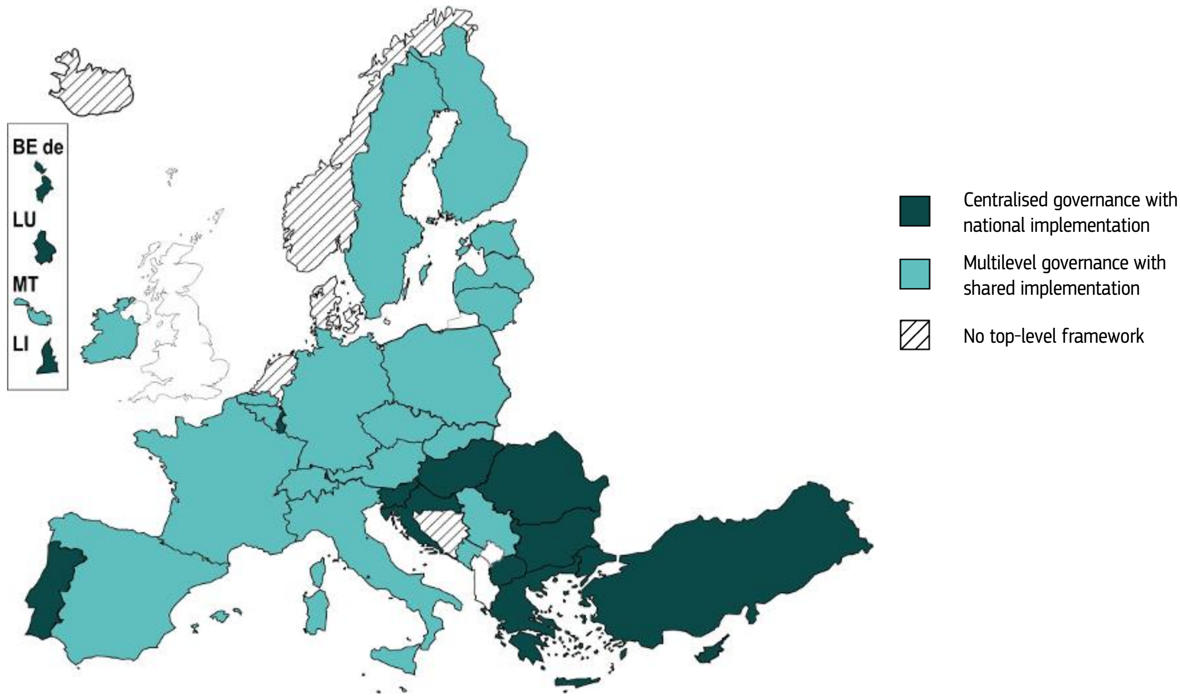
The table presents education systems grouped by the share of students attending schools where Wi-Fi is available to both teachers and students. Data are drawn from the ICILS 2023 ICT coordinator questionnaire and weighted by student population. Wi-Fi availability is based on question Q4B ('Are the following technology infrastructure resources made available by your school to teachers and students? – Wi-Fi'). Systems are classified into three categories based on levels of availability (high ≥ 90 %, mid-range = 60–89 %, low < 60 %). Governance classifications are based on Eurydice data on top-level frameworks for school connectivity (see Figure 1.2).

While most education systems now provide structured support for school connectivity, the availability of stable and high-capacity networks remains uneven across systems. The ICILS 2023 indicates that the existence of a top-level framework or a particular governance model does not in itself ensure reliable performance: education systems operating under similar arrangements display different levels of bandwidth hindrance. This suggests that, alongside policy design, differences in implementation arrangements and local conditions may play an important role in shaping connectivity outcomes across education systems.

1.1.2. Availability and technical specifications of digital hardware

Providing reliable digital hardware is a core condition of digital learning and teaching. The majority of European education systems (33) include hardware provision in their top-level frameworks, although the degree of coordination varies. As in the area of connectivity, two main governance models can be identified: (1) centralised governance with national implementation and (2) multilevel governance with shared implementation. These models are shown in Figure 1.5.

Figure 1.5: Governance models for the provision of digital hardware in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory notes

A **top-level framework** is considered present where hardware provision is addressed in an education policy document, even if it is not the main focus of the policy.
Centralised governance with national implementation: The top-level authority defines technical specifications and coordinates funding or procurement, often distributing devices directly to schools.
Multilevel governance with shared implementation: National authorities define policy directions or recommended technical standards, while regional/local authorities or schools themselves manage procurement and implementation.
No top-level framework: No education-specific policy addresses hardware provision in schools. There is school-level autonomy.

Thirteen systems follow a centralised approach in which national authorities define hardware specifications and coordinate funding or procurement mechanisms, sometimes distributing devices directly to schools. In Bulgaria, the 2025 Digital Bulgaria national programme [26] prioritises the renewal of school equipment, while Greece and Cyprus provide centrally purchased laptops and interactive boards. Croatia's *e-Škole* (e-schools) programme defines national standards for digital devices used by teachers and students (see country example), and Hungary sets national targets through its Digital education strategy [27]. Portugal's Digital school programme combines national technical standards with large-scale procurement (see country example), while Romania links recent upgrades to investments under its National Recovery and Resilience Plan, and Slovenia reports ICT equipment initiatives supported under the same framework. Luxembourg, Liechtenstein and Türkiye follow centrally coordinated approaches to the provision of digital devices, with similar arrangements also reported

26 Bulgaria, 2025 Digital Bulgaria national programme.

27 Hungary, Digital education strategy.

in North Macedonia. These systems are examples of coordinated national efforts combining central funding, shared standards and oversight mechanisms.

Centrally coordinated frameworks for digital hardware provision

In **Croatia**, the *e-Škole* (e-schools) programme, coordinated by the Croatian Academic and Research Network (CARNET), provides a systemic approach to equipping all general secondary schools with ICT hardware. Between 2018 and 2023, over 85 000 laptops were distributed for teaching use, and more than 2 400 school sites received network and wireless infrastructure upgrades. The Strategic framework for the digital maturation of schools and the school system (2030) ([28]) defines standards and catalogues for teachers, students, and learners with special needs. Funding is centrally administered and complemented by national procurement mechanisms, ensuring interoperable and pedagogically relevant equipment across schools.

In **Portugal**, the Digital school programme ([29]) delivers centrally defined packages of digital equipment. These packages typically include laptops or tablets for students and teachers, and also routers, interactive displays and accessories. Specifications – such as battery life, durability, connectivity standards and compatibility with digital learning platforms – are established at the national level, while the allocation of devices is based on school size and student needs. Dedicated technical support and monitoring mechanisms are also embedded in the implementation process.

A second group of 20 systems combines national funding or guidance with decentralised implementation. In these systems, national authorities typically define policy objectives, funding frameworks or general reference parameters, while procurement and deployment are managed by regional authorities, schools' organising bodies or schools themselves. Examples include the French and Flemish Communities of Belgium, where the minimum and supplementary equipment plan and the *Digisprong* strategy, respectively, combine financial support with guidance for schools (see country examples). In Czechia, the School connectivity and security standard ([30]) defines recommended technical parameters for digital hardware and network infrastructure, while procurement decisions and equipment provision are managed by schools and their organising bodies.

Germany's *DigitalPakt Schule* provides federal funding for equipment aligned with Länder media development plans and the Strategy on education in the digital world ([31]). France establishes national minimum infrastructure standards through *Le socle numérique de base pour le niveau collège (ISCED 2)* (The basic digital standards for lower secondary education (ISCED 2), while procurement is managed by local authorities.

Comparable shared responsibility arrangements are observed in Spain (see country example), Latvia, Lithuania, Slovakia, Sweden, Montenegro and Serbia, where national authorities define strategic priorities or provide funding frameworks, while operational implementation and technical support responsibilities remain decentralised. In Slovakia, investments under the National Recovery and Resilience Plan are combined with school-level implementation and nationally defined standards for digital equipment. Austria follows a similar approach through the national grant schemes guided by the Eight-point plan for digital learning ([32]). In Finland and Switzerland, hardware provision is addressed in broad policy terms, while procurement decisions largely rest with municipalities or schools.

Shared responsibility between central and regional authorities in hardware provision

In the **French Community of Belgium**, schools are supported through the *Mes outils numériques* ('My digital tools') initiative, which provides assistance for schools to purchase a stock of devices that can be lent to pupils, alongside providing financial support for families, including a contribution of EUR 150 for parents to use to purchase or lease a device over a three- or four-year period. In parallel, at the regional level, the Walloon Region's *École numérique* (Digital school) plan enables eligible schools to benefit from additional digital educational equipment, focusing on complementary hardware provision.

In the **Flemish Community of Belgium**, the *Digisprong* strategy provides funding for digital equipment, while giving schools the autonomy to choose devices that meet pedagogical needs. Circulars outline the principles for investment, procurement and curriculum alignment, while joint procurement schemes support cost-efficient purchasing. There is no strict enforcement of technical specifications, but schools are encouraged to choose from recommended device types and participate in joint procurement schemes.

28 Croatia, Strategic framework for the digital maturation of schools and the school system in the Republic of Croatia (2030).

29 Portugal, Digital school programme.

30 Czechia, School connectivity and security standard.

31 Germany, Strategy of the Standing Conference of the Ministers of Education and Cultural Affairs on education in the digital world.

32 Austria, Eight-point plan for digital learning.

In **Spain**, the National Institute for Educational Technologies and Teacher Training (INTEF) coordinates a common framework through the School digital plan guide. Autonomous communities then select specific equipment and manage procurement based on both regional needs and central guidelines. Schools may complement regional allocations with their own budgets, ensuring flexibility while maintaining a baseline level of provision.

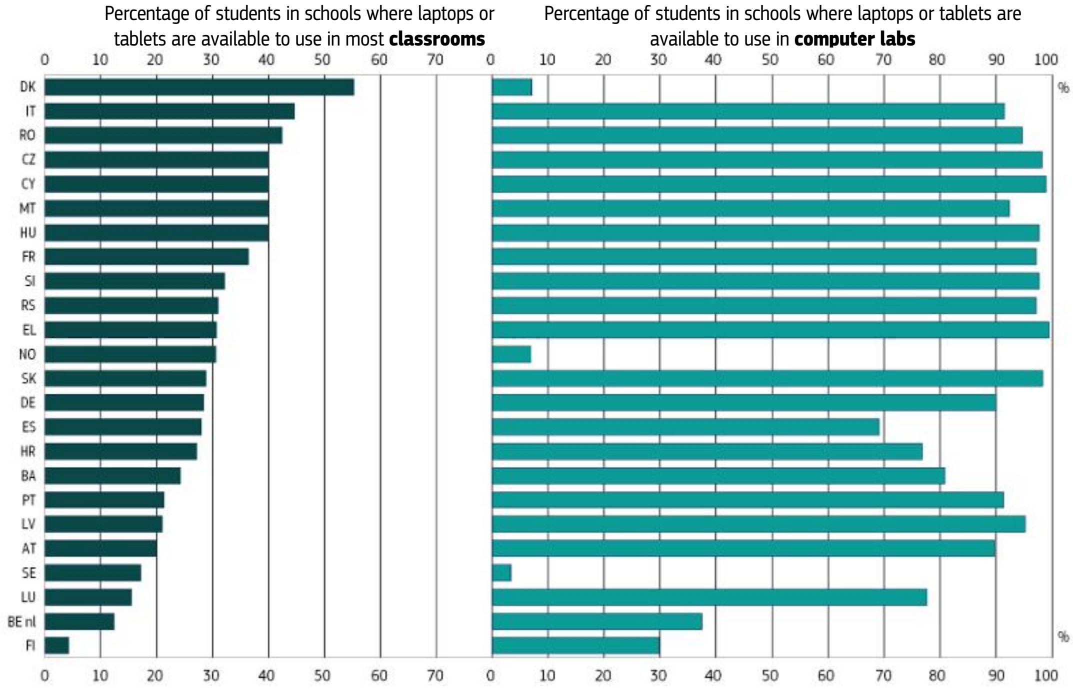
A small number of education systems operate under fully decentralised or non-framework arrangements. In Denmark and Norway, responsibility for procuring and managing digital hardware rests primarily with municipalities or schools within broad national education frameworks. The Netherlands reports no specific top-level framework for hardware provision, relying instead on school-level decision-making within general education policy parameters. In Iceland, responsibility for providing appropriate digital hardware lies with municipal education authorities, in line with curricular requirements and teacher competence frameworks.

Overall, approaches to hardware provision range from centrally managed national programmes to shared governance models, reflecting differences in funding arrangements, governance traditions and administrative capacity.

To complement the policy analysis, ICILS 2023 data provide additional insight into how these governance arrangements relate to students' access to digital devices in schools. Figure 1.6 presents the availability of laptops or tablets for students' use in most classrooms and their availability in computer labs. Across participating education systems, access to devices in computer labs is widespread. The median share of students attending schools where laptops or tablets are available in labs is around 91 %. By contrast, in half of the systems, fewer than 30 % of students attend schools where such devices are available directly in most classrooms. This pattern suggests that, in many education systems, access to digital devices continues to be organised primarily through dedicated computer labs rather than through devices available directly in most classrooms.

Differences between systems are substantial. Denmark records the highest level of classroom availability (55 %) alongside the lowest reliance on computer labs (7 %), reflecting comparatively high levels of classroom-based device availability. Norway similarly reports very limited reliance on computer labs, although classroom availability remains at a more moderate level. Italy, Romania, Czechia, Cyprus, Malta and Hungary combine moderate classroom access (around 40 %) with near-universal provision in computer labs (92–99 %), suggesting that access to digital devices continues to rely partly on dedicated ICT spaces while classroom-based availability is expanding. France (36 %), Slovenia (32 %), Serbia (31 %) and Greece (31 %) show comparable patterns. By contrast, Finland (4 %) and the Flemish Community of Belgium (12 %) report particularly low levels of devices available in most classrooms, while computer lab access also remains comparatively limited (30 % and 37 %, respectively). Portugal, Latvia and Austria combine lower classroom availability with high levels of provision through computer labs, whereas Spain shows more balanced access across classrooms and computer labs.

Figure 1.6: Availability of laptops and tablets in classrooms and computer labs, (%), 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are depicted in descending order based on the percentage of students attending schools where laptops or tablets are available for students' use in most classrooms (80 % or more of classrooms in the school).

The figure is based on question Q10 of the ICILS 2023 ICT coordinator questionnaire ('Where are the ICT devices used by students in [target grade] located?'). It draws on the following variables: ICT resources / location of school computers – in most classrooms (80 % or more) (II3G10A) and ICT resources / location of school computers – in computer laboratories (II3G10B).

Percentages represent the share of students attending schools where ICT coordinators reported that laptops or tablets are available in the specified locations. Results are weighted using student sampling weights (TOTWGTS), so that estimates reflect the student population rather than the number of schools. Exact percentages, standard errors and country coverage are provided in the Statistical tables.

Country-specific note

Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

Taken together, Eurydice evidence and ICILS 2023 data indicate that, while device availability is now widespread, modes of access differ substantially. In many systems, classroom availability remains limited relative to provision in computer labs. Although patterns vary across governance models, both high and low levels of classroom access are observed under different arrangements, suggesting that governance structure alone does not determine how digital devices are integrated into everyday teaching and learning practices. Ensuring ready access within regular classrooms remains a shared challenge.

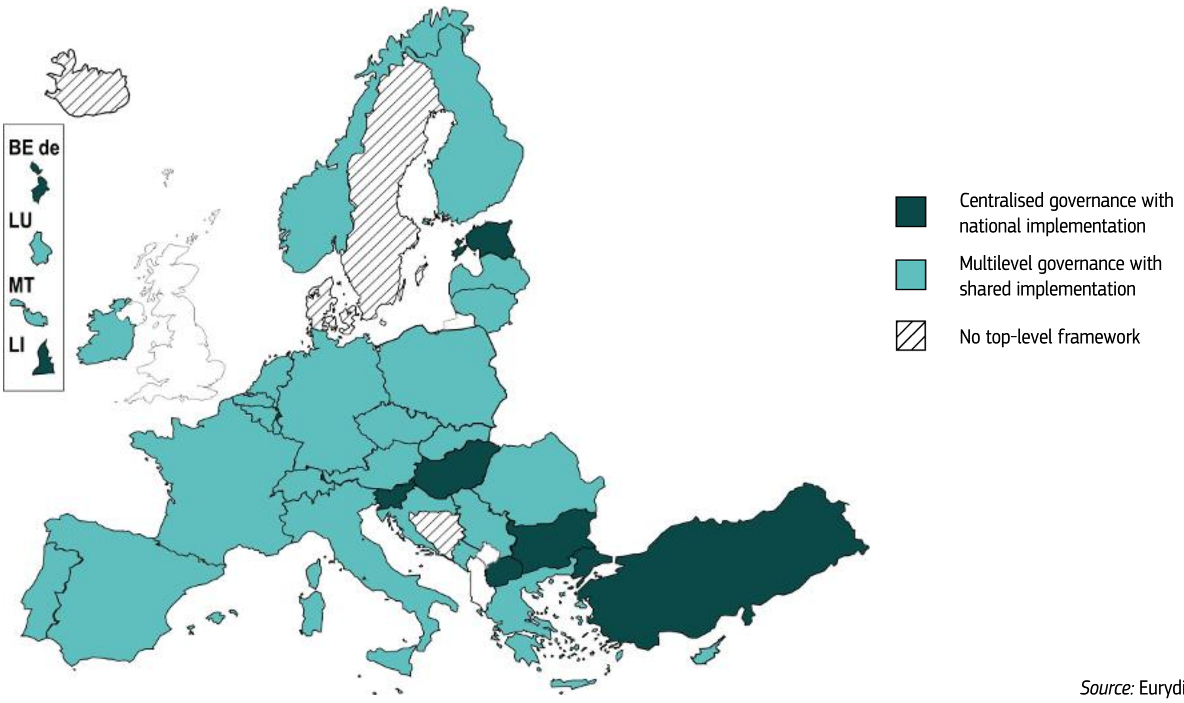
1.1.3. Availability and technical specifications of digital software

Access to digital software – including learning platforms, productivity tools and communication systems – supports the use of digital technologies in teaching, learning and school administration. In this report, the term 'digital learning resources' – used interchangeably with the term 'digital education content' – refers to pedagogical materials in digital format used to support teaching, learning and assessment (see the Glossary). The term 'digital education content' is used in European Commission guidance to denote learning, teaching and assessment materials designed to support pedagogical objectives and made available through digital tools and platforms (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2025b). 'Digital software', by contrast, refers to the tools and platforms through which such content is accessed, created or managed (e.g. learning management systems or collaboration platforms). Digital learning resources are examined in detail in Chapter 3.

Figure 1.7 shows that 34 education systems report addressing software provision within their top-level frameworks, although the scope and governance of these arrangements vary. As in the areas of connectivity and hardware, two main governance models can be distinguished: (1) centralised governance with national implementation and (2) multilevel governance with shared or decentralised implementation.

Eight education systems provide core digital platforms or software services centrally through national authorities or public agencies. These models aim to ensure consistency, secure access and interoperability across schools. In the German-speaking Community of Belgium, office and learning applications are provided under the IT reform for education [33]. In Bulgaria, the Digital Bulgaria 2025 programme supports the integration of digital technologies in education, while Estonia centrally provides interoperable educational e-services that support communication, learning and administration across schools. In Hungary, the Digital education strategy and the KRÉTA platform [34] ensure a coordinated approach to software provision, while Slovenia provides centrally managed access to educational software through the Academic and Research Network of Slovenia (see country example). In Liechtenstein, the *Richtlinie über die Nutzung der Schulinformatik* (Guidelines on the use of school informatics systems) [35] set common rules on devices, software, authentication and data protection across all public schools, ensuring a consistent and secure digital environment. Similar approaches exist in North Macedonia and Türkiye, where national platforms provide digital textbooks, communication tools and access to curriculum-aligned digital materials.

Figure 1.7: Governance models for the provision of digital software in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory notes

A **top-level framework** is considered present where digital software provision is addressed within an education policy document.

Centralised governance with national implementation: National authorities provide core software platforms or shared digital services, define standards and coordinate access centrally.

Multilevel governance with shared implementation: National authorities set guidance or provide reference tools, while regions, local authorities or schools are responsible for software selection and implementation.

No top-level framework: No national standards or requirements; schools choose and manage software independently.

33 German-speaking Community of Belgium, IT reform for education.

34 Hungary, KRÉTA platform: a centrally managed digital system integrating administrative, communication, teaching and learning functions.

35 Liechtenstein, Schulamt (Office of Education), Guidelines on the use of school informatics systems.

Centrally coordinated framework for digital software provision

In **Hungary**, the Digital education strategy (36) establishes a nationally coordinated approach to digital software provision. Centrally managed platforms such as the KRÉTA platform support administration, communication and digital learning, while schools benefit from national licensing schemes, including access to Microsoft 365 for education. Technical guidance is provided by national agencies, ensuring minimum standards for software environments and security across schools.

In **Slovenia**, the Academic and Research Network of Slovenia (ARNES) provides schools with secure access to core digital services (*moj Arnes*), including learning management systems, cloud collaboration tools and videoconferencing tools. A national authentication and authorisation infrastructure (AAI) ensures secure logins across platforms, while the Slovenian Educational Network (SIO) offers virtual classrooms through Moodle and offers resources for professional development (*Skupnosti SIO*). This nationally coordinated approach promotes consistency, secure access and interoperability across schools.

A larger group of 26 education systems combines national guidance, reference platforms or funding arrangements with decentralised decision-making on software adoption. In these systems, national authorities typically define the strategic direction, principles or shared services (e.g. relating to interoperability, security or data protection), while operational choices are made at the regional, municipal or school level.

In the French and Flemish Communities of Belgium, software selection is largely a school-level responsibility within the community framework. For example, in the French Community of Belgium, 932 educational software programmes have been approved by the top-level education authority and are eligible for the 'Manolo' school subsidy programme. In Czechia, the School connectivity and security standard sets out the recommended parameters for digital software environments, while schools and their organising bodies decide which platforms and applications to adopt. In Germany, all federal states (*Länder*) operate learning management systems – including open-source-based or commercial platforms within the National strategy on Education in the digital world. In Ireland, the Digital strategy for schools to 2027 (37) leaves software selection to schools, supported by national guidance and the Oide Technology in Education advisory service. In Spain and France, national authorities provide overarching frameworks for access, data protection and planning, while regional or local actors select and implement specific software tools (see country examples). Italy's *Piano scuola 4.0* (School plan 4.0) (38) encourages investment in digital platforms within nationally defined standards. Cyprus and Latvia define core specifications, while allowing schools to acquire additional compatible tools. Several systems combine centrally supported infrastructure with local flexibility. In Luxembourg, national platforms such as MySchool and One, coordinated by the Centre for Educational IT Management (CGIE), provide shared digital services. In Austria, federal–regional cooperation agreements support the school-level choice of learning management systems (39).

In some systems where software policies are embedded in wider digital education reforms, frameworks tend to focus on infrastructure, competences and access rather than prescribing tools. This applies, for example, in Croatia, where platforms such as Moodle and Zoom are supported through the Croatian Academic and Research Network (CARNET) initiatives. In Norway, the Norwegian Directorate for Education and Training provides guidance on evaluating digital resources but does not mandate software use.

Shared responsibility between central and regional authorities

In **Spain**, the National Institute for Educational Technologies and Teacher Training (INTEF) coordinates a common framework for school digital plans, providing diagnostic tools and national guidance (40). Autonomous communities then select the platforms and applications to be used locally. Some regions deploy their own virtual learning environments, such as EVAGD (*Entorno Virtual de Aprendizaje de Gestión Distribuida* - Virtual Learning Environment with Distributed Management) in the Canary Islands, while drawing on the institute's broader guidelines on interoperability and data protection.

In **France**, software provision combines strong national frameworks with decentralised implementation. National services such as ÉduConnect (41) and the *Gestionnaire d'Accès aux Ressources* (GAR) (Educational Resource Access Manager) (42) provide secure digital identities, authentication and compliance checks for learning resources. Local authorities, meanwhile, procure and implement specific

36 Hungary, Digital education strategy.
37 Ireland, Digital strategy for schools to 2027.
38 Italy, *Piano scuola 4.0* (school plan 4.0).
39 Austria, Eight-point plan for digital learning.
40 Spain, School digital plan guide.
41 France, ÉduConnect (secure identity access).
42 France, Educational Resource Access Manager.

applications. This hybrid model ensures consistency in access and data protection while allowing local flexibility in platform use. The top-level *Stratégie du numérique pour l'éducation 2023–2027* (Digital strategy for education 2023–2027) ([43]) also encourages the use of free and open educational resources, promoted through the Éduscol portal ([44]).

In a smaller group of five systems, software provision is framed in more general terms. Lithuania and Slovakia highlight digital tools within national strategies but leave operational decisions to schools. Switzerland assigns responsibility for software adoption to cantons, while Montenegro reports mainly project-based or donor-supported provision. In Finland, national policy addresses digital services, interoperability and ecosystem development, but does not prescribe specific applications, reflecting a decentralised model in which municipalities and schools take responsibility for software choices.

The ICILS 2023 provides a complementary perspective on how system-level policy approaches are reflected in the availability of digital software at the school level. Figure 1.8 shows that software supporting teaching and learning processes is widely available across participating education systems, although levels of provision vary by software type and by country. Median student coverage reaches around 84 % for video- and photo-editing software, 76 % for graphic or drawing tools, 75 % for digital content linked to textbooks and 82 % for digital textbooks, while interactive whiteboard software remains less widespread, with a median availability of around 55 %. Overall, the results suggest that software supporting curriculum-related activities and basic productivity tasks is commonly accessible, whereas more interactive or presentation-oriented applications are less consistently available across systems.

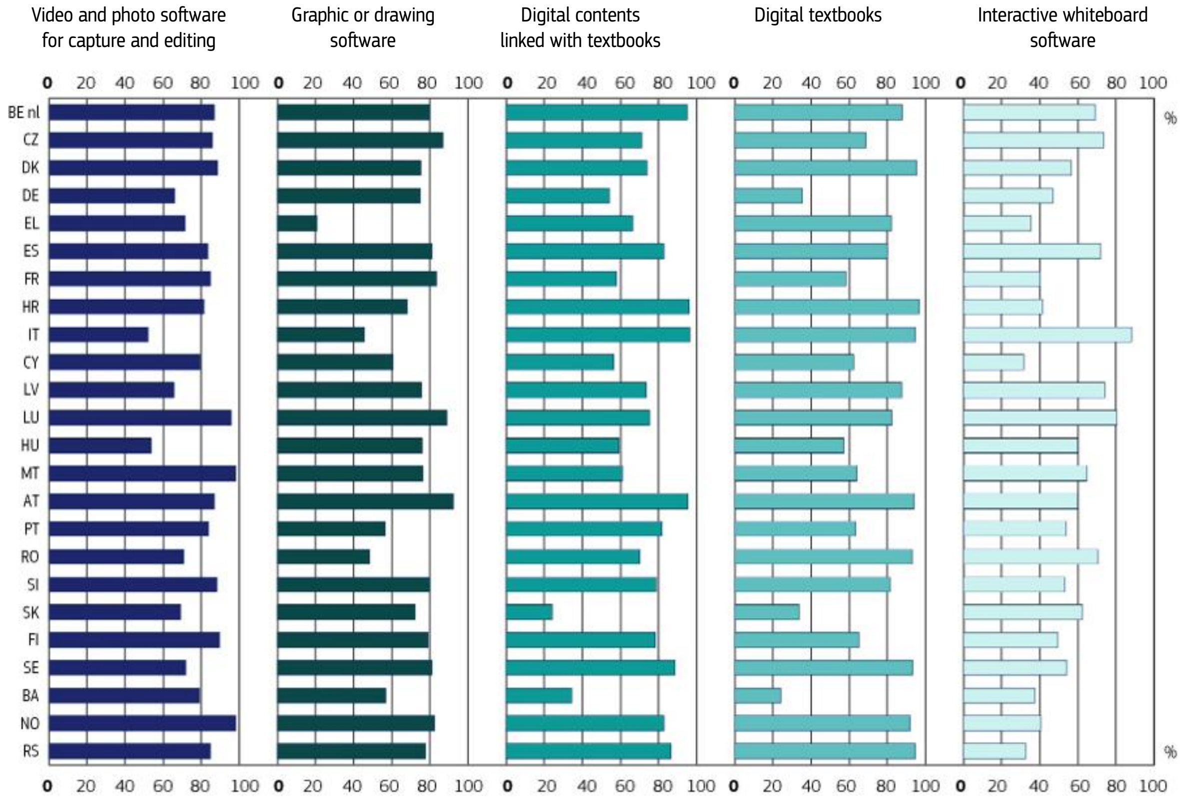
Nevertheless, patterns differ markedly between education systems. Czechia, Spain, Luxembourg, Austria, Slovenia and Sweden report generally high levels of availability across several software categories, indicating more uniform access within these systems. France, Italy and Romania display more uneven profiles, although in different ways. In France, drawing software is widely available (83 %), while digital textbooks remain less common (58 %) and interactive whiteboard software is available in fewer schools (40 %). Italy shows the opposite pattern, with comparatively low availability of video- and photo-editing software (52 %) and drawing software (46 %), but very high levels of access to digital content linked to textbooks (96 %), digital textbooks (95 %) and interactive whiteboard software (88 %). Romania combines very high availability of digital textbooks (93 %) with more limited access to drawing software (48 %), suggesting that software associated with curriculum-related digital materials is more widely available in this system.

Cyprus and Slovakia report comparatively low availability in some software categories, particularly for digital content linked to textbooks (57 % in Cyprus and only 24 % in Slovakia) and digital textbooks (62 % and 34 %, respectively). Interactive whiteboard software remains less common in Cyprus (32 %), while Slovakia reports comparatively higher availability (62 %). In Serbia, software supporting curriculum-related activities – including digital textbooks (95 %) and digital content linked to textbooks (87 %) – is widely available, while interactive whiteboard software remains less common (33 %).

Taken together, the findings point to widespread access to core digital software, alongside continued variation in the breadth and balance of provision across education systems. As with other aspects of digital infrastructure, the presence of policy frameworks or guidance does not necessarily translate into uniform availability of specific software tools at the school level, suggesting differences in implementation conditions and local priorities.

43 France, Digital strategy for education 2023–2027).
44 France, Éduscol portal (national resources and guidance).

Figure 1.8: Availability of core digital software resources in schools (%), 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

The figure is based on question Q5 of the ICILS ICT coordinator questionnaire ('Are the following software resources made available by your school to teachers and students?'). The related variables concern ICT resources / availability of software resources (II3G05F, II3G05J, II3G05L, II3G05M, II3G05P), corresponding, respectively, to video- and photo-editing software, graphic or drawing software, digital content linked to textbooks, digital textbooks and interactive whiteboard software.

Results are weighted by student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools. Please consult the Statistical tables for the exact percentages and standard errors.

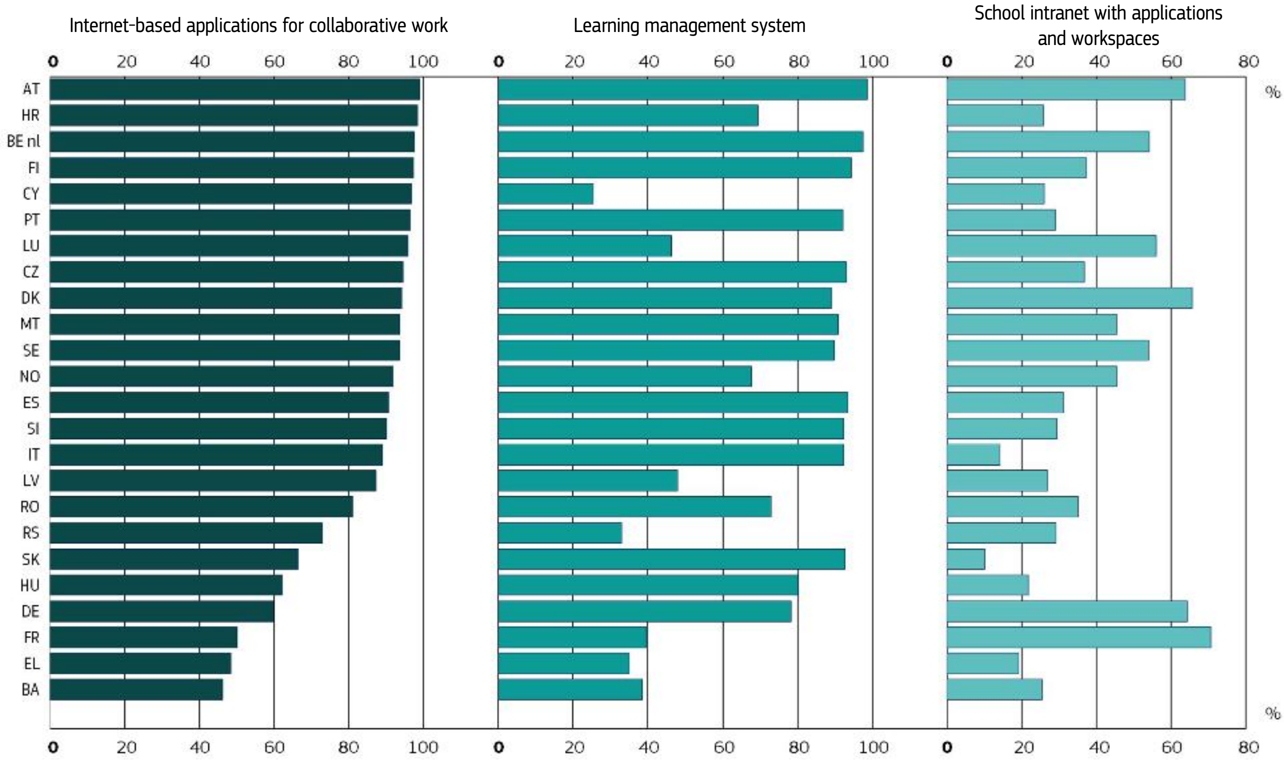
Country-specific note

Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

While Figure 1.8 focuses on software used directly in teaching and learning activities, Figure 1.9 shifts the attention to broader digital platforms that support communication, organisation, and access to and sharing of digital resources within schools. Across participating education systems, collaboration platforms (e.g. Microsoft Teams and Google Workspace) are the most widely available category, with a median student coverage of around 91 %. In a large group of systems – including Austria, Croatia, the Flemish Community of Belgium, Finland, Cyprus, Portugal, Luxembourg, Czechia, Denmark, Malta, Sweden, Norway, Spain and Slovenia – at least 90 % of students attend schools where collaboration platforms are available. By contrast, availability is comparatively low (below 70 %) in Slovakia, Hungary, Germany, France, Greece, and Bosnia and Herzegovina, suggesting more limited diffusion in these systems.

Learning management systems are also widely reported, although levels of availability vary considerably. Very high levels of learning management system availability are observed in Austria, the Flemish Community of Belgium, Finland, Spain, Czechia, Slovakia, Italy, Slovenia, Portugal and Malta, where over 90 % of students attend schools providing such systems. By contrast, access falls below 40 % in Greece, Serbia and Cyprus. Intranets or school portals are less commonly available overall, with a median availability of approximately 33 %. Higher levels of provision are reported in France, Denmark, Germany, Austria, Luxembourg, the Flemish Community of Belgium and Sweden, where over half of students attend schools offering such systems. In most other systems, however, access to intranets or portals remains more limited, particularly in Hungary, Greece, Italy and Slovakia, indicating that secure internal communication and centralised resource management are less developed in many contexts.

Figure 1.9: Availability of digital platforms to both teachers and students in schools (%), 2023



Source: Eurydice, based on IEA, 2023 ICILS database.

Explanatory notes

Education systems are presented in descending order based on the percentage of students attending schools where collaboration platforms are available to both teachers and students. The figure is based on question Q4 of the ICILS ICT coordinator questionnaire ('Are the following technology infrastructure resources made available by your school to teachers and students?') and covers the availability of Internet-based applications for collaborative work (II3G04G), learning management systems (II3G04K) and school intranet with applications and workspaces (II3G04H).

Percentages indicate the shares of students in schools where ICT coordinators reported that each platform is available to both teachers and students. Results are weighted using student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools. For exact percentages and standard errors, see the Statistical tables.

Country-specific note

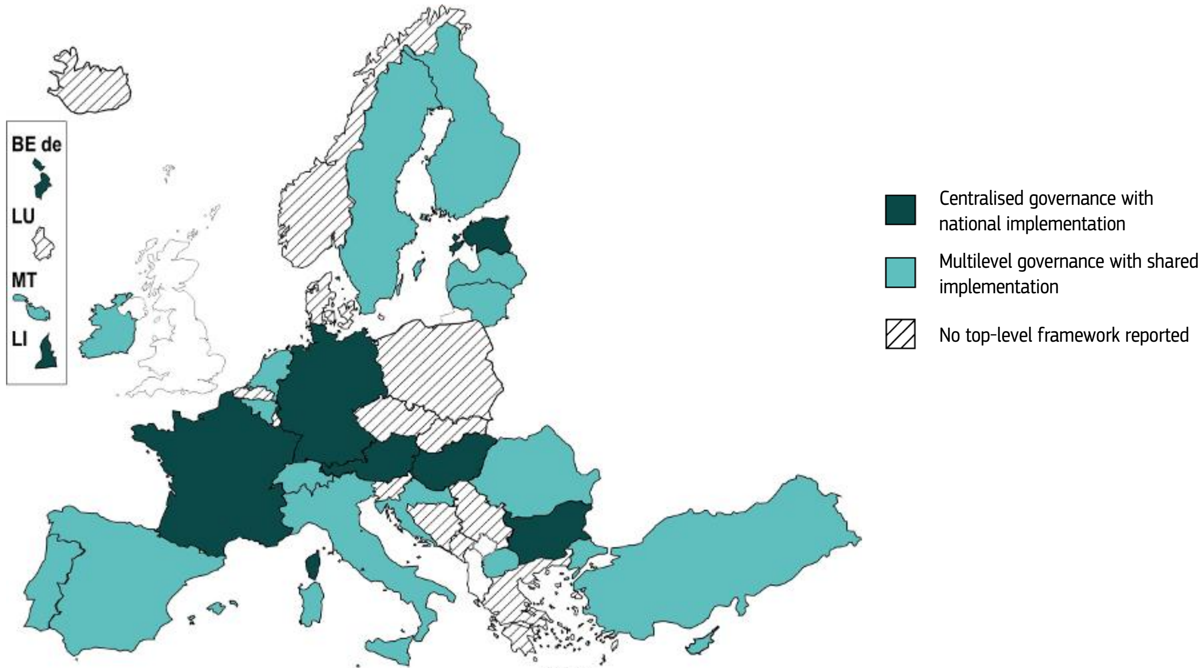
Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

Taken together, Eurydice evidence and ICILS 2023 evidence indicate that, while most education systems now address digital software within policy frameworks, school-level provision remains diverse across Europe. Differences are observed both between and within governance models, suggesting that similar policy arrangements may be associated with very different patterns of availability in practice. ICILS data show that collaboration platforms are widely available across participating education systems, while the availability of learning management systems and school intranets varies more substantially. These findings point to differences in the range of digital platforms available to schools across European education systems.

1.1.4. Interoperability

Interoperability – ensuring that digital systems, platforms and applications can work together securely and efficiently – has become an important consideration, as schools rely on multiple learning platforms, administrative tools and digital resources. Figure 1.10 shows that 25 education systems address interoperability within their top-level frameworks. However, the scope and level of specification vary substantially, ranging from centrally managed identity infrastructure to broad principles encouraging the use of compatible solutions. As in the areas of connectivity, hardware and software, two main governance models can be distinguished: (1) centralised governance with national implementation and (2) multilevel governance with shared implementation.

Figure 1.10: Governance models for ensuring interoperability, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory notes

A **top-level framework** is considered present where interoperability is explicitly addressed within an education policy document, either through binding technical standards or through defined provisions governing data exchange, digital identity management or platform compatibility.

Centralised governance with national implementation: Top-level authorities or agencies define interoperability standards, maintain shared authentication systems or data exchange protocols, and coordinate their application across schools.

Multilevel governance with shared implementation: Top-level frameworks specify requirements or guidance (e.g. digital identity management, application programming interfaces, data protection), while regional or local authorities implement systems and ensure compatibility.

No top-level framework: No top-level requirements exist. Schools adopt digital platforms independently.

A small group of eight systems has developed top-level frameworks that define standards for data exchange, authentication and platform integration. In the German-speaking Community of Belgium and in Bulgaria, top-level authorities have established standards and guidelines to support interoperability across communication, learning and administrative systems. Germany's *DigitalPakt Schule* encourages the *Länder* to adopt open standards so that regional platforms remain compatible within a shared federal framework (see country example). In Estonia, interoperability is part of the broader national e-governance architecture X-Road: education systems use shared digital identities, unified data models and secure interfaces that allow administrative and learning systems to interconnect seamlessly. France secures interoperability through the national authentication and access systems ÉduConnect and *Gestionnaire d'accès aux ressources* (GAR), as well as through the *Schéma directeur des espaces numériques de travail pour l'enseignement scolaire* (SDET) (Master plan for digital learning environments), which together provide unified and secure access to digital resources and define interoperability standards across platforms. In Hungary, the KRÉTA platform integrates pedagogical, administrative and communication functions within a single environment governed by common technical specifications. In Austria, interoperability has been ensured through the roll-out of the national education portal (Bildungsportal), enabling secure and interoperable data exchange between school applications and contributing to more coordinated digital environments. Across these systems, interoperability is supported through national authentication services, application programming interfaces, platform catalogues or data exchange standards, contributing to more consistent and integrated digital ecosystems. In Liechtenstein, interoperability is ensured through centrally managed school software and system-level coordination by the education authority.

Coordinating interoperability and platform standards in Germany

In **Germany**, interoperability is promoted through the national funding programme *DigitalPakt Schule*, the Strategy of the Standing Conference of the Ministers of Education and Cultural Affairs on Education in the digital world ([45]) and its extension 'Teaching and learning in the digital world' (2021). Together, they define shared principles for the compatibility and joint use of school platforms across *Länder*. They encourage the development of standardised learning, communication and working environments that function independently of specific devices or operating systems, while also setting guidelines for secure cloud infrastructure and data management practices in line with national and EU data protection requirements. These coordinated principles provide a common reference for data exchange, authentication and digital resource management, yet they still allow each *Land* to choose technical solutions suited to its own context.

In 17 systems, national guidelines define interoperability principles, data protection obligations or reference standards, while implementation occurs at the regional or local level. The French Community of Belgium ensures interoperability and data security across the platforms Happi, Pix and e-classe, and the administrative counter, while leaving their adoption to schools' discretion in order to respect pedagogical freedom. In Spain, interoperability is guided by national frameworks and guidance, while regional authorities manage the practical integration of tools, platforms and digital content. Ireland's Digital strategy for schools to 2027 ([46]) and Italy's *Piano scuola 4.0* ([47]) emphasise integration and compatibility as important considerations in the development of digital learning environments, while Cyprus and Malta provide general technical guidelines on platform compatibility. In Croatia, Latvia, Lithuania and Romania, interoperability objectives are embedded in wider digital transformation strategies, but operational frameworks remain under development. Portugal's Action plan for the digital transition includes interoperability and data governance principles, particularly for projects supported by national or EU funds, although detailed school sector standards are not defined. In this approach, interoperability is usually defined through policy principles rather than enforced technical standards, and outcomes may depend on coordination capacity and technical expertise at the sub-national level.

In six of these 17 systems, interoperability is addressed through broader digital government strategies, voluntary standards or platform-level arrangements rather than through dedicated education policy frameworks. In the Netherlands, the Edu-V label promotes the use of shared data standards and compatible digital resources ([48]). Finland refers to interoperability within general digital governance strategies, leaving implementation largely to municipalities. In Sweden, the National Agency for Education (Skolverket) promotes alignment through the SS 12000 national standard for data exchange ([49]), while Switzerland combines cantonal school management systems with national coordination through Educa ([50]), supporting common data standards and secure access to digital services. North Macedonia and Türkiye address interoperability primarily within wider e-government and infrastructure initiatives. In these systems, interoperability is addressed primarily through broader digital governance arrangements, with implementation occurring largely at local or sectoral level.

In 13 education systems, no education-specific top-level framework on interoperability was reported. This does not necessarily imply the absence of interoperable systems in practice but rather reflects governance arrangements in which responsibility sits outside the education sector or where there is school-level autonomy. In these systems, coordination relies more heavily on local implementation, platform-level arrangements or cross-sector frameworks.

Overall, interoperability is addressed across European education systems, although the degree of policy specification and implementation arrangements differs substantially. While some systems have developed structured frameworks with standards, shared services and authentication infrastructure, others approach interoperability mainly through general principles or related policy domains. In systems without an education-specific framework, coordination relies more on cross-sector digital governance, platform arrangements or local implementation practices. Together, the evidence indicates that current approaches vary considerably in scope and enforceability, reflecting different governance traditions and stages of digital transformation.

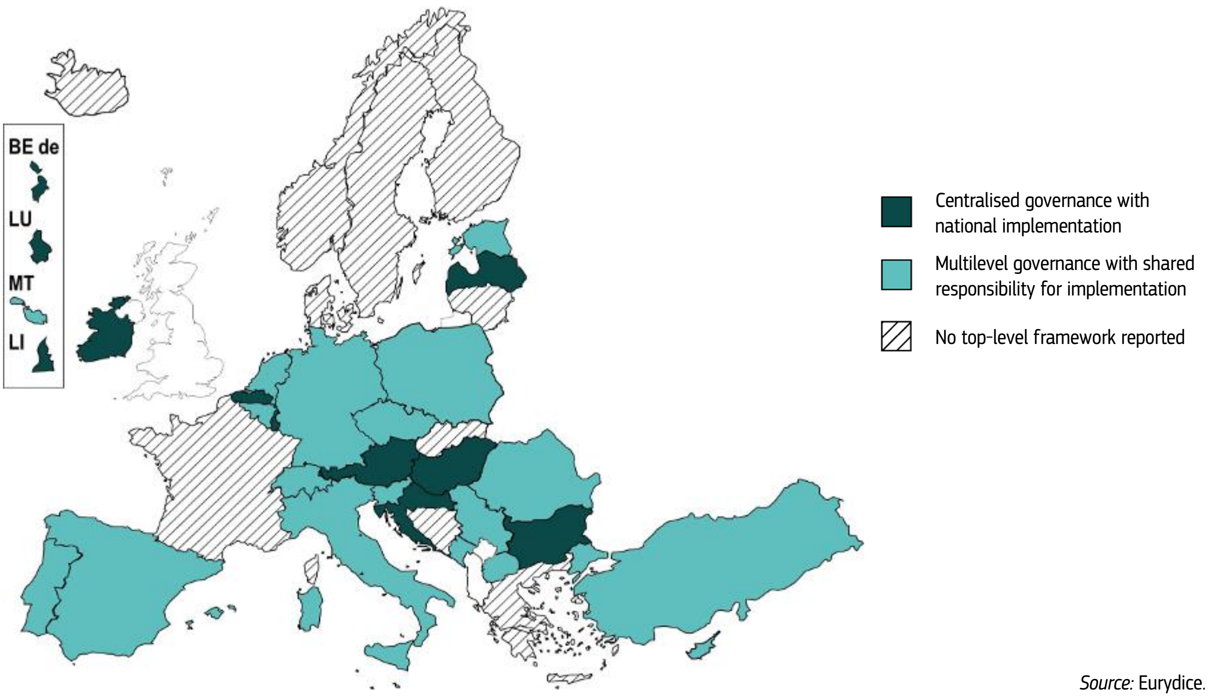
45 Germany, Strategy of the Standing Conference of the Ministers of Education and Cultural Affairs on education in the digital world.
46 Ireland, Digital strategy for schools to 2027.
47 Italy, *Piano scuola 4.0* (school plan 4.0).
48 Netherlands, Edu-V: a national label ensuring common standards for data exchange, privacy and security, supporting interoperability.
49 Sweden, SS 12000 (a technical standard for information exchange in schools).
50 Switzerland, Educa (National Competence Centre for Digital Education).

1.1.5. Information technology maintenance and technical support

Ensuring that digital equipment and platforms can function reliably depends not only on school capacity but also on how maintenance and technical support are organised, coordinated and financed at the system level. Figure 1.11 shows that 28 education systems have incorporated IT maintenance and technical support into their top-level frameworks, although governance arrangements and delivery models differ substantially. This section focuses on the governance of maintenance and technical support at the system level. The organisation and responsibilities of digital coordinators in schools are examined in Chapter 5.

Two main governance models can be identified: centralised governance with national implementation and multilevel governance with shared responsibility. Ten systems report no explicit top-level framework and rely largely on school or municipal discretion.

Figure 1.11: Governance models for IT maintenance and technical support, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory notes

A **top-level framework** for this aspect refers to an education policy document adopted by top-level authorities that defines responsibilities, funding arrangements or organisational models for IT maintenance and technical support in schools.
Centralised governance with national implementation: Top-level authorities define responsibilities, financing arrangements or minimum standards for technical support in schools or establish centrally organised support services.
Multilevel governance with shared responsibility for implementation: Top-level frameworks recognise technical maintenance and support as a system responsibility, while regional or local authorities, local providers or external contractors organise delivery.
No top-level framework reported: No specific education policy framework exists for technical support; arrangements are determined locally by schools or municipalities.

In 10 systems with centralised governance, technical support is regulated directly by national authorities, which define roles, funding mechanisms or organisational structures to ensure consistent provision across schools. Top-level frameworks in the German-speaking and Flemish Communities of Belgium establish formal institutional roles within schools (see country examples). In Bulgaria, national programmes and centralised systems support the management and maintenance of school digital infrastructure. Ireland combines school-level provision with a national support service, while Croatia integrates technical support into a structured digital maturity framework. Austria enables schools to access national funding to recruit or contract technical expertise, Latvia allocates funding in accordance with performance indicators and Hungary operates a centralised help desk embedded within its education platform. Luxembourg provides system-wide support through its Centre for Educational IT Management, and Liechtenstein coordinates school-level provision through its Office of Informatics. These arrangements illustrate how top-level authorities address technical support through statutory roles, funding mechanisms and national support agencies, rather than relying exclusively on school-level provision.

Centrally funded models of in-school technical support

In the **German-speaking Community of Belgium**, every secondary school is legally required to have an ICT support function embedded within the school structure. The position is defined in the IT reform for education framework ([51]) and financed directly through the education budget, establishing technical support as a permanent and system-level responsibility.

In the **Flemish Community of Belgium**, schools appoint ICT coordinators through a centrally funded student-based point system (approximately EUR 54 million annually). National reforms under the Towards ICT teams programme have strengthened coordination, while the Digisprong strategy and the Digisprong Knowledge Centre provide system-level guidance, planning tools and quality support to schools, reinforcing alignment between national policy objectives and school implementation ([52]).

A larger group of 18 systems follows a multilevel governance model, in which maintenance is defined in national strategies but organised in practice by regional authorities, school boards or external providers. In Czechia, the IT guru initiative funded by the National Recovery and Resilience Plan assists schools through consultations and recommendations to find the most suitable solutions. In Germany, *DigitalPakt Schule* enables *Länder* and municipalities to employ technical staff using federal funds. Spain's autonomous communities operate regional support units, while, In Italy, Cyprus and Malta, maintenance is recognised in national strategies but implemented locally. In the Netherlands, school boards manage maintenance guided by frameworks developed by Kennisnet. In Poland, national rules focus mainly on procurement requirements, while servicing and maintenance are organised locally or through external providers. Romania embeds maintenance in wider system-level strategies but leaves daily operations to schools or municipalities. In Slovenia, connectivity services are provided centrally, but technical support and maintenance are organised at the school level, typically through ICT coordinators. Portugal defines national responsibility within its Digital school programme ([53]), while allowing delivery through internal teams or external contractors. In North Macedonia and Montenegro provision relies largely on project-based models. In Switzerland, responsibility lies mainly with cantons and school boards. Meanwhile, in Serbia, national references to support remain indirect and schools or municipalities carry primary responsibility. These shared responsibility models provide flexibility but may also be associated with differences in service provision across regions and providers.

Finally, 10 systems report no education-specific top-level framework for IT maintenance and technical support. In these systems, responsibility is mainly exercised at the municipal or school level within broader public digital governance environments. While this arrangement permits high levels of local autonomy, it may be associated with differences in technical capacity and responsiveness.

ICILS 2023 data provide insight into how system-level governance arrangements are reflected in schools' capacity to maintain and support the use of digital technologies. Figure 1.12 presents two indicators reported by school ICT coordinators: the extent to which teaching and learning with ICT are hindered by a lack of sufficiently experienced or qualified staff to manage technical ICT support, and the extent to which ICT use is hindered by insufficient technical ICT support. Taken together, these indicators capture both human resource constraints and organisational inefficiencies affecting the everyday functioning of school digital environments.

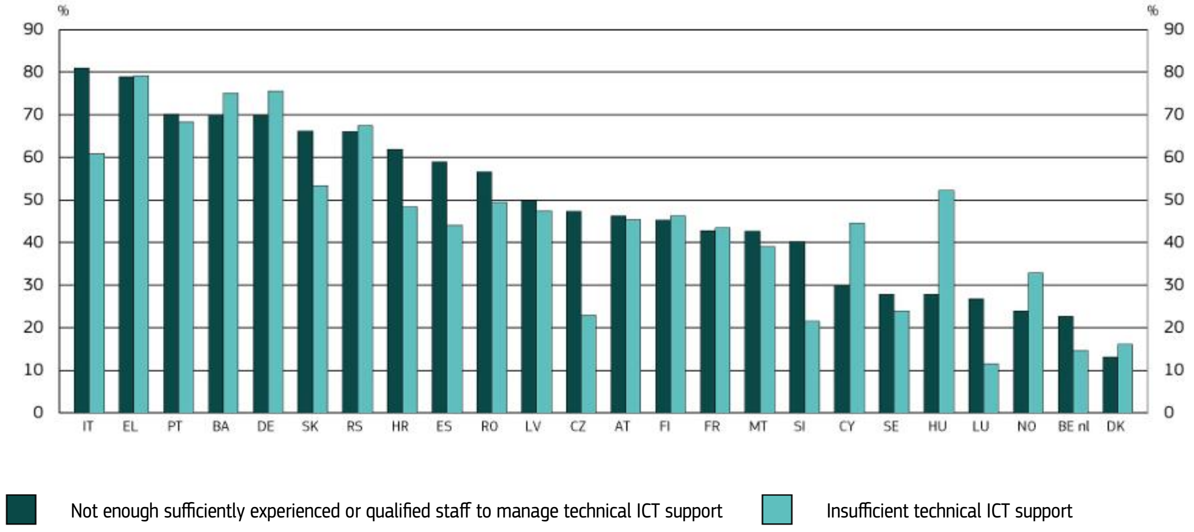
Figure 1.12 shows that, in several education systems, a large proportion of students attend schools where technical support is reported as a significant obstacle. In Italy (81 %), Greece (79 %), Portugal and Bosnia and Herzegovina (70 %), Germany (69.9 %), Slovakia (66 %) and Serbia (66 %), more than two thirds of students attend schools where insufficiently experienced staff are reported as hindering ICT use. These findings point to capacity challenges, even in systems where digital infrastructure and devices are relatively widespread. A similar pattern is visible for insufficient technical ICT support, with particularly high levels reported in Greece, Germany, Bosnia and Herzegovina, Portugal and Serbia. Moderate levels of disruption related to insufficient experienced staff managing ICT support – between roughly 45 % and 65 % – are observed in Croatia, Spain, Romania, Latvia, Czechia, Austria and Finland. By contrast, such obstacles are reported less frequently in Cyprus, Hungary, Sweden, Luxembourg, Norway, the Flemish Community of Belgium and Denmark. Variation in reported levels of support is observed across all governance models. This suggests that factors beyond formal governance arrangements may influence how maintenance and support are experienced in schools.

51 German-speaking Community of Belgium, IT reform for education.

52 Flemish Community of Belgium, Towards ICT teams programme (digital transformation in the Flemish education system: reform of ICT teams in schools).

53 Portugal, Digital school programme.

Figure 1.12: Frequency of ICT-related problems due to insufficient or inefficient technical ICT support (%), 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are presented in descending order based on the percentage of students attending schools where ICT coordinators reported that teaching and learning with ICT are hindered by a lack of sufficiently experienced or qualified staff to manage technical ICT support.

The figure is based on data from the ICILS 2023 ICT coordinator questionnaire and covers the following variables: 'not enough sufficiently experienced or qualified staff to manage technical ICT support' (II3G14G), based on question Q14G ('To what extent is the use of ICT in teaching and learning at your school hindered by each of the following obstacles? – Not enough sufficiently experienced/qualified staff to manage technical ICT support'), and 'Insufficient technical ICT support' (II3G14H), based on question Q14H ('To what extent is the use of ICT in teaching and learning at your school hindered by each of the following obstacles? – Insufficient technical ICT support').

Percentages indicate the share of students attending schools where ICT coordinators reported that ICT use is hindered 'to some extent' or 'a lot' by each obstacle. Results are weighted using student sampling weights (TOTWGTS), so that estimates reflect the student population rather than the number of schools. Exact percentages and standard errors are provided in the Statistical tables.

Country-specific note

Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

Taken together, Eurydice and ICILS 2023 evidence shows that, although most education systems now recognise maintenance and technical support in top-level frameworks, governance approaches remain diverse and reported levels of technical support challenges vary across systems. Centralised systems typically rely on nationally coordinated structures, while multilevel systems involve shared responsibilities across different levels of governance and service providers. Across both models, differences in reported levels of technical support are observed. Ensuring timely, skilled and reliable technical assistance therefore remains an important consideration for the effective use of digital technologies in schools.

Overall, the analysis of connectivity, hardware, software, interoperability and technical support shows that European education systems have widely incorporated the main components of digital infrastructure into top-level policy frameworks. However, governance arrangements remain diverse, particularly regarding how responsibilities are shared between national, regional and school-level actors. Evidence from ICILS 2023 suggests that, despite widespread policy attention and broad access to digital technologies, the conditions supporting their use in schools continue to vary across education systems. In many education systems, laptops and tablets are more commonly available through computer labs than directly within regular classrooms. ICILS 2023 data also point to differences in reported connectivity conditions and technical support across education systems. These findings suggest that the existence of top-level frameworks alone does not guarantee comparable conditions for the everyday use of digital technologies in schools. Access to more advanced digital tools and approaches may depend not only on the existence of policy frameworks, but also on the robustness of the underlying infrastructure, interoperability arrangements and technical support. Reliable connectivity, stable digital environments and timely technical assistance are widely recognised as enabling conditions for the effective integration of advanced and emerging technologies in schools (OECD, 2023b).

Against this background, Section 1.2 examines how top-level policies on AI and other emerging technologies are translated into frameworks guiding school-level practice, and how approaches differ across education systems.

1.2. Integration of artificial intelligence and other emerging technologies

Across Europe, AI and other emerging technologies – including immersive environments, automation tools and adaptive systems – are becoming an important area of policy development in education. International organisations underline that such technologies should be human centred, aligned with children's rights and accompanied by safeguards ensuring transparency, accountability and non-discrimination (UNESCO, 2021; OECD, 2024).

At the EU level, the Digital Education Action Plan (2021–2027) (European Commission, 2020b) identifies AI as a key driver of pedagogical and organisational innovation, while the *Guidelines on the ethical use of artificial intelligence and data in teaching and learning for educators* (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2026c) outline principles for responsible deployment. The Union of Skills Communication (European Commission, 2025e) calls on EU Member States to strengthen digital competences so that learners and teachers can engage critically with AI-based tools. Broader EU initiatives such as the AI Continent Action Plan (European Commission, 2025d) and the Apply AI Strategy (European Commission, 2025a) also emphasise the importance of strengthening Europe's capacity to develop, adopt and deploy trustworthy AI, including through investments in digital skills, innovation ecosystems and education.

The AI Act ([54]) introduces a risk-based regulatory framework that applies to educational uses of AI, complementing the General Data Protection Regulation (GDPR) ([55]) and reinforcing obligations related to transparency and safety. Its implementation is also likely to require continued guidance and capacity-building efforts across education systems, particularly to support schools and authorities in interpreting regulatory requirements and integrating them into educational practice.

Research similarly underlines that, without clear frameworks, AI adoption may deepen inequalities (Schellekens and Skilling, 2024; Varsik and Vosberg, 2024). Recent public opinion evidence likewise indicates sustained attention being paid to how AI tools are introduced, governed and used in schools (European Commission, 2025f). These findings offer contextual insight into public perceptions of AI in education, which form part of the broader background against which governance arrangements and safeguards are examined in this chapter.

Within this changing regulatory and policy environment, education authorities across Europe are defining policy approaches concerning how AI and other emerging technologies are introduced, governed and supported in schools. These policies cover not only the pedagogical potential of AI-enabled tools but also the institutional responsibilities associated with data protection, ethical use, accountability and system oversight (Varsik and Vosberg, 2024; European Commission: Directorate-General for Education, Youth, Sport and Culture, 2026c). As a result, AI is increasingly addressed not only as a technical innovation but also in relation to educational governance, curriculum development and professional responsibility.

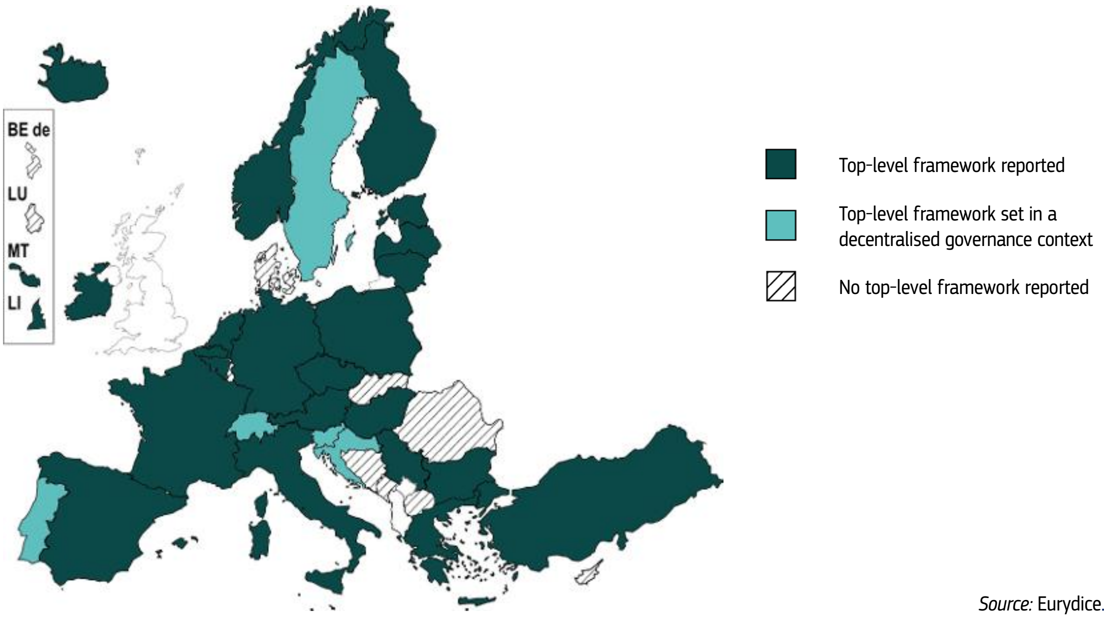
Figure 1.13 shows that 24 education systems report at least one top-level policy framework addressing the integration of AI or other emerging technologies in school education. In most cases, these references appear within broader digital education strategies, national AI policy frameworks or guidance documents rather than in dedicated frameworks on AI in education. Although these frameworks differ in scope, legal status and governance arrangements, two broad

54 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) (OJ L, 2024/1689, 12.7.2024, ELI: http://data.europa.eu/eli/reg/2024/1689/oj).

55 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1, ELI: http://data.europa.eu/eli/reg/2016/679/oj).

patterns of policy engagement can be observed: (1) systems where AI and other emerging technologies are addressed through strategic policy frameworks, either within broader digital education strategies or through dedicated national AI frameworks that include education, and (2) systems where AI and other emerging technologies are addressed mainly through national guidance, professional support structures and, in some cases, pilot initiatives and experimentation. These patterns should be interpreted as indicative rather than mutually exclusive, as several education systems combine elements of strategic planning, guidance and experimentation within their policy approaches.

Figure 1.13: Top-level frameworks on the integration of AI and other emerging technologies in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory note

A top-level framework for the integration of AI and other emerging technologies is considered present where education authorities have adopted an education-specific policy document that sets out system-level policies for the use, governance or support of AI and/or other emerging technologies in schools. Such frameworks may take the form of strategies, action plans, formal guidelines or coordinated national guidance. They may address pedagogical use, ethical principles, data protection, accountability or institutional responsibilities. Both binding and non-binding documents are included.

Country-specific notes

Cyprus: Cyprus reports the establishment of an expert group and draft initiatives addressing AI in education.
Luxembourg: Following the reference period of the report (2024/2025), Luxembourg adopted the *KI-kompass* strategy (October 2025) ([56]), which provides national guidance on the use of AI in the education sector.
Portugal: Following the reference period of the report (2024/2025), Portugal adopted the National AI agenda ([57]), in force from January 2026, and established the Working Group on Digital and AI in Education in September 2025 to prepare a dedicated national strategy.
Slovakia: Following the reference period of the report (2024/2025), Slovakia adopted a Plan for the responsible use of AI in education for 2025–2027 (September 2025) ([58]). The national plan provides a framework for introducing AI-related learning and for promoting the safe and responsible use of AI tools across education levels during 2025–2027.

In a first group of six education systems (the Flemish Community of Belgium, Spain, Malta, Poland, Iceland and Türkiye), AI and other emerging technologies are addressed through strategic policy frameworks. These frameworks may take the form of broader digital education or digital transformation strategies that incorporate AI-related objectives or dedicated national AI strategies or action plans that include specific provisions for education. Across these systems, AI is generally positioned within wider processes of digital transformation in education and linked to curriculum development, teacher support and governance safeguards, indicating a more strategic approach to policy development.

56 Luxembourg, *KI-kompass* strategy.

57 Portugal, National AI agenda.

58 Slovakia, Ministry of Education, Research, Development and Youth, Plan for the responsible use of artificial intelligence in education for 2025–2027.

In the Flemish Community of Belgium, the Policy on responsible AI use in education ([59]) is linked to wider digital education reform and supported through Digisprong implementation tools. Spain combines national guidance from the National Institute for Educational Technologies and Teacher Training (INTEF) with regional frameworks issued by autonomous communities, such as the Canary Islands, Catalonia, and Navarre ([60]), creating a multilevel governance structure for implementation. In Malta, AI is addressed through the Digital education strategy 2024–2030 ([61]) and the national AI strategy ([62]), which include objectives related to AI literacy, skills development and the integration of AI-related competences across education levels. Poland's 2024 Policy on the digital transformation of education ([63]) positions AI as both a curriculum topic and a cross-cutting pedagogical tool within a broader national reform programme, supported by teacher training initiatives and data governance provisions. In Iceland, the AI action plan for 2025–2027 ([64]) includes a dedicated chapter on education. Actions under the responsibility of the Ministry of Education and Children focus on defining criteria for the use of AI in education and on identifying the competences required for teachers, with implementation guidance under development. Türkiye has adopted the Artificial Intelligence in education: Policy document and Action plan for 2025–2029 ([65]) and centrally developed guidance, thereby establishing a formal system-level framework for AI integration in schools.

A second group of 18 education systems addresses AI and other emerging technologies mainly through national guidance, professional support structures and resource platforms, sometimes complemented by pilot initiatives and experimentation. In these systems, top-level authorities typically issue recommendations, provide reference materials and support professional learning, while operational decisions remain largely at the school or local level.

In the French Community of Belgium, the e-classe platform provides teacher-facing materials on AI and extended reality ([66]). Bulgaria situates AI guidance within wider reforms on digital competences and data protection, linking classroom practice to national cybersecurity and skills strategies (see country example). In Czechia, national authorities support schools through a dedicated AI portal ([67]) and tailored recommendations for the use of AI in basic and upper-secondary schools ([68]). The resolution of the Ministers of Education and Cultural Affairs (KMK) 'Recommendations for education authorities on the use of artificial intelligence in school educational processes' defines pedagogical and ethical principles for AI use, explicitly aligning school responsibilities with the GDPR and the AI Act ([69]) (see country example). Estonia disseminates pedagogical and ethical advice through national portals, while Ireland supports schools mainly through Oide Technology in Education, which provides professional learning and advisory services (see country examples). In France, integration is supported through ministry guidance such as the *Cadre d'usage de l'IA en education* (Framework for the use of AI in education) ([70]). In Italy, the National guidelines for the introduction of AI in schools establish a system-level framework for responsible deployment, linking pedagogical innovation with data protection, transparency and ethics (see country example). In the Netherlands, guidance developed by national support agencies is consolidated through the Kennisnet's Guide to AI in education and the Edu-V privacy covenant ([71]), translating legal requirements on interoperability and data protection into operational guidance for schools. In Austria, pilot initiatives such as the AI for schools programme, operating across 100 schools, demonstrate a structured effort to generate evidence to inform future policy development.

59 Flemish Community of Belgium, Policy on the responsible AI use in education.

60 Spain, National Institute for Educational Technologies and Teacher Training, Guide on the use of artificial intelligence in education.

61 Malta, Digital education strategy for 2024–2030.

62 Malta, A Strategy and vision for artificial intelligence in Malta 2030.

63 Poland, Policy on the digital transformation of education (*Journal of Laws* 2024).

64 Iceland, AI action plan 2025–2027.

65 Türkiye, Artificial Intelligence in education: Policy document and Action plan 2025–2029.

66 French Community of Belgium, *La réalité étendue dans l'éducation* (Extended reality in education), *Focus: L'intelligence artificielle, Comprendre et appliquer l'AI Act* (Focus: Artificial intelligence, Understanding and applying the AI Act) and *Intelligence artificielle et enseignement: Principes d'application* (Artificial intelligence and teaching: Principles for implementation).

67 Czechia, Ministry of Education, Youth and Sports, AI – Support for Schools in Introducing AI in Education.

68 Czechia, Recommendations for the use of AI in basic and upper-secondary schools.

69 Germany, Standing Conference of the Ministers of Education and Cultural Affairs, Recommendations for education authorities on the use of artificial intelligence in school education processes (2024).

70 France, Framework for the use of AI in education.

71 Netherlands, Kennisnet, Guide to AI in education and Edu-V, The Privacy Covenant within Edu-V: Implications for schools.

Top-level guidance addressing the integration of AI and other emerging technologies in schools

In **Bulgaria**, the Ministry of Education and Science has issued Guidelines on the use of artificial intelligence in the education system ([72]), providing practical recommendations for pedagogical use, personalisation and assessment, alongside requirements related to ethical awareness and data protection. The guidelines highlight the need for teacher training, ethical awareness and safeguards against data misuse. AI measures are explicitly linked to national digital skills strategies and cybersecurity frameworks, situating AI within broader education system reform.

In **Germany**, the Standing Conference of the Ministers of Education and Cultural Affairs adopted 'Recommendations for the education authorities on the use of artificial intelligence in school education processes' ([73]). These define pedagogical opportunities and risks and clarify responsibilities relating to transparency, copyright and data protection. The recommendations explicitly reference the AI Act and the GDPR and calls on sub-national authorities (*Länder*) to ensure secure data interfaces between schools and education technology providers. Human oversight, explainability and teacher professional responsibility are central principles.

In **Estonia**, the integration of AI in schools is supported through ministry-endorsed guidance and national digital portals rather than through a dedicated national strategy ([74]). Schools receive pedagogical recommendations on the use of AI tools, along with advisory material on data protection and digital safety. This model places implementation at the school level and supports it through guidance and national reference resources, rather than formal regulation.

In **Ireland**, the use of AI in schools is supported primarily through national guidance, professional development and advisory services. Oide Technology in Education provides resources on the responsible and ethical use of digital tools, including AI, while the Department of Education and Youth promotes digital competences through the Digital strategy for schools to 2027 and the guidance on AI in schools ([75]). Guidance on data protection and the use of digital platforms is embedded in wider national frameworks for digital governance.

In **Italy**, the Ministry of Education and Merit has adopted Guidelines for the introduction of AI in schools, establishing a national framework for the responsible integration of AI into education ([76]). The guidance supports schools in using AI for teaching, innovation and organisational development, while setting out principles on data protection, transparency and security. Ethical use and digital responsibility are further reinforced through the Guidelines for teaching civic education ([77]), which link AI use with information reliability, data protection and the protection of individual wellbeing.

Latvia, Lithuania, Hungary, Finland, Liechtenstein, Norway and Serbia likewise rely mainly on guidance, advisory materials or professional support structures rather than on comprehensive regulatory or strategic frameworks. In Latvia, national education platforms provide teachers with guidance on the use of AI in education ([78]). Lithuania embeds AI ethics and data protection within its digital education guidelines ([79]), while Greece and Hungary promote responsible AI use within their broader digital education strategies. In Finland, education authorities provide guidance on the responsible use of AI in education, highlighting issues such as transparency, explainability and the need to strengthen teachers' capacity to use AI tools pedagogically. Liechtenstein and Norway similarly rely on advisory materials and professional resources rather than formalised regulatory frameworks.

In several systems – namely Croatia, Portugal, Slovenia, Sweden and Switzerland – policy engagement occurs mainly within decentralised governance arrangements. National authorities provide reference materials or support initiatives, while decisions on implementation are largely taken at the regional or school level. In Croatia, projects such as the Application of artificial intelligence-based digital technologies in education (BrAIn) project support curriculum development and teacher training, but implementation remains school based. In Portugal, during the reference period of the report, AI-related initiatives were embedded in school digital transition plans under the national digital education plan and supported by digital ambassadors, ICT competence centres and teacher training centres ([80]). Following the reference period, further policy development was initiated (see explanatory note to Figure 1.13). In Slovenia, AI-related activities are supported through a national AI programme ([81]) and participation in EU-funded projects, contributing to policy learning and capacity building, while implementation remains decentralised and without binding top-level requirements for schools. In Sweden, national

72 Bulgaria, Guidelines on the use of artificial intelligence in the education system.

73 Germany, Standing Conference of the Ministers of Education and Cultural Affairs, Recommendations for education authorities on the use of artificial intelligence in school education processes (2024).

74 Estonia, Ministry of Education and Research, AI guidelines.

75 Ireland, Digital strategy for schools to 2027.

76 Italy, Guidelines for the introduction of artificial intelligence in schools.

77 Italy, Ministry of Education and Merit, Ministerial Decree No 183 of 7 September 2024 laying down the guidelines for the teaching of civic education, replacing in full Ministerial Decree No 35 of 22 June 2020 and Guidelines for the teaching of civic education.

78 Latvia, Materials for teachers on the use of artificial intelligence in the education sector.

79 Lithuania, Ministry of Education, Science and Sports, Digital education guidelines.

80 Portugal, Directorate-General for Education, Digital education.

81 Slovenia, National programme for promoting the development and use of artificial intelligence in the Republic of Slovenia until 2025.

agencies issue advisory materials while municipalities develop their own guidance. In Switzerland, cantons develop their own guidance (e.g. Zurich ([82])), with coordination provided at national level by Educa ([83]).

Taken together, these patterns suggest that European education systems are engaging with AI through a variety of policy approaches. While some systems embed AI within broader digital education reforms, others rely primarily on guidance, professional learning and advisory resources, and a smaller number continue to support experimentation through pilot initiatives. Across these approaches, increasing attention is being given to governance safeguards, professional capacity and the development of AI-related competences.

Against this backdrop, the following sections examine more closely how top-level frameworks give concrete form to these policy directions. Section 1.2.1 examines how top-level frameworks address key policy dimensions, including integration into learning and school organisation, ethical use, data protection and learner safety. Section 1.2.2 complements this analysis with ICILS 2023 evidence on the school-level availability of emerging technologies, offering insight into how school-level availability relates to the policy approaches described above. Section 1.2.3 subsequently maps large-scale initiatives designed to support the roll-out of AI in schools.

1.2.1. Policy dimensions of top-level frameworks on artificial intelligence and other emerging technologies

Across the 24 education systems reporting top-level frameworks on AI and other emerging technologies, two main policy dimensions can be identified: (1) integration into learning and school organisation and (2) ethical use, data protection and learner safety. These dimensions reflect priorities emphasised at the European and international levels, particularly transparency, accountability and a human-centred approach to AI in education (UNESCO, 2021; OECD and Education International, 2023; European Commission: Directorate-General for Education, Youth, Sport and Culture, 2026c).

In parallel with governance frameworks, several education systems have also begun to address the development of AI-related competences among learners and teachers. This reflects wider policy attention being paid to AI literacy and critical digital skills. A notable example is the AI literacy framework for primary and secondary education, which provides a common reference for understanding and supporting AI literacy in school education (OECD, 2025a). Some systems incorporate AI-related topics into digital competence frameworks, curriculum elements or certification schemes. For example, in France, the national Pix digital competence certification framework includes learning modules addressing AI-related concepts and the responsible use of digital technologies, and addresses AI within broader media and digital literacy education. Other examples reported by education authorities include curriculum-based initiatives in Spain (Galicia) and Sweden. These initiatives illustrate how some education systems are linking AI governance with the development of learners' capacity to understand and critically assess AI-based technologies.

The **first policy dimension** concerns how AI and other emerging technologies are integrated into teaching, learning and school organisation. In most education systems, this aspect is addressed in top-level policy frameworks, although references sometimes remain implicit or embedded within broader digital education policies; however, Lithuania and Malta did not report dedicated measures specifically targeting this dimension. The maturity of the approaches varies, particularly in the extent to which policies connect technological innovation with curriculum reform, teacher professional learning and school-level planning.

In many education systems, the integration of AI into learning and school organisation is framed within broader digital education reforms. Policy documents often connect AI-related initiatives with curriculum development, teacher professional learning and school-level planning. For example, the Flemish Community of Belgium, Poland and Finland link AI-related measures to wider digital education strategies, while Spain combines national guidance with regional frameworks developed by autonomous communities. In Italy, integration is framed through national guidelines that explicitly link pedagogical innovation with institutional development and governance responsibilities. Integration is also strongly developed in Czechia and Türkiye, where national authorities have established central reference frameworks and support structures to guide schools' use of AI (see country examples). In Iceland, the AI action plan for 2025–2027 includes education-specific actions; criteria and guidance for schools had been announced but were not yet operational at the time of reporting.

82 Switzerland, Canton of Zurich, Artificial Intelligence in compulsory education.

83 Switzerland, Educa (National Competence Centre for Digital Education).

Top-level frameworks supporting AI integration into learning and school organisation

In **Czechia**, the Ministry of Education, Youth and Sports and the National Pedagogical Institute have developed a robust non-regulatory support package to help schools integrate AI. A dedicated national portal AI – Support for Schools in Introducing AI in Education provides schools with practical resources, webinars and curated examples of classroom practice. This is complemented by the Recommendations for the use of AI in basic and upper-secondary schools [84], issued in tailored versions for teachers, school leaders, students and parents. The framework set out in the Recommendations promotes responsible pedagogical experimentation with AI tools, while emphasising the importance of the critical evaluation of AI outputs, ethical awareness and age-appropriate use.

In **Türkiye**, the Artificial intelligence in education: Policy document and Action plan (2025–2029) [85] is coordinated by the Directorate General for Innovation and Educational Technologies under the Ministry of National Education. The framework defines policy priorities for curriculum integration, teacher capacity-building and the responsible use of AI in schools. It is supported by national guidance documents, teacher handbooks and online resources on AI applications in schools, and training activities delivered in digital and face-to-face formats. At the core of this policy framework is the Digital Education Platform, developed through the transformation of the National Digital Education Platform (EBA) into a next-generation digital learning ecosystem accessible free of charge via web and mobile applications. Supported by AI-based infrastructure, the platform enables personalised learning and provides integrated services, including AI-supported tools for lesson planning, content creation and assessment.

In several education systems, integration is supported primarily through national guidance, professional support structures and resource platforms rather than through prescriptive regulatory requirements. Ministries typically issue recommendations, curate teaching resources and provide training opportunities, while operational decisions remain largely at the school or local level. The French Community of Belgium, Estonia, Ireland and France are examples of this approach.

National guidance and expert-led support for AI integration in schools

In **France**, AI integration in schools is supported through ministry guidance and national knowledge resources. The Ministry of National Education has published collections of research studies, international guidance and curated reference materials on AI in education [86], alongside initiating a national consultation which informed the development of the Framework for the use of AI in education [87]. This model demonstrates an approach based on central guidance and expert input, with implementation decisions largely remaining at the school or local level.

A smaller group of education systems relies primarily on pilot projects and innovation programmes to explore the use of AI in education. Austria and Malta emphasise experimentation as a preparatory phase for future policy development. In decentralised governance contexts such as Croatia, Portugal, Sweden and Switzerland, national authorities typically issue reference materials or guidance, while responsibility for implementation remains largely at the regional or school level.

Across education systems, policy frameworks tend to position AI within broader processes of digital transformation in education, linking technological innovation with curriculum development, school planning and organisational readiness. While policy attention focused on integration into learning and school organisation is widespread, the degree of precision varies substantially. In some systems, AI policies are closely aligned with curriculum development and school planning; in others, AI is addressed more indirectly as part of general digital learning guidance. Teacher preparation for the pedagogical use of AI is addressed in more detail in Chapter 5.

The **second policy dimension** concerns governance safeguards accompanying the use of AI and other emerging technologies in education.

84 Czechia, Recommendations on the use of artificial intelligence in primary and secondary schools.

85 Türkiye, Artificial Intelligence in education: Policy document and Action plan 2025–2029.

86 France, *EdunumRech*, AI in Education: International and French Perspectives.

87 France, Ministry of National Education, Framework for the use of AI in education.

Ethical use and data protection are addressed in most of the top-level frameworks reported by education systems. Of the 24 education systems reporting frameworks on AI and other emerging technologies, 21 refer explicitly to ethical use and data protection. Greece ([88]), Malta and Austria did not report AI-specific measures within the identified frameworks, although general data protection legislation and regulatory provisions applicable to schools are in place. Across education systems, policy frameworks commonly emphasise transparency, fairness, human oversight and lawful data processing, reflecting alignment with the GDPR ([89]) and, in many cases, with the principles enshrined in the AI Act ([90]).

Although these principles are widely shared, the degree of operational specification varies considerably between systems. In several cases, they are translated into concrete implementation guidance, such as rules governing platform selection, technical standards, data-sharing arrangements or school-level risk assessment procedures. In most education systems, however, ethical governance is articulated mainly through guidance documents and high-level policy principles rather than through binding procedural requirements.

More operationalised approaches can be observed in a group of 10 systems (the Flemish Community of Belgium, Bulgaria, Germany, Ireland, France, Italy, the Netherlands, Poland, Finland and Türkiye), where ethical safeguards are supported by clearer technical guidance or institutional instruments. In the Flemish Community of Belgium, the policy on responsible AI use in education establishes a structured ethical framework aligned with the existing data protection system (see country example). Bulgaria embeds AI guidance within broader national reforms on digital skills and data protection ([91]), while Germany's standing conference recommendations clarify responsibilities concerning explainability, copyright and secure data exchange, drawing explicitly on the AI Act.

In Ireland, data protection obligations are integrated within wider digital learning policies through national guidance and a comprehensive toolkit for schools developed by the Data Protection Commission. Under data protection legislation, schools and Education and Training Boards are responsible for their own compliance with the GDPR and the Data Protection Act ([92]). In France, ethical governance is supported through cooperation with the national data protection authority (National Commission on Informatics and Liberty) and operational tools such as the Educational Resource Access Manager ([93]), alongside detailed guidance provided through Éduscol ([94]).

In Italy, national AI guidelines articulate principles for responsible use and connect pedagogical innovation with issues of security, transparency and data protection. In the Netherlands, the Kennisnet's Guide to AI in education and the Edu-V agreement provide operational tools for GDPR-compliant data exchange (see country example), while Poland's 2024 public policy on the digital transformation of education ([95]) mandates lawful data processing and ethical use of AI, supported by professional development measures. Finland's 2025 AI recommendations for education ([96]) similarly require schools to ensure transparency, fairness and explainability in the use of AI-based systems. In Türkiye, the AI in education policy: Policy document and Action plan for 2025–2029 establishes a system-level reference framework for ethical AI use in schools ([97]).

Translating ethics and data protection into school practice

In the **Flemish Community of Belgium**, the Policy on responsible AI use in education ([98]) establishes a clear ethical framework for schools, centred on human oversight, transparency and proportionality in the use of AI tools. The policy aligns explicitly with the GDPR and requires schools and governing bodies to assess risks related to data protection, bias and accountability before deploying AI-based applications.

88 In Greece, data protection in education is governed by general legislation, including Law 2472/1997 on the protection of personal data and related regulatory provisions applicable to schools.

89 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1, ELI: http://data.europa.eu/eli/reg/2016/679/oj).

90 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) (OJ L, 2024/1689, 12.7.2024, ELI: http://data.europa.eu/eli/reg/2024/1689/oj).

91 Bulgaria, Guidelines on the use of artificial intelligence in the education system.

92 Ireland, Data Protection Commission, Data protection toolkit for schools.

93 France, Ministry of National Education, Éduscol, *Applications et services numériques nationaux* (national digital applications and services).

94 France, Ministry of National Education, Éduscol, *Protection des données personnelles et assistance* (protection of personal data and support).

95 Poland, Policy on the digital transformation of education.

96 Finland, Artificial intelligence in education – legislation and recommendations.

97 Türkiye, Artificial Intelligence in education: Policy document and Action plan 2025–2029.

98 Flemish Community of Belgium, Vision Paper – Responsible AI in Flemish education: A collaborative process from development to use.

In the **Netherlands**, the Kennisnet's Guide to AI in education ([99]) helps school leaders make informed decisions about using AI tools responsibly, addressing issues of bias, transparency and algorithmic accountability. In parallel, the Edu-V privacy covenant ([100]) ensures GDPR-compliant data exchange between schools and digital learning providers. Together, these initiatives balance ethical guidance with enforceable privacy safeguards, offering schools a practical model for integrating AI responsibly within a secure digital education ecosystem.

A second group of seven systems (Czechia, Estonia, Latvia, Lithuania, Hungary, Norway and Serbia) addresses ethical governance primarily through guidance and professional support rather than regulatory instruments. In these contexts, policy documents promote digital citizenship, ethical awareness and responsible use, but do not usually establish binding requirements for school-level implementation. Czechia encourages the critical evaluation of AI outputs and responsible citation practices ([101]), while Estonia provides ethical guidance with basic data security recommendations. Latvia, Lithuania and Hungary embed ethical use within their wider digital strategies. The Norwegian Directorate for Education and Training provides advice on responsible AI use and data sharing ([102]), and Serbia embeds ethical considerations within its national digital competence framework, including a specific competence area dedicated to AI literacy ([103]).

Finally, in the French Community of Belgium and Liechtenstein, ethical and privacy issues are acknowledged at the policy level, but without detailed operational guidance. In these contexts, schools retain broad responsibility for interpreting national provisions and for determining how ethical principles are implemented in practice. In the French Community of Belgium, school leadership teams are supported by techno-pedagogical advisors and government services responsible for digital education, which provide advice on the appropriate use of new technologies, including AI, and on the integration of relevant regulatory frameworks.

Overall, while most policy frameworks recognise the importance of ethical safeguards and data protection in the use of AI in education, the level of operational detail varies substantially across education systems. In some systems, ethical principles are supported by technical guidance and institutional instruments, whereas in others they are articulated primarily through advisory materials and professional support.

1.2.2. Translating policy into practice: school availability of emerging technologies

While policy frameworks provide information on the governance and use of emerging technologies, fewer sources provide comparable evidence on their availability at school level. The ICILS 2023 therefore offers an important empirical complement, capturing access to advanced tools such as simulations, virtual reality (VR) or augmented reality (AR) applications and adaptive learning systems as indicators of schools' preparedness to integrate emerging technologies. The results suggest that access to such technologies remains relatively limited in many education systems. Across participating countries, median availability stands at 29 % for simulations and modelling software, 26 % for VR/AR applications and 18 % for adaptive learning systems.

A small group of systems reports comparatively higher levels of availability. Austria (96 %) and Finland (87 %) record the highest shares of students attending schools with access to simulations and modelling software; Cyprus also reports comparatively broad access (78 %), despite not having a dedicated national framework for AI or emerging technologies. For VR/AR applications, Malta (61 %) and Czechia (56 %) stand out as those with the highest levels of access. Portugal, Spain, Denmark and Croatia also report comparatively high levels (around 40 %). Adaptive learning systems are most commonly available in the Flemish Community of Belgium (56 %), Norway (46 %) and Malta (45 %). By contrast, in several systems, availability remains very limited across one or more indicators. Variability is also evident among systems that do report top-level guidance, suggesting that policy frameworks alone do not automatically translate into school-level access.

99 Netherlands, Kennisnet, Guide on AI in education.

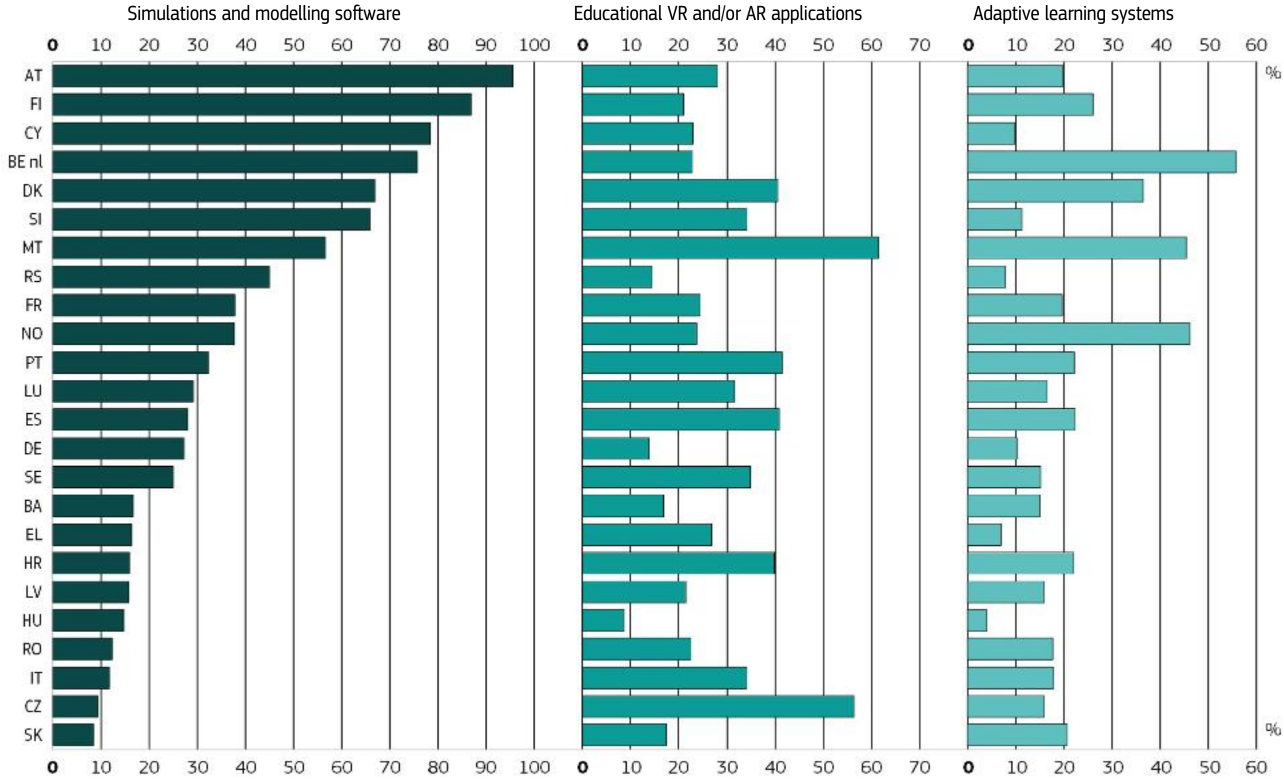
100 Netherlands, Edu-V, The Privacy Covenant within Edu-V: Implications for schools.

101 Czechia, Recommendations on the use of artificial intelligence in primary and secondary schools.

102 Norway, Directorate for Education and Training, Advice on responsible AI use and data sharing.

103 Serbia, Framework of digital competences for 2023.

Figure 1.14: Availability of emerging technologies for teachers and students (%), 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are presented in descending order based on the percentage of students attending schools where simulations and modelling software are available to both teachers and students.

The figure is based on data from the 2023 ICILS ICT coordinator questionnaire, drawing on question Q5 ('Are the following software resources made available by your school to teachers and students?'). It covers the following variables: ICT resources / availability of software resources – simulations and modelling software (II3G05I), educational VR or AR applications (II3G05N) and adaptive learning systems (II3G05O).

Percentages indicate the shares of students attending schools where ICT coordinators reported that each type of software is available to both teachers and students. Results are weighted using student sampling weights (TOTWGTS), so that estimates reflect the student population rather than the number of schools. Exact percentages and standard errors are provided in the Statistical tables.

Country-specific note

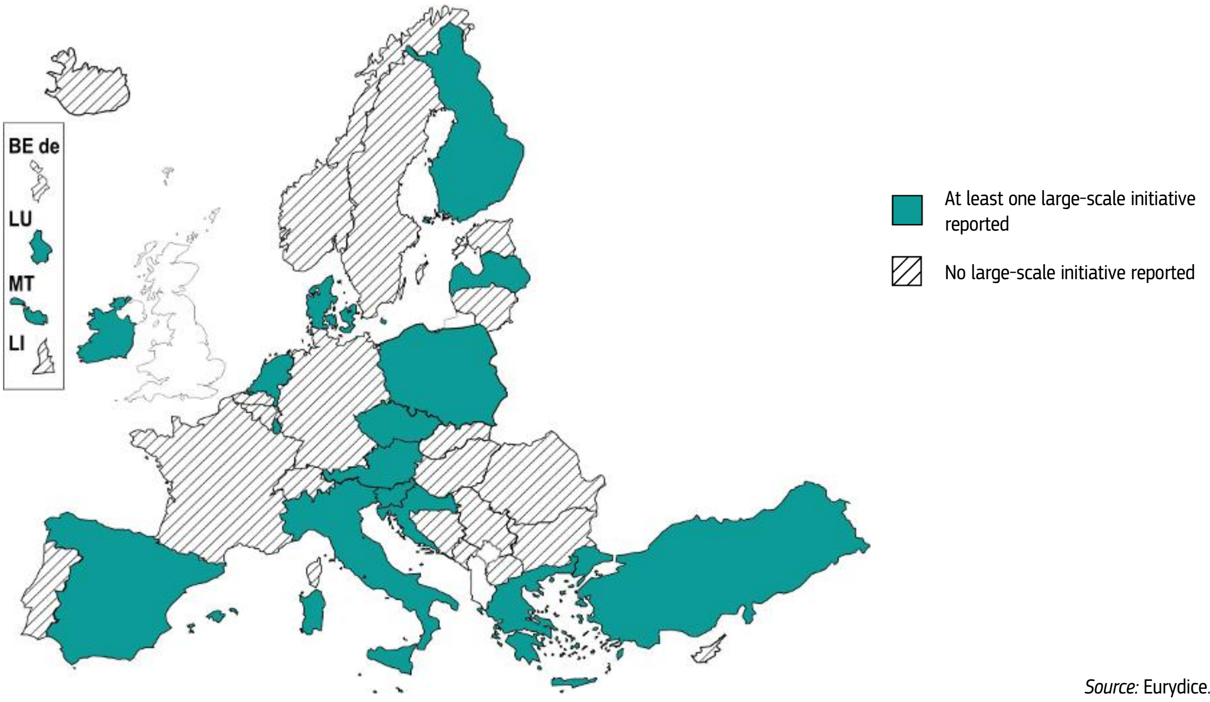
Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

The ICILS findings point to an uneven diffusion of advanced digital tools across education systems. Availability varies substantially between and within countries, including among those reporting top-level frameworks, and the data do not allow causal conclusions to be drawn. This suggests that school-level access is shaped by a wider set of enabling conditions beyond policy direction alone. Section 1.2.3 therefore examines large-scale initiatives and national projects supporting AI use in schools, focusing on how systems seek to bridge the gap between policy intentions and implementation through experimentation, professional support and institutional investment.

1.2.3. Large-scale initiatives supporting artificial intelligence use in schools

Across Europe, top-level authorities are complementing policy frameworks with coordinated policy initiatives that test AI applications in real school settings. Figure 1.15 shows that 16 education systems report at least one large-scale initiative supporting the use of AI in schools, indicating that some education systems are complementing policy frameworks with broader implementation initiatives. Although these initiatives vary in scope, maturity and governance arrangements, together they show how education systems are seeking to support the implementation of AI-related policies in practice.

Figure 1.15: Large-scale initiatives supporting AI use in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory note

For the purposes of this report, 'large-scale initiatives' refers to publicly supported or officially recognised actions aiming to deploy AI-enabled tools or platforms, strengthen teacher capacity to use AI, participate in European partnerships or test innovative approaches linked to broader digital transformation agendas. A detailed overview of these initiatives is provided in Annex 1.

Country-specific notes

Belgium (BE fr): The system reports participating in a European technical support instrument project entitled 'Futureproof education: Supporting schools in the AI evolution', in partnership with the United Nations Educational, Scientific and Cultural Organization ([104]). The project involves several European education systems and aims to develop strategic policy frameworks and guidance for the responsible and ethical integration of AI in school education.

Belgium (BE fr and **BE nl), Estonia** and **France**: There are reported activities related to AI in education either targeting the primary or upper-secondary level only, or scheduled to begin after 2024/2025. Therefore, they do not appear in the figure.

Classroom innovation and adaptive learning constitute the most common focus areas of these initiatives. In Denmark, *SkoleGPT*, a national AI platform for schools, supports creative and critical uses of generative AI (GenAI) in everyday teaching. In Greece, AI is integrated into the national Skills Labs programme, particularly within science, technology, engineering and mathematics (STEM)-related modules. Spain's *Código Escuela 4.0* 'Welcome Kit' embeds AI within national teacher resources and is complemented by regional experimentation led by autonomous communities. Croatia's Application of artificial intelligence-based digital technologies in education (BrAIn) project combines AI-based tools with new curricula and teacher training. In Latvia, Artificial intelligence (AI) support for an accelerated approach to mathematics learning (AI4Math) promotes computational thinking and personalised mathematics learning. Luxembourg is testing AI-supported tools such as KI Léierbud and Teachino to support differentiation, while Malta's Fair AI Education (FAIE) pilot project focuses on the use of adaptive tutoring in mathematics. The Netherlands' national co-creation programme National Education Lab AI (NOLAI) develops and evaluates AI tools in cooperation with schools, and Austria's 100-school AI pilot project examines a range of AI applications under scientific observation.

A second group of initiatives focuses on **longer-term capacity building and governance development** rather than on direct classroom deployment alone. In Czechia, initiatives such as AIDIG and AI EduLab @ Sféra support the integration of AI into education through teacher training, methodological guidance and collaboration between educators, researchers and technology experts. Ireland combines structured

104 European technical support instrument project entitled 'Futureproof education: Supporting schools in the AI evolution'.

teacher support with national coordination through the Oide AI Hub, while Slovenia's initiative GEN-UI – digital transformation of teaching and learning through AI analyses pedagogical, organisational and ethical implications to inform future system-wide guidance. Poland's Lesson: AI initiative centres on teacher development and resource production, and Finland's Generation AI project aims to build a foundation for a new generation of technology education and to bring together technology developers, schools, public authorities, companies and non-governmental organisations. Italy is following a similar path with the Two-year AI experimentation initiative, combining awareness raising, experimentation and professional learning activities while policy frameworks continue to develop. In Türkiye, the Dynamic course project supports teachers in developing technology-enhanced teaching scenarios using digital tools, including emerging AI applications, within the National Digital Education Platform.

Four systems combine **several large-scale initiatives in parallel**. Czechia, Spain, Latvia and Luxembourg each report two initiatives targeting lower-secondary education, reflecting a dual strategy of experimentation and capacity building.

As the implementation of the AI Act ([105]) advances, education systems are likely to continue developing approaches to the governance and use of AI in schools. Across Europe, the integration of AI and other emerging technologies in schools is being addressed, although with differing levels of coherence across education systems. Many education systems now articulate expectations relating to pedagogical use, ethical safeguards and data protection; however, the scope, legal status and operational depth of frameworks vary considerably. Integration into teaching and learning is the most consistently addressed policy area, whereas references to monitoring and evaluation appear less frequently in the frameworks reported. Evidence from the ICILS 2023 further suggests that the presence of policy frameworks or national initiatives does not in itself ensure comparable access to advanced digital tools at the school level. These findings suggest that school-level access to emerging technologies is associated with a broader set of enabling conditions, including infrastructure, technical support, funding arrangements and institutional capacity.

1.3. Conclusions

This chapter examined how European education systems support the digital transformation of schools through top-level policy frameworks and explored school-level access to and the functioning of digital technologies. Nearly all education systems report at least one top-level framework addressing aspects of digital education in schools. While their structures, legal forms and scopes differ, most frameworks cover core elements of the digital ecosystem, including connectivity, hardware, software, interoperability and technical support. These arrangements reflect diverse governance traditions and different distributions of responsibility between national, regional and local authorities. Evidence from the ICILS 2023 suggests that access to basic digital infrastructure is generally widespread across participating education systems, although reliability and technical support vary. Systems operating under similar governance arrangements often display different levels of connectivity availability and technical performance.

Approaches to software provision, platform organisation and interoperability also differ across systems. Some education systems provide centrally coordinated digital environments supported by shared authentication services and technical standards, while others rely primarily on school- or local-level choice within broader policy guidance. The ICILS 2023 data show that productivity tools and software supporting curriculum-related activities are widely available across participating education systems, whereas institutional platforms such as school intranets and portals show greater variation in availability. Interoperability is addressed in policy frameworks, but the degree of specification ranges from binding technical standards to general principles encouraging compatibility. Arrangements for IT maintenance and technical support likewise vary, and schools in several education systems report challenges related to the availability of technical expertise and the efficiency of support services.

105 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) (OJ L, 2024/1689, 12.7.2024, ELI: http://data.europa.eu/eli/reg/2024/1689/oj).

The chapter also examined policy approaches to AI and other emerging technologies. Most education systems (24) refer to them in policy frameworks such as strategies, guidance or official recommendations. These policy frameworks address issues such as pedagogical use, ethical considerations and data protection in line with the GDPR ([106]) and the AI Act ([107]), although the scope and level of operational detail vary across systems. Evidence from the ICILS 2023 shows that access to advanced digital tools – including simulations, immersive environments and adaptive learning systems – varies across education systems.

Overall, the findings show that European education systems address digital technologies through top-level policy frameworks covering infrastructure, platforms, AI and other emerging technologies. At the same time, school-level access to and the functioning of digital technologies vary across education systems and policy areas. Differences are observed in connectivity conditions, device availability, software environments, platform integration and technical support. These findings suggest that policy frameworks operate alongside a broader set of enabling conditions, including infrastructure quality, technical support arrangements, funding structures and institutional capacity. Digital transformation is now addressed across European education systems through a variety of policy frameworks, although approaches, governance arrangements and implementation conditions differ.

106 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1, ELI: http://data.europa.eu/eli/reg/2016/679/oj).

107 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) (OJ L, 2024/1689, 12.7.2024, ELI: http://data.europa.eu/eli/reg/2024/1689/oj).

Chapter 2: Digital equity and inclusion

Inequalities in education are a growing concern in European education systems. Recent results from international student assessment surveys such as the Organisation for Economic Co-operation and Development (OECD) Programme for International Student Assessment (PISA) show widening achievement gaps between socioeconomic groups (European Commission / EACEA / Eurydice, 2025a). The COVID-19 pandemic exacerbated these challenges, widening inequalities in access to learning and accelerating downward trends in performance. School closures and the reliance on digital devices and distance learning also highlighted the importance of equitable access to digital technologies as an essential component of efforts to reduce educational inequalities and foster inclusive education systems.

Chapter 1 demonstrated that, while most European education systems have top-level frameworks supporting schools' access to and use of digital technologies, the range and coherence of the available infrastructure and tools remain uneven. This chapter takes this a step further and analyses differentiated access to digital technologies **within** education systems based on students' and schools' background characteristics.

An OECD working paper on 'Digital equity and inclusion in education' (Gottschalk and Weise, 2023) provides a useful conceptual framework for understanding equity and inclusion in relation to digital technologies. First, digital technologies promise to make education systems more equitable and inclusive, as they allow for increasing flexibility and personalisation, providing additional learning resources and facilitating support based on individual students' needs. This is what the working paper labels as digital technologies '[*f*]*or equity/inclusion* in education' (Gottschalk and Weise, 2023, p. 8, emphasis original). At the same time, digital inequalities, in terms of both unequal access to these digital technologies and differences in digital skills, can significantly weaken this potential. This second dimension can be referred to as digital (in)equity '[*i*]*n* education' (Gottschalk and Weise, 2023, p. 8, emphasis original).

This chapter primarily focuses on the second aspect of equity in digital education: equal access to digital technologies. Relying on the results of the 2023 International Computer and Information Literacy Study (ICILS) of the International Association for the Evaluation of Educational Achievement (IEA), the first section discusses students' access to digital technologies in the home environment. It also highlights how and to what extent education systems provide support for disadvantaged students in relation to accessing digital technologies (good-quality internet connection and digital devices). The second section analyses the availability of digital technologies in the school environment, examining differences between schools with different socioeconomic composition, and between schools situated in more rural or urban environments, also based on the ICILS survey. The section also looks at examples of top-level measures aiming to reduce differences between more advantaged and disadvantaged schools. The third section of the chapter focuses on the potential of digital technologies to aid equity/inclusion in education, primarily focusing on measures ensuring that students with special needs can access assistive technologies.

2.1. Students' access to digital technologies at home

The 'digital divide' between students – that is, inequalities in their access to and use of digital technologies, and also differences in digital competences – starts at home. International assessment surveys such as the ICILS show that many students report learning important digital competences outside school (see Chapter 4). Given the important role that socioeconomic differences play in the access to and use of digital technologies, this chapter therefore starts by analysing access to digital technologies, focusing first on the home environment.

The digital divide has several layers. The first-level digital divide is about the inequality of access to digital technologies and devices, where socioeconomic differences play a clear role (Scheerder, van Deursen and van Dijk, 2017; van Deursen and van Dijk, 2019). Beyond access, the digital divide is also apparent in how such digital technologies are being used (van de Werfhorst, Kessenich and Geven, 2022; Fraillon, 2025). This is labelled as the second-level digital divide, which highlights differences in whether and to what extent students actually learn from using digital technologies (Scheerder, van Deursen and van Dijk, 2017). Internet use, for example, might not always be educational, and socioeconomic differences can also have an impact on whether students and young people use the web (and digital technologies in general) for educational purposes (González-Betancor, López-Puig and Cardenal, 2021). Finally, researchers have started focusing on the third level of such digital inequalities: the outcomes of the differentiated use of digital technology. This third level emphasises differences in students' competences resulting from differentiated technology use (Scheerder, van Deursen and van Dijk, 2017; Ma, 2021).

Therefore, while this section focuses primarily on whether and how students can access digital technologies (good-quality internet connection and digital devices) at home, it specifically examines their quality and availability for students to do their schoolwork. The section analyses whether there are significant differences between students from higher and lower socioeconomic backgrounds in this respect. The section concludes with discussion of the availability of top-level measures supporting students' internet connectivity at home and the provision of digital devices for home learning.

2.1.1. Access to good-quality internet at home

As Chapter 1 explained, reliable internet connectivity is a fundamental precondition for digital learning. Having access to good-quality internet at home influences learning possibilities. If the learning process is disrupted by internet connection problems, this can not only have an impact on digital skills but can also widen educational inequalities in general.

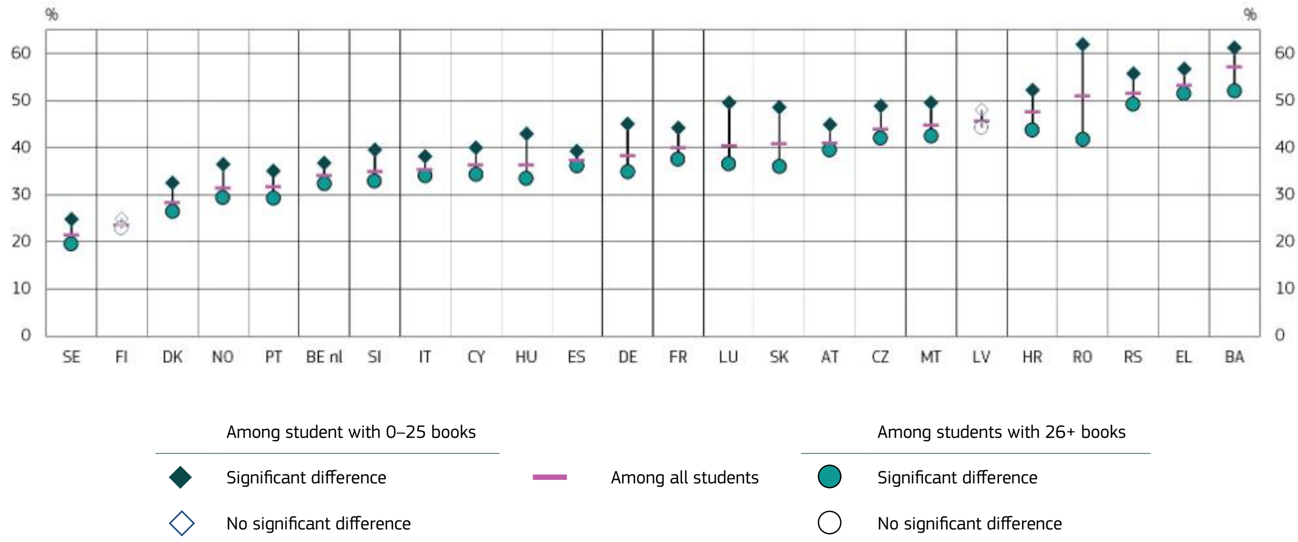
Based on the ICILS survey, Figure 2.1 depicts the percentage of students with internet quality problems at home, by the reported number of books at home (0–25 books or 26+ books). The number of books at home as reported by students is a common proxy used for socioeconomic status (see, for example, Schütz, Ursprung and Wößmann, 2008). This figure examines differences in the percentage of students with internet quality problems from lower (maximum of 25 books at home) and higher (26 books or more at home) socioeconomic backgrounds.

As the figure shows, in nearly all European education systems participating in the survey, students from low socioeconomic backgrounds (0–25 books) are significantly less likely to have access to a good-quality internet connection than their peers from higher socioeconomic backgrounds (26+ books). Students from low socioeconomic backgrounds are more likely not to have access to the internet at all, or to experience internet drops or a slow connection more often, hindering the completion of their schoolwork.

The percentage point (pp) gap between the percentages of students with internet quality problems from high and low socioeconomic backgrounds is especially wide in Romania (20.2 pp), followed by Luxembourg (13.0 pp) and Slovakia (12.5 pp). Among all participating European education systems, the only two where the gap between students from higher and lower socioeconomic backgrounds is not significant are Finland and Latvia; with a low percentage of students (23.6 %) reporting internet quality problems in the first, and a relatively higher percentage of students (45.7 %) doing so in the second.

More than half of the students from low socioeconomic backgrounds report experiencing internet quality problems that make it difficult to do their homework in Croatia, Romania, Serbia, Greece, and Bosnia and Herzegovina. In the last four of those, the overall percentages of students with internet quality problems are also above 50 %. The education systems where students report internet connection problems the least are Sweden, Finland, Denmark, Norway and Portugal.

Figure 2.1: Percentage of grade 8 students with internet quality problems at home, by the number of books at home (0–25 or 26+), 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are depicted in ascending order based on the total percentage of students with internet quality problems.

The figure is based on question Q15 of the ICILS student questionnaire (on 'The quality of your home internet connection'). The percentages were calculated based on two variables: Quality of home internet connection / Dropout (IS3G15A) and Quality of home internet connection / Slow (IS3G15B). The percentages include students who reported having an internet connection that disconnects for five minutes or longer or becomes so slow that it makes it difficult to do their schoolwork at least once a week, or who reported having no internet connection at all.

The original categories of the number of books at home variable (IS3G14) were transformed so that there were only two values: (1) 0–25 books and (2) 26+ books. Please consult the Statistical tables for the exact percentages, the relative sizes of the two subgroups and the standard errors.

Country-specific note

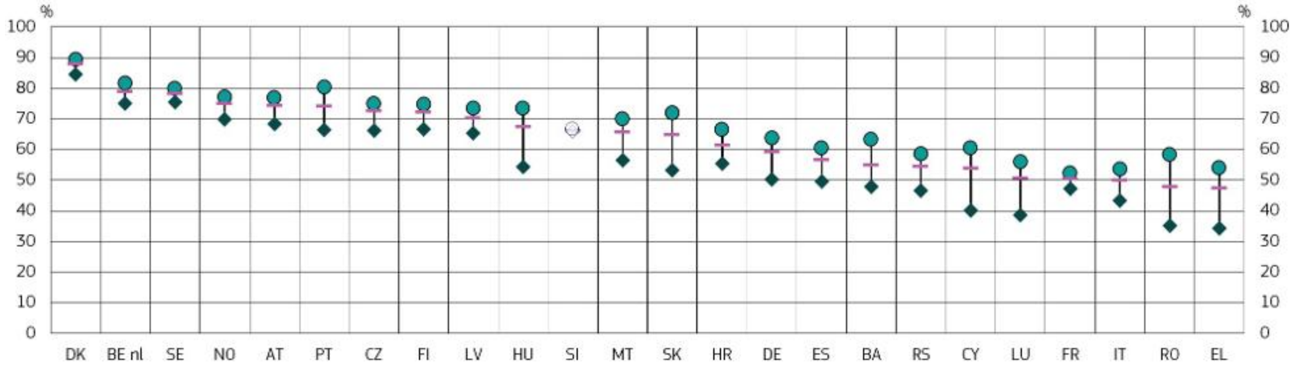
Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

2.1.2. Access to digital devices for schoolwork at home

Students' access to digital devices at home for being able to do their schoolwork is also a very important component of digital equity. Therefore, on the basis of the ICILS survey, this section examines to what extent students report having access to specific devices **whenever they need them** for doing their schoolwork. Three types of digital device are taken into consideration: computers (desktop or laptop), tablet devices and smartphones. Figure 2.2 shows the overall percentages of students who reported always having access to specific devices for schoolwork, and the differences between students from higher and lower socioeconomic backgrounds (students having 26+ and 0–25 books at home, respectively).

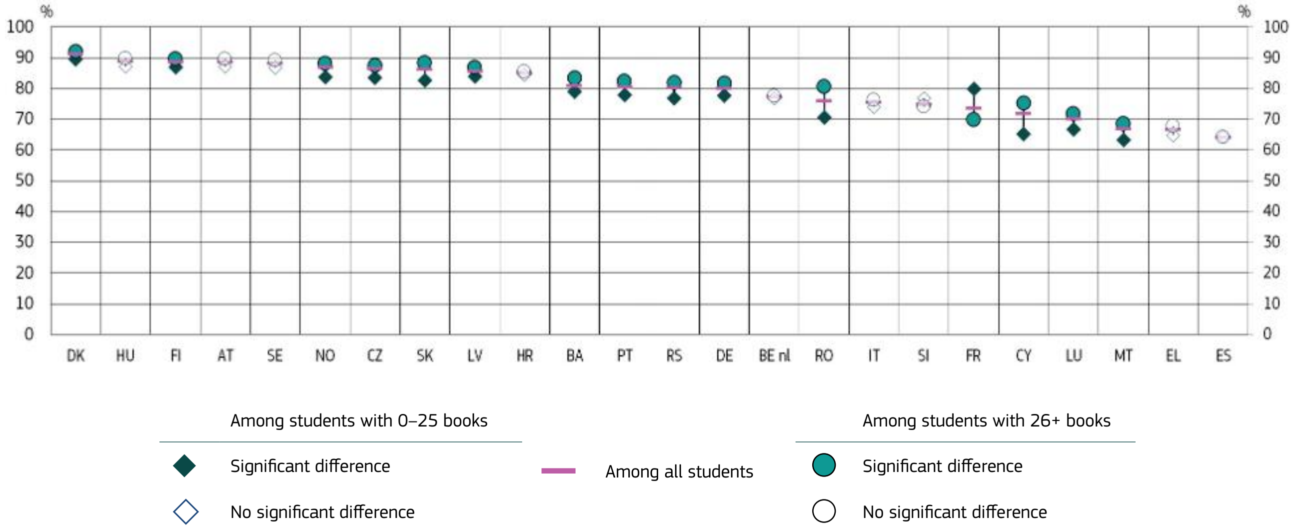
Figure 2.2: Percentage of grade 8 students who can always access specific devices for schoolwork whenever they need them, by the number of books at home (0–25 or 26+), 2023

(A) Desktop or laptop computers



(B) Tablet devices

(C) Smartphones



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are depicted in descending order based on the total percentage of students always having access to specific devices for schoolwork.

The figure is based on question Q16b of the ICILS student questionnaire ('Can you access the following ICT devices at home whenever you need to use them for your schoolwork?'). The percentages were calculated based on the following variables: Can you access the following ICT devices at home for schoolwork / Desktop or laptop computers (IS3G16BA), Can you access the following ICT devices at home for schoolwork / Tablet devices (IS3G16BB) and Can you access the following ICT devices at home for schoolwork / [Smartphone] (IS3G16BC). The percentages include students who reported always having access.

The original categories of the number of books at home variable (IS3G14) were transformed so that there were only two values: (1) 0–25 books and (2) 26+ books. Please consult the Statistical tables for the exact percentages, the relative sizes of the two subgroups and the standard errors.

Country-specific note

Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

Having access to computers is an essential condition for most schoolwork. Overall, the majority of students have access to a computer whenever they need it in almost all European countries with available data (Figure 2.2(A)). Percentages of students reporting always having access to computers for schoolwork range from less than 50 % in Romania and Greece to more than 80 % in Denmark. However, such relatively high overall access does not mean that all students have the same conditions for learning. Gaps between the access of students from lower and higher socioeconomic backgrounds are significant in almost all countries (the only exception is Slovenia) and show the systematic disadvantage of students with only 0–25 books at home. The percentage of students from low socioeconomic backgrounds who report always having access to a computer for schoolwork is below 40 % in Luxembourg, Romania and Greece. Gaps between students from different socioeconomic backgrounds tend to be bigger in countries with lower overall access levels and are the widest in Romania (23.2 pp), Cyprus (20.3 pp), Greece (19.8 pp), Hungary (19.0 pp) and Slovakia (18.7 pp).

The percentage of students who report having access to tablet devices for schoolwork is, overall, lower than that for computers (Figure 2.2(B)). Percentages range from around 30 % in Latvia and Czechia to above 60 % in Luxembourg. The gaps between students from lower and higher socioeconomic backgrounds are somewhat smaller than in the case of computer access and are not significant in six education systems. However, significant gaps always show the disadvantage of students from lower socioeconomic backgrounds. Differences between students with 0–25 and 26+ books are again the biggest in Romania (16.4 pp) and Cyprus (14.7 pp).

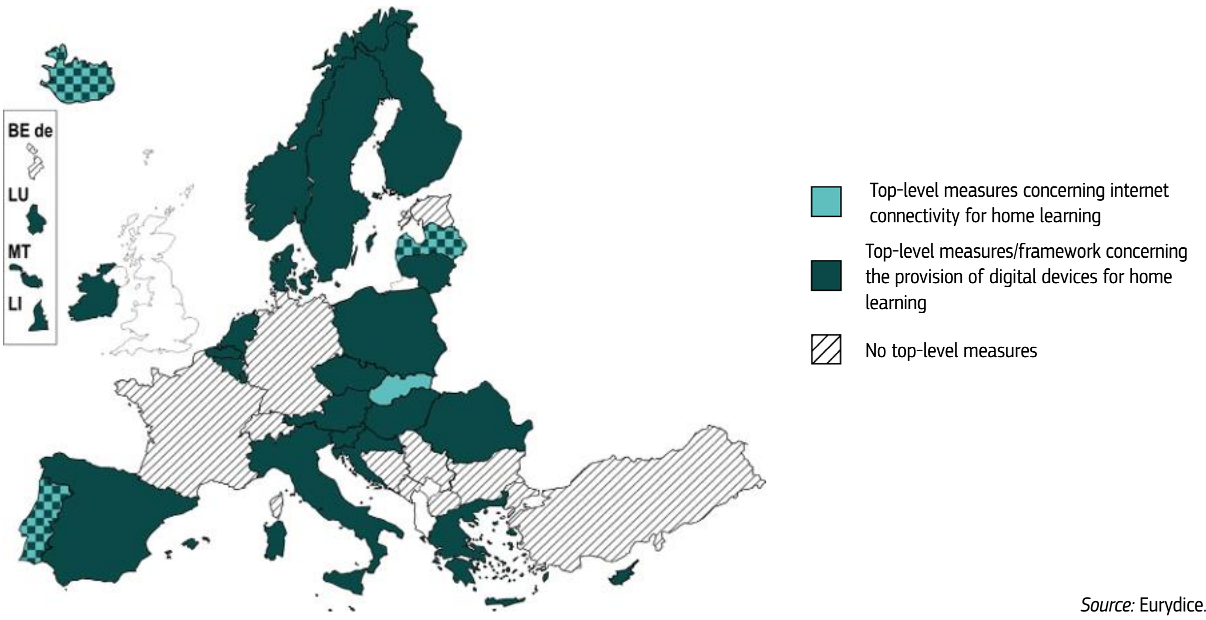
Finally, the highest levels of access are reported for smartphones (Figure 2.2(C)), where the percentages of students always having the necessary access is above 60 % in all participating European countries. This is also the type of device for which the gaps between students from higher and lower socioeconomic backgrounds are the smallest, and often not even significant. Nevertheless, where such gaps are significant, they almost always show higher levels of access for students from higher socioeconomic backgrounds (the only exception is France, where the percentage of students reporting always having access is higher among students from lower socioeconomic backgrounds). Always having access to smartphones for schoolwork is reported by more than 90 % of students in Denmark, and less than 70 % of students in Malta, Greece and Spain.

2.1.3. Top-level support for internet connectivity and digital devices at home

The previous sections demonstrated that students from lower socioeconomic backgrounds are less likely to have access to a good-quality internet connection or digital devices for doing their schoolwork at home than their peers from higher socioeconomic backgrounds. Gaps differ across countries and between the different digital technologies analysed, but the disadvantages are always present. Therefore, it is important to examine the measures European countries have put in place to decrease digital inequalities.

Figure 2.3 shows the presence of top-level measures and frameworks concerning internet connectivity at home, on the one hand, and the provision of digital devices for home learning, on the other. As the figure shows, only four education systems (Latvia, Portugal, Slovakia and Iceland) provide top-level support for internet connectivity for home learning. In Latvia, the municipal housing benefit, which provides financial support to low-income households, also covers telecommunication and internet service costs to secure a stable, high-quality internet connection. In Portugal, internet connectivity is provided together with digital devices to socially disadvantaged students. Slovakia ([108]) offers vouchers to eligible students and their families to enable them to upgrade to a good-quality internet connection in their homes. In Iceland, broadband connectivity is ensured for the whole country.

Figure 2.3: Supporting internet connectivity and/or the provision of digital devices for home learning, ISCED 24, 2024/2025



Source: Eurydice.

The provision of digital devices is more widespread, as top-level measures or frameworks exist in 26 education systems. The most common approach that European education systems rely on is to distribute digital devices (or lump sum support) to schools, from which students can borrow laptops or tablet devices to use at school and at home. This approach exists in Belgium (French and Flemish Communities), Czechia, Denmark, Ireland, Greece, Croatia, Italy, Latvia, Lithuania, Hungary, Malta, the Netherlands, Poland, Portugal, Slovenia, Finland, Sweden, Iceland, Liechtenstein and Norway. In most systems, while the financial support comes from the top level, the decision to lend digital devices to students can be made by the schools themselves. In Portugal, digital devices and internet access are allocated to students who benefit from school social support through a phased programme, where financial support and allocation is decided at the top level and distribution is organised by the schools ([109]). Alternatively, both the financial aspects and the distributional tasks can be delegated to local authorities, as in Denmark, Finland, Sweden, Iceland and Norway. The main goal can be framed in a targeted way (the support is explicitly provided to help disadvantaged students) or can aim for universal provision (e.g. in Denmark, Malta, Finland, Sweden, Iceland, Liechtenstein and Norway; see the box on the universal provision of digital devices).

Universal provision of digital devices

In **Malta**, the One Device Per Child project co-funded by the European Social Fund Plus will enhance education through the distribution of laptops to students, educational digital content and software, professional development for educators and school leaders, cloud-based classroom management solutions and education on online safety. These devices will be used by students both at school and at home.

In **Denmark**, **Finland**, **Sweden**, **Iceland** and **Norway**, the Primary and Lower Secondary School Act ([110]), the Basic Education Act ([111]), the Swedish Education Act ([112]), the Compulsory School Act ([113]) and the Norwegian Education Act ([114]), respectively, aim to ensure that compulsory education is free of charge for everyone. This means that students

108 Slovakia. Social vouchers for internet connection for students.

109 Portugal, Digital School Programme.

110 Denmark, the Primary and Lower Secondary School Act (LBK No 1100 of 5 September 2025, paragraph 19).

111 Finland, Basic Education Act 628/1998.

112 Sweden, Education Act (2010:800) (Chapter 10, Section 10).

113 Iceland, Compulsory School Act (191/2008).

114 Norway, Act relating to primary and secondary education and training (the Education Act) (LOV-2023-06-09-30, Section 2-5).

must have access to the learning tools necessary for their education at no cost. Furthermore, everyone must have equal access to education within the school system, regardless of geographical location or social and economic conditions ([115]). This also means that, if a computer is necessary to participate in instruction or complete homework, the school/municipality must provide one to the student ([116]).

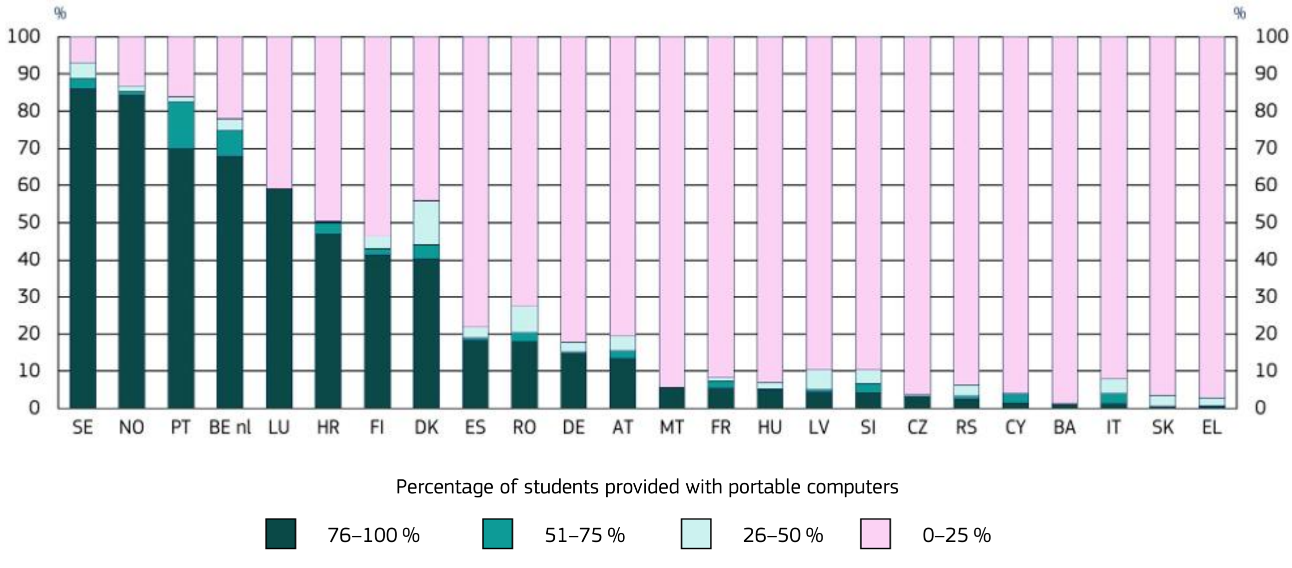
In **Liechtenstein**, all students in compulsory education are provided with a personal device for their work in connection with lessons. This device is managed centrally by the Office of Education.

Another approach is to provide financial support to students' families directly so that they can buy a digital device. Eligible families can receive lump sum support, as in the French Community of Belgium and Romania. In Cyprus, disadvantaged families can get a full reimbursement of the purchase price of the digital device. In Austria, pupils are provided with digital devices as learning and working tools by the Ministry of Education, with parents paying only 25 % of the purchase price, or nothing at all if certain conditions are met. In Luxembourg, the iPad programme is based on a loan model, in which low-income households receive specific subsidies to make sure that every student has a tablet on which to work. In Spain, the model of support depends on the autonomous community.

The extent of the provision of digital devices for home use can be demonstrated by the results of the ICILS survey for the participating countries. Figure 2.4 shows the percentage of students in schools where 76 % or more / 51–75 % / 26–50 % / 25 % or less of the students are provided with portable computers for use both at school and at home.

As the figure shows, in countries aiming for the universal provision of digital devices, a large proportion of students attend schools where portable computers are widely distributed and available for home use ([117]). In Sweden and Norway, more than 80 % of students are in schools where the vast majority of students (76 % or more) have access to portable digital devices and can take them home. Such extensive school-wide distribution of portable computers is also quite common in Portugal, Belgium (Flemish Community), Luxembourg, Croatia, Finland and Denmark.

Figure 2.4: Percentage of students by extent of school provision of portable computers for use both at home and at school (76–100 % / 51–75 % / 26–50 % / 0-25 %), 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are depicted in descending order based on the total percentage of students in schools where 76–100 % of students are provided with portable computers for use at school and at home.

The figure is based on question Q9 of the ICILS ICT coordinator questionnaire ('Approximately what percentage of students at the [target grade] have access to portable computers (laptops, netbooks or tablet devices) at school?' – b) Students provided with portable computers by their [school] for use at home and at school). The related variable is ICT Resources / Student with access to portable computers / Provided for use at home and at school (II3G09B). Results are weighted by student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools.

Please consult the Statistical tables for the exact percentages and standard errors.

115 Sweden, Education Act (2010:800) (Chapter 1, Section 8).

116 Denmark, Ministry of Children and Education, Parental payment in primary school.

117 The project in Malta started after the reference year of the ICILS survey.

However, in many countries, the distribution of portable computers for home use is rare. Nonetheless, this does not necessarily mean that students do not have access to computers that they can use only in school. The next section of this chapter explores students' access to digital resources in schools, and the potential differences between schools within European education systems.

2.2. Students' access to digital technologies at school

The digital transformation of schools aims to enable and support students' digital learning. Building on the system-level analysis of Chapter 1, this section examines whether disparities in access to digital technologies exist between schools within education systems, focusing on two key characteristics: schools' socioeconomic composition and their locations.

2.2.1. Socioeconomic differences between schools

If the socioeconomic backgrounds of students influence their learning possibilities, it is also important to examine whether less affluent students face further disadvantages in the schools they attend. Previous studies show that socioeconomically advantaged schools are better prepared for digital learning – that is, the first-level digital divide is also apparent at the school level (see e.g. OECD, 2020). In addition, evidence points towards second- and third-level digital differences between schools based on their socioeconomic composition: students attending more affluent schools are more likely to use computers for schoolwork within and outside schools, and have a higher level of digital competences than students attending more disadvantaged schools (Ma, 2021).

This section aims to map the differences between schools in European countries based on the ICILS survey. In the survey, school composition was derived from school principals' estimates of the proportions of students coming from socioeconomically affluent or disadvantaged homes. Three types of schools were distinguished: (1) schools with more affluent than disadvantaged students, (2) schools with neither more affluent nor more disadvantaged students and (3) schools with more disadvantaged than affluent students. In this report, in order to study digital gaps between schools based on socioeconomic composition, differences between type 1 and type 3 schools were calculated and examined.

Confirming earlier findings, the results of the 2023 ICILS survey show that the digital competences of students in schools with a more disadvantaged socioeconomic mix are significantly lower than those of their peers in more affluent schools in almost all European countries ([118]). Therefore, it is interesting to examine whether such differences can be connected to the availability of digital technologies.

Similarly to Chapter 1, this section starts the analysis by looking at **internet connectivity**. Among the countries with an overall high level of Wi-Fi access (see Chapter 1), variation between schools is limited given the near-universal provision. By contrast, where overall availability is lower, differences between schools tend to be more pronounced. However, these differences are rarely associated with schools' socioeconomic composition. Moreover, in the few cases where schools with more affluent or more disadvantaged student populations are significantly different from each other in terms of Wi-Fi access, this does not necessarily imply that disadvantaged schools have lower degrees of Wi-Fi connectivity.

Significant differences between schools on the basis of socioeconomic composition can be found in only two education systems: Cyprus and Latvia. However, the direction of the difference is not the same. In Cyprus, the percentage of students in more disadvantaged schools having access to Wi-Fi (4.3 %) is smaller than that of their peers in more advantaged schools (28.0 %). In contrast, in Latvia, disadvantaged schools have higher levels of Wi-Fi coverage: among the students in schools with more disadvantaged than affluent students, 91.7 % have access to Wi-Fi as opposed to 74.3 % of students in schools with more affluent than disadvantaged students ([119]). While Latvia does not provide targeted support to schools based on socioeconomic criteria, it provides earmarked funding to schools in rural/remote areas (see Figure 2.12). In Latvia, most disadvantaged schools are located in small towns/communities ([120]).

118 See Table 2.7 in the Statistical tables.

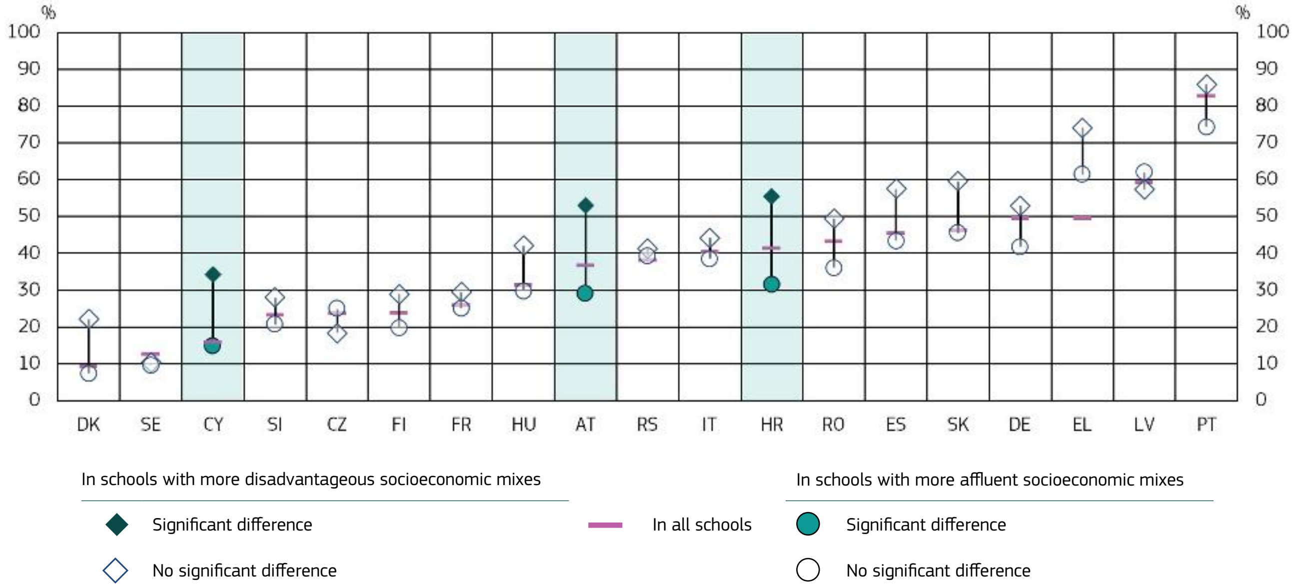
119 These percentages reflect the percentages of students who are in schools where Wi-Fi access is provided to both teachers and students, by school composition (P_COMP). The related variable concerns ICT Resources / Availability of technology resources / Wi-Fi (II3G04B). Percentages are presented in the Statistical tables. Sample sizes were too low to be considered for Luxembourg, Malta, and Bosnia and Herzegovina.

120 The Spearman correlation coefficient between school location and school socioeconomic composition is – 0.30 in Latvia, which is one of the largest among European countries participating in the ICILS survey. The strongest correlation is in Romania (– 0.54), also indicating that most disadvantaged schools are located in small towns/communities; this is followed by Serbia (– 0.35), going in the same direction, and Austria (0.31), where it indicates the opposite pattern. See Table 2.6 in the Statistical tables for more details.

While there is no discernible pattern across Europe in Wi-Fi access by school composition, the picture is somewhat clearer when it comes to the quality of internet connection. As Chapter 1 already explained, high internet coverage does not necessarily translate into reliable performance, which can hinder teaching and learning. Figure 2.5 shows the percentage point gaps between schools with a more affluent socioeconomic mix and those with a more disadvantageous socioeconomic mix in reporting that the use of information and communications technology (ICT) in teaching and learning is hindered by insufficient internet bandwidth or speed at least to some extent.

The extent of such problems varies widely across European countries (see also Chapter 1). At the same time, schools with more disadvantaged students are more likely to report that the use of ICT in teaching and learning is hindered by insufficient internet bandwidth or speed in nearly all participating countries. However, this difference is significant only in Cyprus, Austria and Croatia. The percentage point gaps are around 20 pp in these three education systems, although the prevalence of internet connection problems differs. Among the students in disadvantaged schools, while only around a third are in schools reporting internet connection problems in Cyprus, more than half of them face such issues in Austria and Croatia.

Figure 2.5: Percentage point gaps between schools with more affluent and more disadvantageous socioeconomic mixes in reporting that the use of ICT in teaching and learning is hindered by insufficient internet bandwidth or speed at least to some extent, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are depicted in ascending order based on the total percentage of students in schools where the use of ICT in teaching and learning is hindered by insufficient internet bandwidth or speed at least to some extent. Only education systems with available data on school composition are depicted.

The figure is based on question Q14B of the ICILS ICT coordinator questionnaire ('To what extent is the use of ICT in teaching and learning at your school hindered by each of the following obstacles? – Insufficient internet bandwidth or speed'). School composition is based on question Q6B of the ICILS principal questionnaire ('Approximately what percentage of students in your school have the following socio-economic backgrounds?').

Percentage point gaps were calculated on the basis of the percentages of students who are in schools where ICT coordinators report that the use of ICT in teaching and learning is hindered by insufficient internet bandwidth or speed 'a lot' or 'to some extent', by school composition (P_COMP). The related variable is ICT Support / Use of ICT hindered / Insufficient internet bandwidth or speed (II3G14B). Results are weighted by student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools.

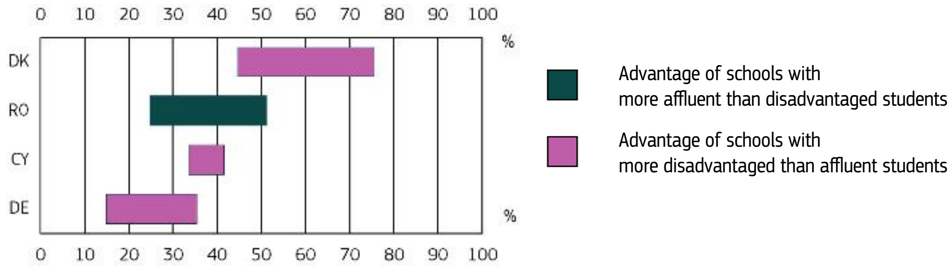
Please consult the Statistical tables for the exact percentages, for the relative sizes of the two subgroups and for the standard errors.

Country-specific notes

Belgium (BE nl), Netherlands and **Norway**: No data on school composition.
Luxembourg: Too low a sample size for schools with more affluent than disadvantaged students.
Malta: Missing data for schools with more disadvantaged socioeconomic mixes.
Bosnia and Herzegovina: Too low a sample size for schools with more disadvantaged than affluent students.

The second aspect of digital technologies to be analysed is access to **digital hardware** resources. Chapter 1 showed that, in many education systems, digital learning continues to rely heavily on dedicated rooms rather than being integrated into everyday teaching spaces (classrooms). Following up on these findings, this section investigates whether the way students can access computers is dependent on the socioeconomic conditions of schools. Figure 2.6 shows education systems where there are significant gaps between the percentages of students in more disadvantaged and more affluent schools in the availability of computers in classrooms. Only education systems with statistically significant gaps are shown.

Figure 2.6: Percentage point gaps between schools with more advantageous and more disadvantageous socioeconomic mixes in the availability of laptops and tablets in classrooms, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are depicted in descending order based on the total percentage of students in schools where laptops and tablets are made available in most classrooms (see Figure 1.6).

The figure is based on question Q10 of the ICILS ICT coordinator questionnaire ('Where are the ICT devices used by students in [target grade] located?'). School composition is based on question Q6B of the ICILS principal questionnaire ('Approximately what percentage of students in your school have the following socio-economic backgrounds?').

Percentage point gaps were calculated on the basis of the percentages of students who are in schools where the ICT devices used by students are located in most classrooms (80 % or more), by school composition (P_COMP). The related variable concerns ICT Resources / Location of school computers / In most classrooms (80 % or more) (II3G10A). Results are weighted by student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools.

Only education systems with statistically significant gaps ($p < 0.05$) are shown.

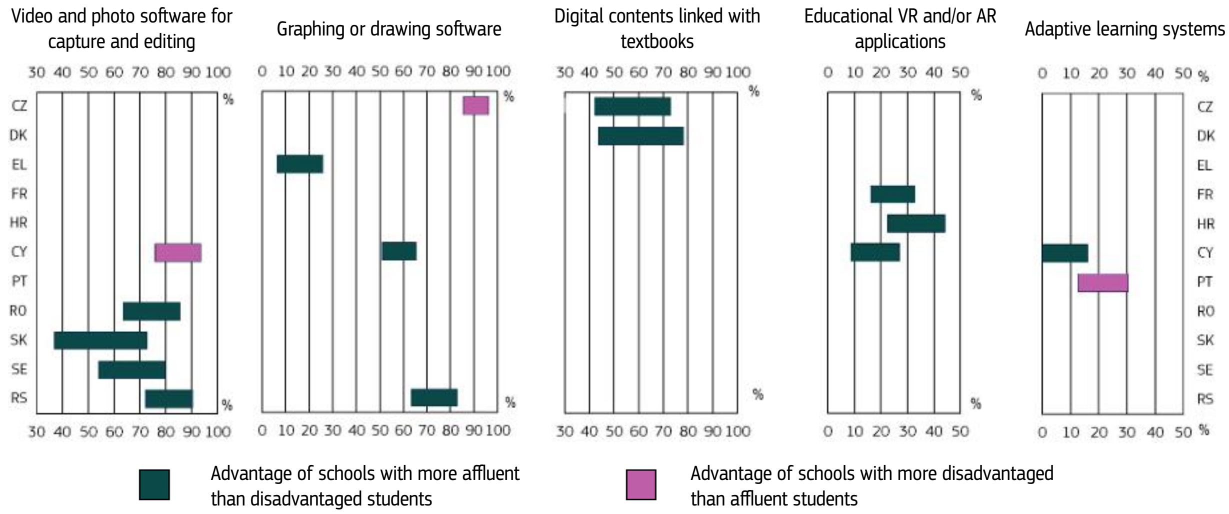
Country-specific notes

Belgium (BE nl), Netherlands and **Norway**: No data on school composition.
Luxembourg: Too low a sample size for schools with more affluent than disadvantaged students.
Malta: Missing data for schools with more disadvantageous socioeconomic mixes.
Bosnia and Herzegovina: Too low a sample size for schools with more disadvantaged than affluent students.

The figure shows, first, that differences between schools in the availability of digital devices in classrooms are only significant in four European countries. Second, where these differences are significant, with the exception of Romania, it is disadvantaged schools that tend to have more devices available in classrooms. The gap between schools based on their socioeconomic composition is the biggest in Denmark (around 30 pp), and the smallest in Cyprus (less than 10 pp). In Romania, where more advantaged schools tend to have digital devices in classrooms more often, the percentage point gap between more affluent and more disadvantaged schools is 26 pp.

Besides the availability of hardware, access to **digital software** is also an essential condition for learning. Chapter 1 analysed the availability of core software resources and emerging technologies across European countries based on the ICILS survey. Figure 2.7 examines differences between schools based on their socioeconomic composition with regard to three core software resources and two emerging technologies (educational virtual reality (VR) and/or augmented reality (AR) applications and adaptive learning systems).

Figure 2.7: Percentage point gaps between schools with more advantageous and more disadvantageous socioeconomic mixes in specific software resources made available to both teachers and students, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

The figure is based on question Q5 of the ICILS ICT coordinator questionnaire ('Are the following software resources made available by your school to teachers and students?'). School composition is based on question Q6B of the ICILS principal questionnaire ('Approximately what percentage of students in your school have the following socio-economic backgrounds?').

Percentage point gaps were calculated on the basis of the percentages of students who are in schools where specific software resources are made available to both teachers and students, by school composition (P_COMP). The related variables concern ICT Resources / Availability of software resources (II3G05F, II3G05J, II3G05L, II3G05N, II3G05O). Results are weighted by student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools.

Only education systems with statistically significant gaps (p < 0.05) are depicted.

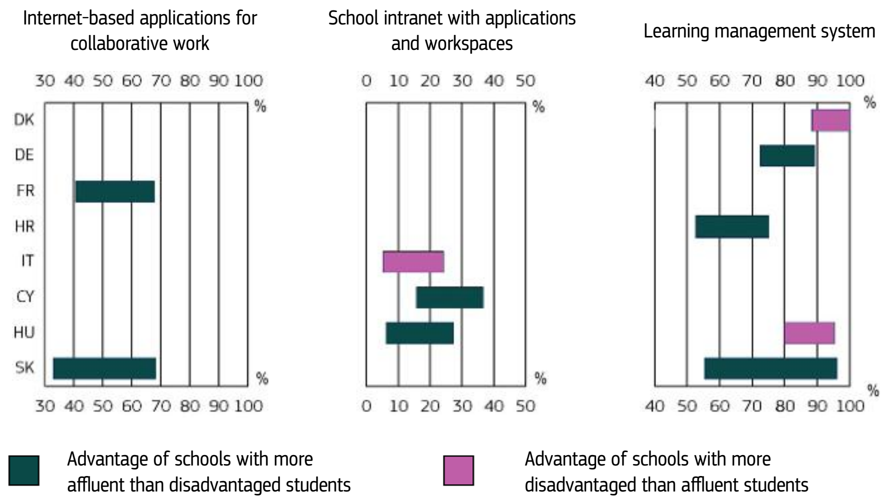
Country-specific notes

Belgium (BE nl), Netherlands and **Norway**: No data on school composition.
Cyprus: No disadvantaged schools chose the option 'available to both teachers and students' for adaptive learning systems. Based on the confidence interval around the value for advantaged schools (16.2 %, with a standard error of 3.8), it can be assumed that the percentage of students in affluent schools where adaptive learning systems are available to both teachers and students is significantly different from 0.
Luxembourg: Too low a sample size for schools with more affluent than disadvantaged students.
Malta, and **Bosnia and Herzegovina**: Too low a sample size for schools with more disadvantaged than affluent students.

As Figure 2.7 shows, in the majority of countries with significant gaps, more affluent schools have an advantage, with higher percentages of students having access to both traditional and more 'emerging technology' software. Nevertheless, even for the software types with the largest percentage point gaps between schools, such differences are only significant in five education systems at most (for video and photo software). In Cyprus and Serbia, more affluent schools have a more advantageous position in relation to two or more software items.

Finally, Figure 2.8 shows significant percentage point gaps between schools related to having access to **digital learning platforms**. Differences between schools on the basis of socioeconomic composition are the most substantial for the availability of learning management systems (significant in five education systems). Overall, in most systems, more affluent schools have the advantage. The percentage point gaps show that the advantage of more affluent schools is the widest in Slovakia: 35.5 pp regarding internet-based applications for collaborative work, and 40.5 pp for the availability of a learning management system.

Figure 2.8: Percentage point gaps between schools with more affluent and more disadvantageous socioeconomic mixes in specific technology infrastructure resources made available to both teachers and students, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

The figure is based on question Q4 of the ICILS ICT coordinator questionnaire ('Are the following technology infrastructure resources made available by your school to teachers and students?'). School composition is based on question Q6B of the ICILS principal questionnaire ('Approximately what percentage of students in your school have the following socio-economic backgrounds?').

Percentage point gaps were calculated on the basis of the percentages of students who are in schools where specific technology infrastructure resources are made available to both teachers and students, by school composition (P_COMP). The related variables concern ICT Resources / Availability of technology resources (II3G04G, II3G04H, II3G04K). Results are weighted by student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools.

Only education systems with statistically significant gaps ($p < 0.05$) are depicted.

Country-specific notes

Belgium (BE nl), Netherlands and **Norway**: No data on school composition.
Luxembourg: Too low a sample size for schools with more affluent than disadvantaged students.
Malta, and **Bosnia and Herzegovina**: Too low a sample size for schools with more disadvantaged than affluent students.

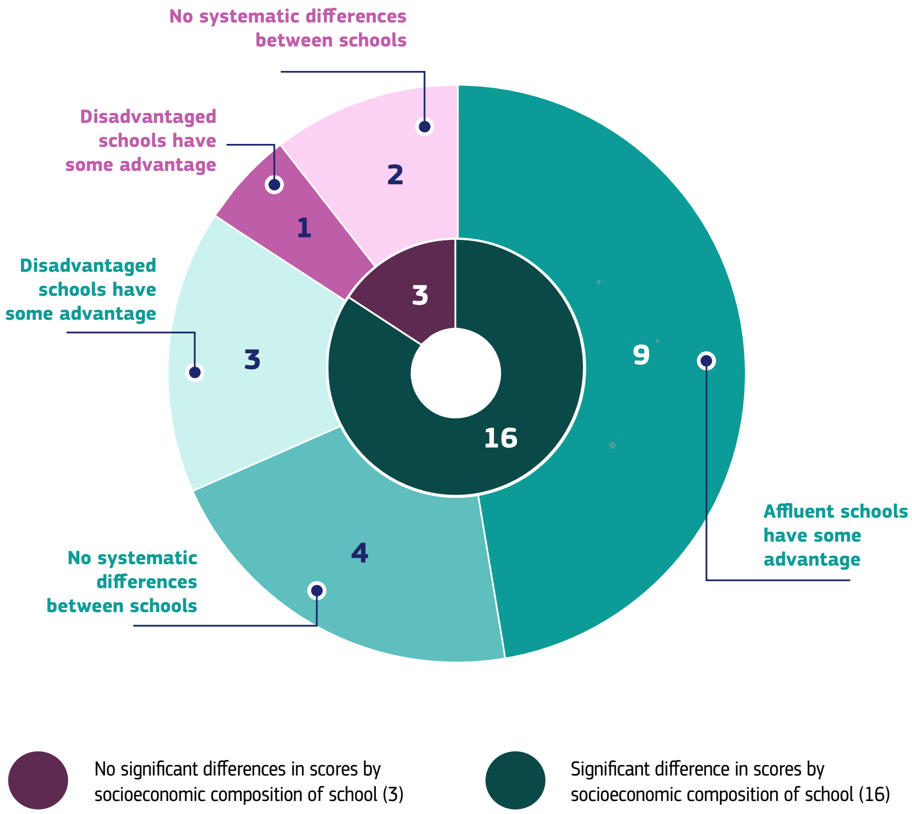
In summary, while the socioeconomic composition of schools does play some role when it comes to having access to crucial digital technologies, no clear pattern emerges across Europe. In the majority of education systems, gaps between schools with more disadvantaged and more affluent students are not significant. At the same time, significant gaps tend to confirm the advantages of more affluent schools, especially when it comes to the quality of internet connection, the availability of digital learning platforms and the provision of emerging technologies.

How do these findings relate to the starting point of this section, that is, the significantly lower achievement levels of students in schools with more disadvantaged socioeconomic mixes? To illustrate the overall picture, Figure 2.9 presents, in the inner circle, the number of education systems in which students' digital competences differ significantly between socioeconomically disadvantaged and affluent schools (in dark green) and those in which they do not (in purple). It also shows whether, within each of these categories, there are significant differences in the availability and quality of digital infrastructure between disadvantaged and affluent schools (outer circle).

The figure suggests that students' digital competences cannot be systematically associated with inequalities in the distribution of digital infrastructure. However, in education systems where students in disadvantaged schools achieve at levels comparable to those of their peers in more affluent schools, disadvantaged schools do not have lower levels of access to any digital resources.

This implies that while having access to digital technologies in school appears to be an important precondition for achieving higher competence levels, schools and students facing higher levels of socioeconomic disadvantage encounter multiple challenges (including inequalities in digital resources at home – see Section 2.1) that all influence digital literacy outcomes.

Figure 2.9: Digital resource gaps between disadvantaged and affluent schools in education systems with or without differences in digital literacy scores, based on socioeconomic composition of school, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

The figure summarises the information analysed in this section related to significant differences between schools with a more disadvantaged socioeconomic mix and those with a more affluent socioeconomic mix in their access to digital resources. Education systems showing significant differences for at least one resource are classified under either 'affluent schools have some advantage' or 'disadvantaged schools have some advantage', depending on the direction of the difference. When disadvantaged schools have an advantage for some resources and affluent schools for others, the education system is assigned to the category that applies to the greater number of resources. If both school types have an equal number of advantages, the education system is classified under 'no systematic differences between schools'.

The categorisation of education systems with available data is the following:
Affluent schools have some advantage: Greece, France, Croatia, Cyprus, Austria, Romania, Slovakia, Sweden and Serbia.
Disadvantaged schools have some advantage: Denmark, Italy, Latvia and Portugal.
No systematic differences between schools: Czechia, Germany, Spain, Hungary, Slovenia and Finland.

Education systems with no significant differences in scores by socioeconomic composition of school are Portugal, Slovenia and Finland (see Table 2.7 in the Statistical tables).

2.2.2. Regional differences between schools

Regional differentiation between schools is another factor influencing equity in digital education. Schools in rural areas and small communities can face challenges not only in digital learning and access to high-quality digital infrastructure, but also in attracting and retaining teachers, having access to teacher training and working with educational infrastructure in general. At the same time, digital technologies and connectivity can bring new opportunities to more rural and remote regions, connecting them with a broader range of opportunities available elsewhere. Therefore, it is crucial to examine if there are significant differences between schools located in small communities and in bigger cities in terms of the availability and quality of digital infrastructure.

Nevertheless it is also important to note that the relationship between schools' geographical locations and students' competences is much less straightforward than that between school composition and digital literacy scores. The results of the 2023 ICILS survey show that the digital competences of students in schools in small towns/communities do not differ significantly from those of their peers in bigger cities in around half of the European countries with available data ([121]). Where significant, differences in achievement scores nevertheless point towards the disadvantages of students in small towns/communities, with the exception of Austria, where students in smaller settlements have higher average literacy scores ([122]).

This section examines the same indicators on digital education resources as the previous one investigating socioeconomic differences between schools, starting with **internet connectivity**. The ICILS survey reveals no significant differences in Wi-Fi access between schools based on their location. The only education system with significant gaps in this regard is Czechia, where schools in small towns/communities with fewer than 15 000 people have a clear advantage in having access to a Wi-Fi connection: 63.5 % of students in schools located in small communities attend schools where a Wi-Fi connection is made available to both students and teachers, as opposed to only 38.6 % of their peers living in cities with over 100 000 inhabitants ([123]).

Differences between schools based on their location are more substantial concerning the quality of their internet (broadband) connection. Figure 2.10 shows the percentage point gaps between schools in small towns/communities and in big cities in reporting that the use of ICT in teaching and learning is hindered by insufficient internet bandwidth or speed at least to some extent.

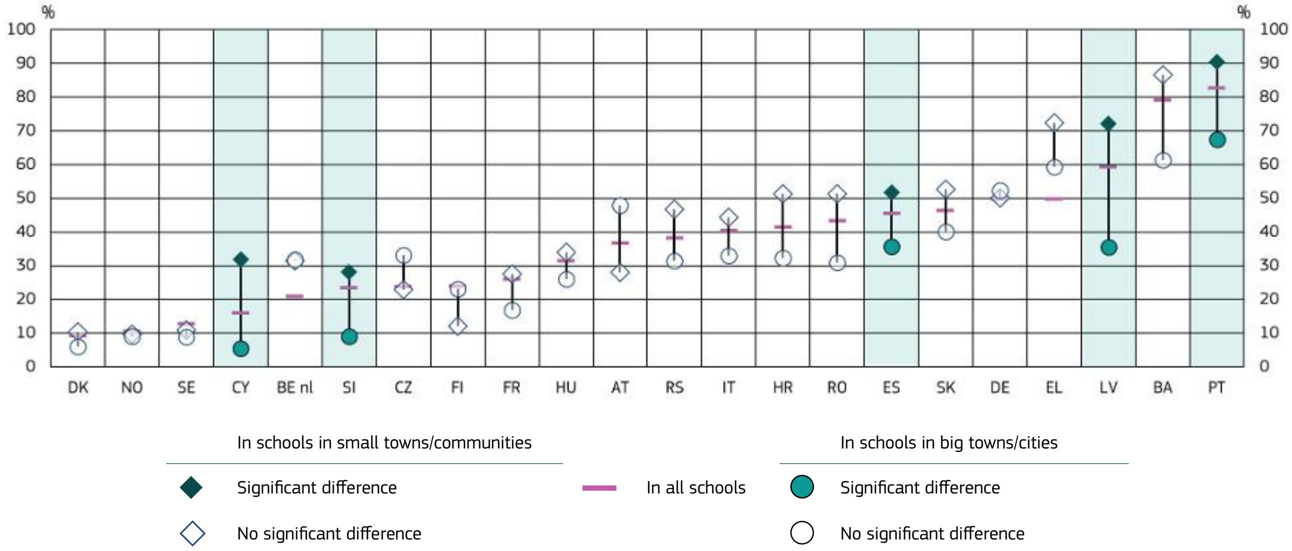
Differences between schools are significant in five education systems (Cyprus, Slovenia, Spain, Latvia and Portugal), and schools in small towns/communities are more likely to report internet connection problems in all of them. The gap is the widest in Latvia, where 72.2 % of students in small towns of fewer than 15 000 inhabitants are attending schools that report that insufficient internet bandwidth or speed hinders the use of ICT in teaching and learning, while 35.4 % of their peers in larger cities have to face such problems.

121 See Table 2.8 in the Statistical tables.

122 As noted previously, the Spearman correlation coefficient between school location and school socioeconomic composition is relatively high in Austria (0.31), indicating that socioeconomically disadvantaged schools tend to be located in bigger cities. See Table 2.6 in the Statistical tables for more details.

123 These percentages reflect the percentages of students who are in schools where Wi-Fi access is made available to both teachers and students, by school location (IP3G05). The related variable concerns ICT Resources / Availability of technology resources / Wi-Fi (II3G04B). The percentages cover schools situated in a community with fewer than 3 000 people or in a town with at least 3 000 but less than 15 000 people, on the one hand, and in a town/city with 100 000 or more people, on the other. Percentages are presented in the Statistical tables.

Figure 2.10: Percentage point gaps between schools in small towns/communities and in big cities in reporting that the use of ICT in teaching and learning is hindered by insufficient internet bandwidth or speed at least to some extent, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are depicted in ascending order based on the total percentage of students in schools where the use of ICT in teaching and learning is hindered by insufficient internet bandwidth or speed at least to some extent.

The figure is based on question Q14B of the ICILS ICT coordinator questionnaire ('To what extent is the use of ICT in teaching and learning at your school hindered by each of the following obstacles? – Insufficient internet bandwidth or speed'). School location is based on question Q5 of the ICILS principal questionnaire ('Which of the following best describes where your school is located?').

Percentage point gaps were calculated on the basis of the percentages of students who are in schools where ICT coordinators report that the use of ICT in teaching and learning is hindered by insufficient internet bandwidth or speed 'a lot' or 'to some extent', by school location. The related variable is ICT Support / Use of ICT hindered / Insufficient internet bandwidth or speed (II3G14B). Results are weighted by student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools.

The original categories of the school location variable (IP3G05) were transformed, merging the two first categories '1: In a community with fewer than 3 000 people' and '2: In a town with at least 3 000 but less than 15 000 people' and the last two categories '4: In a city with at least 100 000 but less than 1 000 000 people' and '5: In a city with 1 000 000 or more people'. The gaps show percentage point differences between schools located in towns/communities with less than 15 000 people, and schools located in larger towns/cities with more than 100 000 people.

Country-specific notes

Luxembourg: Too low a sample size for larger towns/cities.
Malta: Data not shown due to the absence of cities with more than 100 000 inhabitants.
Netherlands: Too low a sample size for small towns/communities.

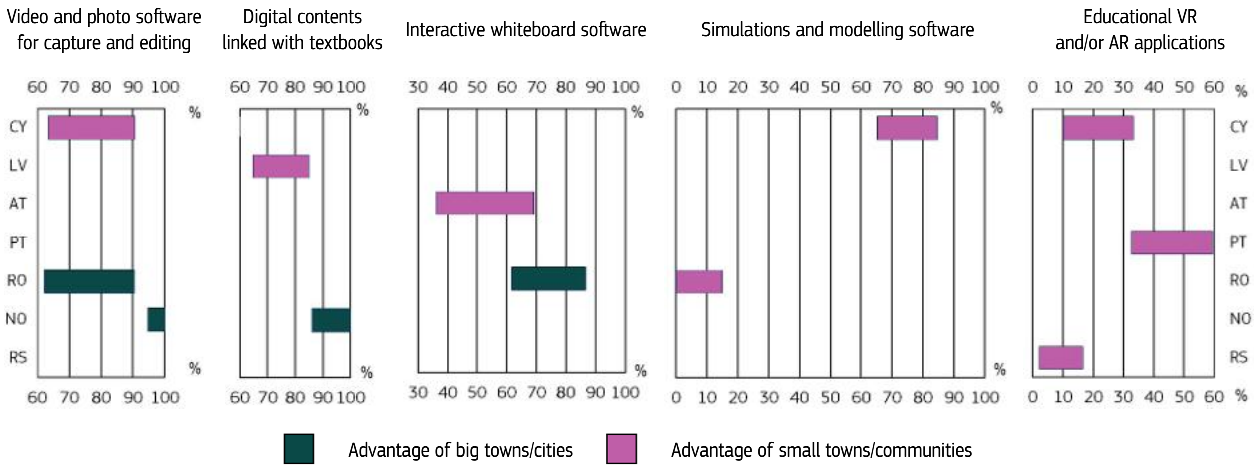
By contrast with access to a good-quality internet connection, access to **digital hardware** does not seem to be a particular problem for small communities across Europe. Percentage point gaps between schools in small towns/communities and in bigger cities in the availability of laptops and tablets in classrooms are only significant in Romania ([124]), indicating the advantage of bigger towns/cities, with a gap of 37.5 pp ([125]).

Regarding the availability of **digital software** (both more 'traditional' and 'emerging'), the disadvantage of students in schools located in small towns/communities is not confirmed. Figure 2.11 shows the percentage point gaps between schools in small towns/communities and in big cities in the availability of three more traditional and two emerging software resources for both teachers and students. The figure depicts only significant gaps, and only for software resources where gaps are significant for at least two education systems.

124 The strongest correlation between schools' socioeconomic compositions and locations is in Romania among the countries participating in the ICILS survey (– 0.54), indicating that most disadvantaged schools are located in small towns/communities. Therefore, these results are strongly related to the ones shown in Figure 2.5.

125 These percentages reflect the percentages of students who are in schools where laptops and tablets are made available in most classrooms, by school location (IP3G05). The related variable concerns ICT Resources / Location of school computers / In most classrooms (80 % or more) (II3G10A). The percentages cover schools situated in a community with fewer than 3 000 people or in a town with at least 3 000 but less than 15 000 people, on the one hand, and in a town/city with 100 000 or more people, on the other. Percentages are presented in the Statistical tables.

Figure 2.11: Percentage point gaps between schools in small towns/communities and in big cities in the availability of specific software resources to both teachers and students, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

The figure is based on question Q5 of the ICILS ICT coordinator questionnaire ('Are the following software resources made available by your school to teachers and students?'). School location is based on question Q5 of the ICILS principal questionnaire ('Which of the following best describes where your school is located?').

Percentage point gaps were calculated on the basis of the percentages of students who are in schools where specific software resources are made available to both teachers and students, by school location. The original categories of the school location variable (IP3G05) were transformed, merging the two first categories '1: In a community with fewer than 3 000 people' and '2: In a town with at least 3 000 but less than 15 000 people' and the last two categories '4: In a city with at least 100 000 but less than 1 000 000 people' and '5: In a city with 1 000 000 or more people'. The gaps show percentage point differences between schools located in towns/communities with less than 15 000 people, and schools located in larger towns/cities with more than 100 000 people.

The percentages are based on the variables on ICT Resources /Availability of software resources (II3G05F, II3G05I, II3G05L, II3G05N, II3G05P). Results are weighted by student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools.

Only education systems with statistically significant gaps ($p < 0.05$) are depicted.

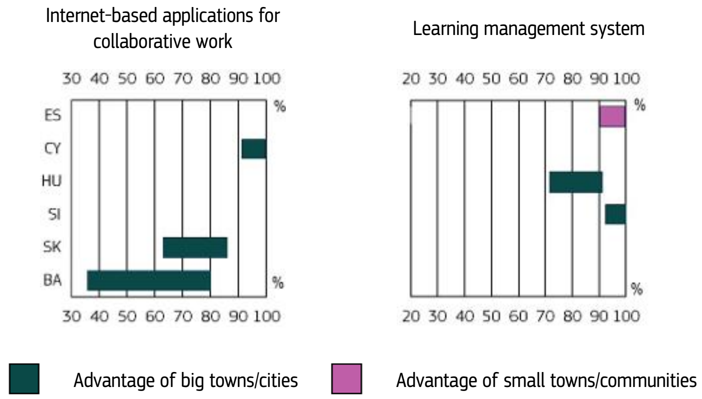
Country-specific notes

Luxembourg: Too low a sample size for larger towns/cities.
Malta: Data not shown due to the absence of cities with more than 100 000 inhabitants.
Netherlands: Too low a sample size for small towns/communities.
Romania: No schools in big towns/cities chose the option 'available to both teachers and students' for simulations and modelling software. Based on the confidence interval around the value for schools in small towns/communities (14.8 %, with a standard error of 6.7), it can be assumed that the percentage of students in schools in small towns/communities where simulations and modelling software are available to both teachers and students is significantly different from 0.

These gaps are most often not significant. Yet the majority of significant differences indicate the advantage of small towns/communities, especially when it comes to emerging technologies, where there are no significant gaps indicating the advantage of big cities. In Cyprus, students in smaller towns/communities are more likely to have access to three of the five software resources in the figure. As the next section will show, Cyprus provides financial support to schools in rural/remote areas. In Romania, while more traditional software items are more likely to be available in bigger cities, small towns/communities have better access to simulation and modelling software.

Looking at **digital learning platforms**, the picture looks slightly different again (Figure 2.12). What is similar to previous findings is that most differences between small towns/communities and bigger cities are not significant. There are no significant regional differences regarding the availability of a school intranet with applications and workspaces at all (or the sample sizes are too low to be reliable). However, when differences are significant, they most often indicate that students in schools in more rural environments are less likely to have access to digital learning platforms – in contrast to being more likely to have access to digital software resources.

Figure 2.12: Percentage point gaps between schools in small towns/communities and in big cities in the availability of specific technology infrastructure resources to both teachers and students, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

The figure is based on question Q4 of the ICILS ICT coordinator questionnaire ('Are the following technology infrastructure resources made available by your school to teachers and students?'). School location is based on question Q5 of the ICILS principal questionnaire ('Which of the following best describes where your school is located?').

Percentage point gaps were calculated on the basis of the percentages of students who are in schools where specific technology infrastructure resources are made available to both teachers and students, by school location. The original categories of the school location variable (IP3G05) were transformed, merging the two first categories '1: In a community with fewer than 3 000 people' and '2: In a town with at least 3 000 but less than 15 000 people' and the last two categories '4: In a city with at least 100 000 but less than 1 000 000 people' and '5: In a city with 1 000 000 or more people'. The gaps show percentage point differences between schools located in towns/communities with less than 15 000 people, and schools located in larger towns/cities with more than 100 000 people.

The percentages are based on the variables on ICT Resources / Availability of technology resources (II3G04G, II3G04K). Results are weighted by student sampling weights (TOTWGTS), so that estimates reflect the share of students rather than the share of schools.

Only education systems with statistically significant gaps ($p < 0.05$) are depicted.

Country-specific notes

Luxembourg: Too low a sample size for larger towns/cities.
Malta: Data not shown due to the absence of cities with more than 100 000 inhabitants.
Netherlands: Too low a sample size for small towns/communities.

In summary, the digital divide seems to be less prevalent between rural and urban schools than between schools with different socioeconomic compositions, as most differences within European countries remain not significant. In addition, neither rural nor urban schools are clearly in a more advantageous position in terms of the availability of digital technologies. While students in bigger towns and cities are more likely to have access to a good-quality internet connection and digital learning platforms, the schools of their peers in smaller towns and communities are better equipped with software resources, at least in some education systems. This might, at least in some systems, be the result of targeted policies and measures, which are examined in the next section.

With regard to the relationship between literacy score gaps and unequal access to digital infrastructure, some of the patterns mirror those reported in Section 2.2.1.

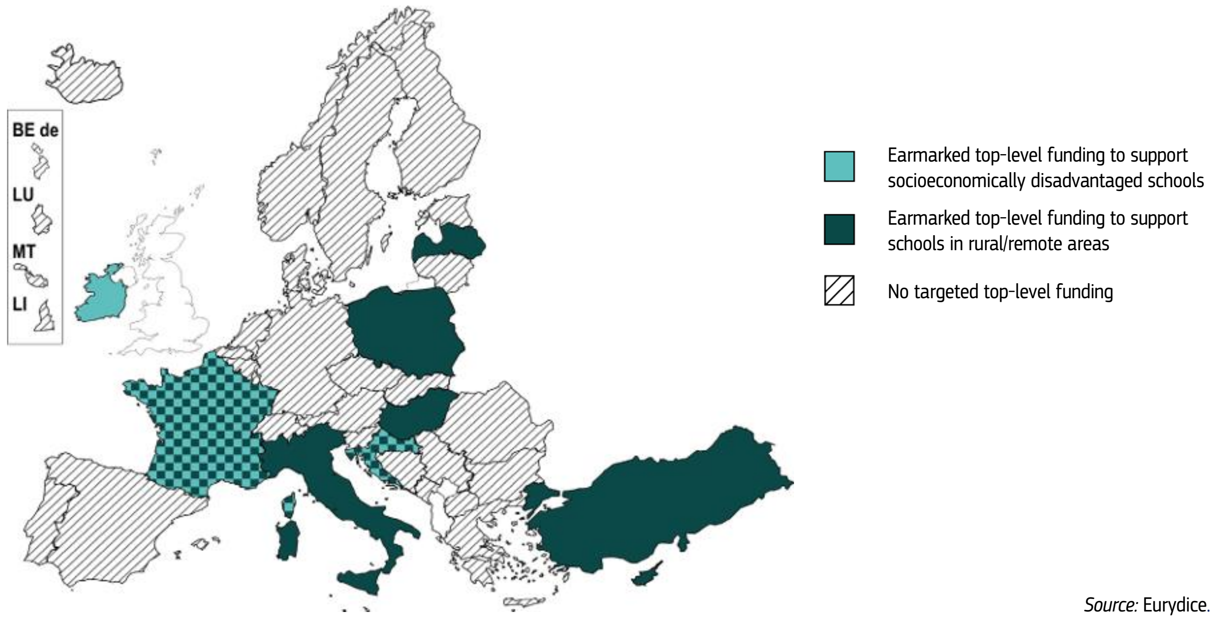
First, in almost all education systems where schools in small towns/communities have some disadvantages in accessing digital technologies, literacy score gaps are also significant to the detriment of students in more rural schools (126). Second, significant literacy score gaps can occur despite no differences in access to digital technologies. At the same time, in contrast to the findings of Section 2.2.1, in the majority of education systems with no differences between more rural and more urban schools in the availability of digital technologies, differences between students' achievement scores are not significant either. Finally, in Austria, the advantage of schools in small towns/communities in having access to digital resources corresponds to higher average achievement scores. These findings suggest that having access to digital technologies in school can be a necessary, but not a sufficient condition for achieving higher competence levels.

126 The only exception is Norway, where there are no significant differences in achievement score by school location, but rural schools reported some disadvantages in access to some software resources. However, despite these differences, all schools report very high levels of access to these software resources, with close to or over 90 % availability.

2.2.3. Top-level measures supporting disadvantaged schools

Earmarked funding concerning digital infrastructure, software and hardware targeting or favouring disadvantaged schools (based on either socioeconomic composition or location) is not very common in European countries. As Figure 2.13 shows, only nine education systems reported having such targeted support measures in place.

Figure 2.13: Earmarked funding to support disadvantaged schools or schools in rural/remote areas, ISCED 24, 2024/2025



Source: Eurydice.

Targeting schools in rural/remote areas is more common than targeting schools based on socioeconomic composition; funding addressing the latter exists in only three education systems (Ireland, France and Croatia), and is provided in combination with support provided to rural schools in two of them. Such targeted funding is often ensured through the national recovery and resilience plans (in Ireland, Croatia and Poland). In Ireland, an enhanced central funding allocation is provided to DEIS ([127]) schools under the Digital Strategy for Schools to 2027.

Earmarked top-level funding for digital infrastructure to support schools in rural/remote areas often forms part of programmes with a wider goal of decreasing territorial inequalities in education. In Italy, for example, the aims of investing resources in digital infrastructure include reducing territorial gaps, strengthening the basic competences of students in lower secondary education, preventing early school drop-out, and promoting educational success and social inclusion ([128]).

2.3. Digital technologies for inclusive learning

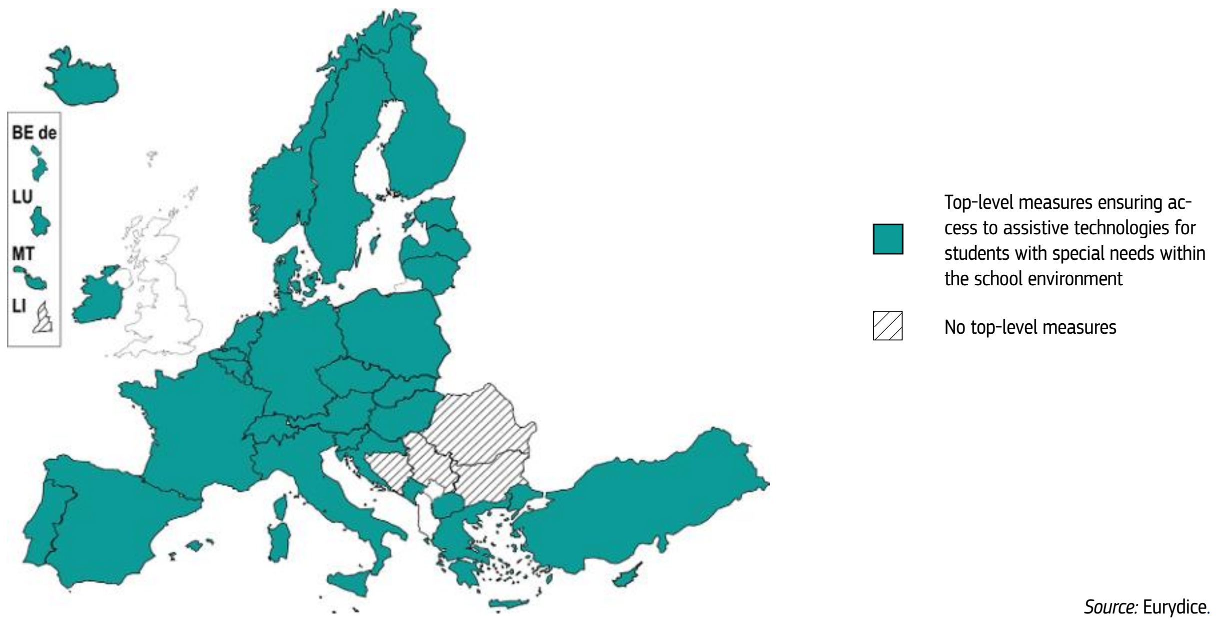
As outlined at the start of this chapter, digital equity relates to two main concepts: digital equity in education, and digital technologies for equity/inclusion in education (Gottschalk and Weise, 2023). While the first two sections discussed digital equity **in** education, this section of the chapter turns to top-level measures aiming to ensure that digital technologies are used **for** increased equity and inclusion in education. This primarily concerns top-level measures providing access to assistive technologies for students with special needs.

'Assistive technologies' is an umbrella term that can signify the availability of various digital technologies, devices and tools that can enable students with special needs to participate in mainstream education. Assistive technologies can be (adapted) digital devices or other hardware (e.g. specialised e-readers), specific software, or adapted learning materials and resources.

127 DEIS (Dream, Empower, Inspire, Succeed) schools are schools with high concentrations of socioeconomically disadvantaged students.

128 Italy, Reducing territorial gaps – FUTURA.

Figure 2.14: Access to assistive technologies for students with special needs within the school environment, ISCED 24, 2024/2025



Source: Eurydice.

As Figure 2.14 shows, nearly all education systems have top-level measures ensuring access to assistive technologies for students with special needs within the school environment. Yet the nature of such top-level support varies across European countries. Education systems report various forms and levels of top-level support:

- top-level education legislation, where the principle of inclusive education ensures that local administrations and/or schools provide the necessary support for all students based on their individual needs (e.g. in Czechia, Germany, Estonia, France, Latvia, Hungary, Finland, Sweden, Switzerland and Norway);
- top-level assessment frameworks, which make sure that students receive special teaching materials and technical aids in order to be able to follow classroom instruction based on their needs (e.g. in Denmark and Luxembourg);
- the provision of digital learning materials (digital textbooks, digital content linked to textbooks) and learning platforms (e.g. in the French Community of Belgium, Czechia, Greece, Croatia, Lithuania, the Netherlands, Iceland, Montenegro and Türkiye);
- the provision of or support provided for the acquisition of the digital devices and other hardware resources needed (e.g. in the French and German-speaking Communities of Belgium, Ireland, Greece, Spain, Italy, Cyprus, Luxembourg, Hungary, Malta, Austria, Poland, Portugal, Slovenia, Slovakia, Iceland and North Macedonia);
- the provision of specialised software resources (e.g. text-to-speech software) (e.g. in the Flemish Community of Belgium, Czechia, Spain, France, Hungary, Poland, Slovakia and Iceland);
- remote access for students with long-term illnesses (e.g. in the Flemish Community of Belgium and Germany).

2.4. Conclusions

This chapter analysed the equity and inclusion aspects of digital education: equity **in** accessing digital technologies, on the one hand, and using digital technologies **for** more-inclusive education, on the other. Regarding the first aspect, equity in accessing digital technologies, the chapter investigated two questions. First, based on data from the ICILS survey, it examined whether there are significant differences between students with higher and lower socioeconomic backgrounds in having access to digital technologies at home to be able to do schoolwork. Second, it analysed differences between schools and the availability of digital resources based on schools' socioeconomic composition and geographical location (small towns or bigger cities).

ICILS survey data show that students' socioeconomic backgrounds significantly influence the chances of having access to digital technologies at home. Students from lower socioeconomic backgrounds are more likely to have difficulties in doing their schoolwork at home due to internet quality problems or a lack of access to digital devices. The majority of European education systems try to mitigate these disadvantages through targeted measures making it possible for students to borrow digital devices from schools, or to buy them for a lower price. Some education systems aim for the universal provision of digital devices for home use, which generally translates to a much more extensive distribution of portable devices to students.

Targeted measures directed at schools based on their socioeconomic composition or geographical location are less widespread. Where such measures exist, education systems tend to allocate targeted resources to schools based on their locations rather than their socioeconomic composition. At the same time, differences between schools are also much less pronounced than those between students. While the provision of digital technologies is rarely universal within European education systems, differences between schools are most often not systematically dependent on schools' socioeconomic composition or urban/rural location. In addition, when differences between schools based on these fundamental characteristics are significant, there is a rather mixed pattern across Europe. Nevertheless, overall, significant differences tend to point towards a relatively even distribution of digital infrastructure based on school location, but also to the disadvantages of schools with a more disadvantaged socioeconomic composition.

While the analysis of unequal access to digital technologies mostly highlights the first-level digital divide, equity in accessing digital technologies is crucial, as it influences the digital competences of students. Students who experience internet connection problems or who cannot always access computers for schoolwork at home have, on average, lower computer and information literacy scores all across Europe (Fraillon, 2025). The digital competences of students in schools with more disadvantaged socioeconomic mixes are significantly lower than those of their peers in more affluent schools in almost all European countries. And while the impact of schools' geographical locations on students' competences is much less straightforward, students in smaller towns/communities have significantly lower digital literacy scores than their peers in larger cities in around half of the education systems with available data. The analysis of this chapter highlighted that while the availability of digital infrastructure in schools seems to be an essential condition for improving digital competences, disadvantaged schools and students face multiple challenges that cannot be reduced to or solved only by access to technology.

The last section of the chapter was dedicated to the second aspect of digital equity: the availability of digital technologies for creating the conditions for more inclusive education. In this regard, the chapter found that providing access to assistive technologies for students with special needs within the school environment is a widespread practice across European countries. Most education systems have the necessary measures in place so that students can receive support based on their needs. Several education systems provide digital devices and other hardware resources, and also digital learning materials and specialised software resources for students with special needs. Some countries even provide for remote access for students with long-term illnesses.

Chapter 3: School-level digital planning and quality assurance

Chapter 3 shifts the focus from system-level policy frameworks and issues of access and equity (Chapters 1 and 2) to how digital education is organised, managed and evaluated at the school level. It examines how education systems define expectations for schools, allocate responsibilities and establish mechanisms for support, oversight and accountability in relation to the use of digital technologies.

At the EU level, digital transformation in education is framed not only as an infrastructure challenge but also as a matter of governance and quality assurance. The Staff Working Document accompanying the Digital Education Action Plan (2021–2027) highlights the importance of coherent policy design, clearly assigned responsibilities and monitoring arrangements to support consistent and sustainable implementation across education systems (European Commission, 2020a). International evidence likewise points to the importance of institutional coordination and accountability mechanisms as digital technologies become more deeply embedded in schooling (OECD, 2023b). The *Education and Training Monitor 2019* also highlights the role of governance, monitoring and evaluation capacity in shaping the effectiveness of education reforms, including those linked to digital transformation (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2019).

Research shows that digital transformation in education is not only a technical process but also an organisational one. Studies underline the importance of formal structures, planning instruments and evaluation systems in shaping how digital policies are enacted at the school level (Vanderlinde and van Braak, 2011; Voogt *et al.*, 2015). The European framework for digitally-competent educational organisations (DigCompOrg) conceptualises digital competence as an organisational capability, highlighting the importance of leadership, professional learning and institutional self-evaluation in developing digitally competent schools (Kampylis, Punie and Devine, 2015). From this perspective, digital transformation depends not only on the availability of tools and connectivity but also on the governance environments within which schools operate, including the clarity of expectations, the availability of support and the presence of feedback mechanisms.

Recent public opinion evidence provides additional context. Findings from the Flash Eurobarometer ‘Future needs in digital education’ indicate broad public support for digital education and AI literacy, alongside recognition of the importance of digital wellbeing, online safety and the effective use of digital technologies in education. The survey also highlights the perceived importance of supporting learners in the safe and responsible use of digital technologies and points to public support for standards governing the use of digital technologies in education, including in relation to data protection and AI. Taken together, these findings suggest that governance arrangements and institutional responsibilities play an important role in supporting the digital transformation of education (European Commission, 2025f).

Comparative evidence suggests that, although many European education systems have adopted national digital education strategies, these are not always systematically integrated into quality assurance or evaluation frameworks. In many systems, provisions for monitoring digital education remain underdeveloped or embedded within general school evaluation processes rather than articulated through digital-specific criteria (European Commission / EACEA / Eurydice, 2019; Boeskens and Meyer, 2025). Governance and evaluation can therefore be seen as an important interface between policy objectives and implementation, influencing how priorities are interpreted, translated into practice and sustained over time (Burns and Köster, 2016).

Against this background, Chapter 3 examines how European education systems organise school-level digital planning, assign responsibilities for digital education and embed digital transformation within quality assurance frameworks. Section 3.1 explores how schools are guided in developing digital plans and addressing key policy domains. Section 3.2 analyses governance arrangements and support structures at the system level that steer digital education.

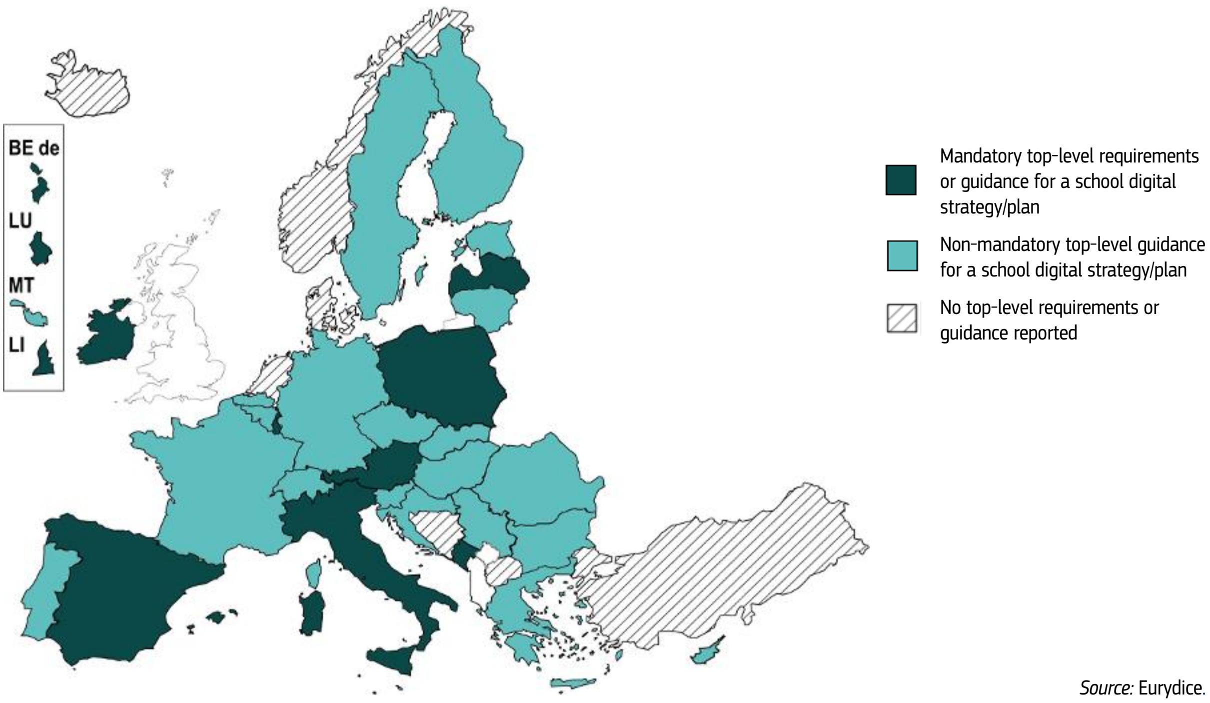
3.1. School-level digital planning

Beyond infrastructure and connectivity, many education systems now seek to strengthen schools' capacity to plan and manage digital transformation. Research suggests that successful digital transformation depends not only on access to devices but also on institutional capacity (Boeskens and Meyer, 2025). School-level planning is a key link between national strategies and everyday classroom practice. Schools may be required – or encouraged – to adopt a dedicated digital strategy or to integrate digital priorities into their broader development plans. The Digital Education Action Plan (2021–2027) (European Commission, 2020b) highlights the importance of whole-school approaches in the development of effective digital education ecosystems. From this perspective, school-level digital planning can be considered as a central mechanism through which system-level strategies are translated into concrete organisational practices and pedagogical priorities within schools. Most education systems provide some form of guidance, but the degree of prescription varies considerably.

3.1.1. Top-level requirements or guidance for school digital plans

Top-level authorities in most education systems promote school-level digital planning, either as a legal requirement or through non-binding guidance. Figure 3.1 shows that 10 education systems require all schools to have a digital strategy or plan, while 21 recommend it. Seven systems report no specific top-level requirement or recommendation. This variation reflects broader differences in governance traditions, ranging from systems that emphasise binding frameworks and coordinated implementation to those relying more strongly on school autonomy supported by guidance and professional support.

Figure 3.1: Top-level requirements or guidance for school digital plans, ISCED 24, 2024/2025



Source: Eurydice.

In systems with mandatory school digital plans, requirements are usually anchored in legislation, school quality frameworks or formal planning cycles. In the German-speaking Community of Belgium, schools develop their plans in accordance with the framework-based information and media literacy guidelines (*IMK-Leitfaden*) ([129]) aligned with the community's Digital action plan for education. In Ireland, every school is required to prepare a digital learning plan using the national platform DLPlanning.ie (see country example). Spain's Organic Law on Education ([130]) integrates digital competences and planning into school governance structures. Meanwhile, in Italy, schools are required to integrate digital priorities into existing planning documents guiding the digital transition. Within the three-year school educational plan (*Piano Triennale per l'Offerta formativa*) ([131]), each school must include a section on the planned actions concerning its digital education policy. *Piano scuola 4.0* ([132]) is an orientation document produced with the aim of guiding schools into the digital transition, powered and financed by National Recovery and Resilience Plan investments. Across these systems, mandatory planning frameworks typically combine strategic orientation with practical support mechanisms designed to guide schools in defining priorities, allocating resources and monitoring progress in digital transformation.

Latvia, Luxembourg, Austria and Poland embed digital planning within broader school development or quality assurance procedures. For example, in Poland, schools are required to integrate digital priorities into their development planning processes, guided by national education policy priorities and the policy on the digital transformation of education adopted in 2024 ([133]). In Liechtenstein and Montenegro, national frameworks encourage schools to use self-reflection tools on digital competences such as Self-reflection on Effective Learning by Fostering the Use of Innovative Educational Technologies (SELFIE) for Schools) to integrate digital objectives into school development plans. Across these systems, mandatory frameworks usually provide templates, training and digital maturity tools. They typically cover infrastructure, pedagogy and safe technology use, but the level of detail and the strength of monitoring vary depending on how closely plans are linked to quality assurance processes, inspection frameworks and funding mechanisms.

Digital planning in schools in Ireland

In **Ireland**, every school is required to draw up a digital learning plan through the national online platform DLPlanning.ie. This obligation is part of the digital strategy for schools to 2027 and aims to ensure that all schools engage in structured self-evaluation and planning for digital learning. The digital learning framework ([134]) offers step-by-step guidance, while the Professional Development Service for Teachers provides training and support. Each plan sets out the school's current digital capacity, areas for improvement and measurable objectives linked to teaching, learning and assessment. Plans are updated as part of regular school self-evaluation cycles, so that digital transformation is part of continuous quality improvement rather than a one-off project.

As shown in Figure 3.1, in 21 systems, school digital planning is encouraged but not compulsory. Often, digital objectives are integrated into broader school development processes. In the French and Flemish Communities of Belgium and in France, schools are guided to include digitalisation objectives in their overall policy plans, supported by circulars, professional development and diagnostic tools. Bulgaria's Strategic framework for the development of education, training and learning in the Republic of Bulgaria 2021–2030 provides a planning framework under the priority area 'Educational innovations, digital transformation and sustainable development' ([135]), while Estonian schools align their plans with national competence models and use the Digipeegel (Digital Mirror) maturity tool. Greece and Hungary link digital planning to school self-evaluation and quality assurance, leaving room for local adaptation. In these systems, top-level authorities typically emphasise capacity building and professional guidance rather than formal compliance mechanisms, encouraging schools to adapt digital strategies to their specific contexts.

In decentralised systems such as Germany, Finland, Sweden and Switzerland, responsibility lies mainly with regional or local authorities. German schools are expected to develop comprehensive concepts for digitally supported teaching and learning in line with the Standing Conference of the Ministers of

129 German-speaking Community of Belgium, Framework-oriented guidelines to building information and media literacy in primary and secondary education (*IMK-Leitfaden*).

130 Spain, Organic Law 2/2006 on Education, amended by Spanish Law 3/2020.

131 Italy, Ministry of Education, Note No 17832 of 16 October 2018 on the 'three-year plan of the learning offer (PTOF) 2019–2022 and social reporting'.

132 Italy, *Piano scuola 4.0* (School plan 4.0).

133 Poland, Digital transformation policy for education.

134 Ireland, Digital learning framework and planning resources for post-primary schools.

135 Bulgaria, Strategic framework for the development of education, training and learning in the Republic of Bulgaria 2021–2030.

Education and Cultural Affairs strategy on teaching and learning in the digital world ([136]). In Sweden, the Swedish National Agency for Education supports school organisers and school leaders in managing and implementing change within the national curriculum framework, including digitalisation processes. In Switzerland (see country example), cantons play a central role in promoting strategic digital planning as part of school development.

Locally driven digital planning in Switzerland

In **Switzerland**, there is no binding federal requirement applicable to all cantons. Instead, cantonal and municipal authorities encourage strategic planning as part of school development processes. The top-level Digital Switzerland strategy ([137]) sets broad objectives, while cantons adapt these to local conditions and often invite schools to develop their own digital plans. The curricula developed for the different language regions (*Lehrplan 21*, *Plan d'études romand*, *Piano di studio*) ([138]) integrate digital competences across subjects, which indirectly encourages schools to reflect on their digitalisation strategies. Cantonal initiatives complement this with professional development programmes and self-assessment tools, supporting schools that wish to formalise their planning.

In another group of systems, school digital planning is promoted mainly through EU-funded or national programmes (Czechia, Croatia, Cyprus, Lithuania, Malta, Portugal, Romania, Slovenia, Slovakia and Serbia). Czechia and Cyprus provide national guidance and resources through projects and regional initiatives. Croatia's strategic framework for the digital maturation of schools and the school system (2030) provides the basis for school-level reflection ([139]). In Lithuania, legislation and methodological resources encourage schools to include digitalisation objectives in their plans ([140]). Malta's centrally designed continuing professional development and monitoring tools, including the internal review handbook, support schools in integrating digital priorities ([141]). Portugal and Slovenia combine SELFIE-based self-evaluation with school action plans for digital development, while Romania, Slovakia and Serbia link school planning to quality assurance, national strategies and EU-funded programmes. Across these systems, approaches balance school autonomy with structured national or regional support.

The International Computer and Information Literacy Study (ICILS) 2023 helps to show how school digital planning requirements and guidance are reflected in practice. In the ICILS 2023, the term 'ICT plan or vision' is used to refer to school-level planning for the use of digital technologies; in this section, this concept is discussed more broadly as 'school digital planning'. The ICILS data therefore provide a complementary perspective, offering insight into how such planning arrangements are perceived and implemented at the school level.

Figure 3.2 presents the distributions of students across schools that report having an ICT vision/plan perceived as effective, having a vision/plan perceived as ineffective and having no ICT vision/plan at all. Across participating education systems, most students attend schools that report having an ICT vision or plan; in the majority of systems, principals consider these plans to contribute positively to teaching and learning. The median share of students attending schools where ICT plans are perceived as supporting the effective use of digital technologies is around 60 %, while approximately one third of students attend schools without such a plan.

In systems where school digital planning is subject to mandatory requirements – Spain, Austria, Italy, Latvia and Luxembourg – comparatively large proportions of students attend schools where principals report positive effects of ICT planning. In each of these systems, around 60 % or more of students are enrolled in schools where ICT plans are perceived as supporting teaching and learning. This pattern suggests that formal requirements for ICT planning may be associated with higher levels of uptake and perceived usefulness at the school level.

In systems relying primarily on non-binding guidance, the picture is more mixed. In several of these systems, the majority of students attend schools where ICT planning is reported as effective, as seen, for example, in Portugal, Cyprus, Serbia, Romania, Slovakia and Greece. In others, however, a substantial share of students attend schools without an ICT vision/plan or schools where plans are not perceived as contributing meaningfully to teaching and learning. This is particularly visible in Hungary and France,

136 Germany, Standing Conference of the Ministers of Education and Cultural Affairs, Strategy on teaching and learning in the digital world.

137 Switzerland, Digital Switzerland strategy.

138 Switzerland, *Lehrplan 21* (Curriculum 21) project, *Plan d'études romand* (French-speaking Swiss curriculum framework) and *Piano di studio* (Study plan).

139 Croatia, Strategic framework for the digital maturation of schools and the school system in the Republic of Croatia (2030).

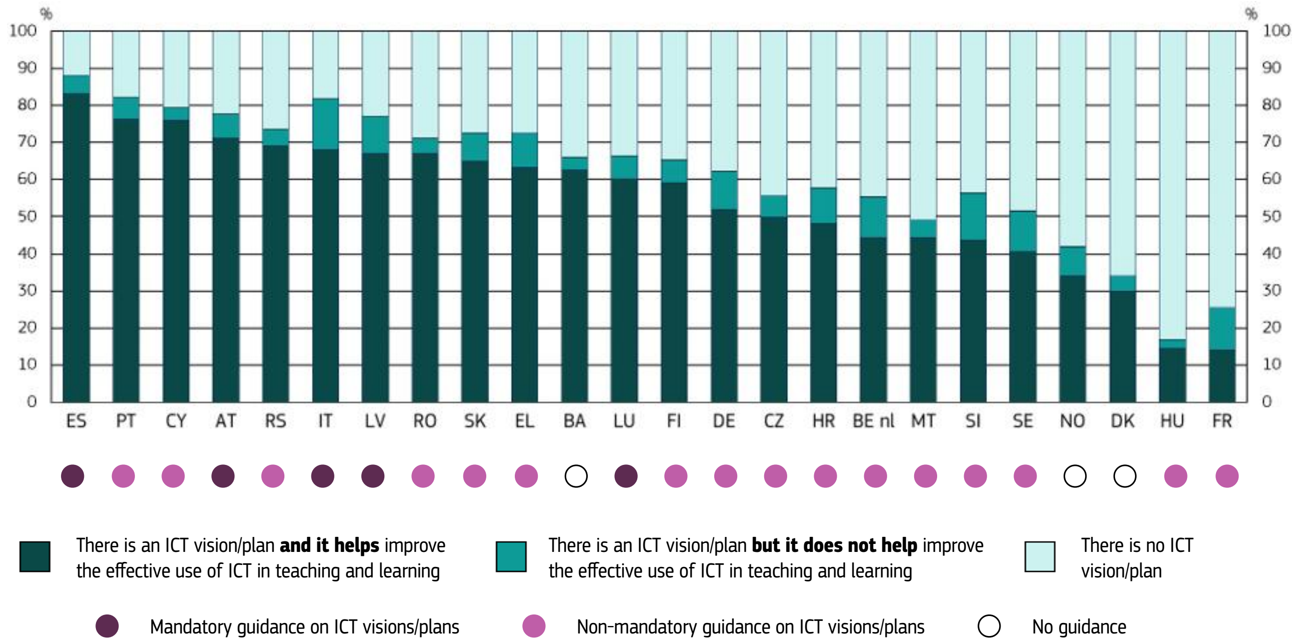
140 Lithuania, Law on Education of the Republic of Lithuania, No I-1489, adopted on 25 June 1991 (consolidated version valid from 1 May 2026 to 31 August 2026). Amended version effective from 1 July 2011 under Law No XI-1281 of 17 March 2011.

141 Malta, Handbook on the Internal Review Process for Schools.

where relatively large proportions of students attend schools without any ICT vision/plan. In two education systems reporting no specific top-level guidance – Denmark and Norway – a higher share of students attend schools without an ICT vision or plan, and fewer principals report that existing plans contribute to improving teaching and learning. In both systems, more than half of students are enrolled in schools without an ICT vision/plan.

Across all policy categories, a small but consistent share of students attend schools that report having an ICT vision/plan that does not help improve the effective use of digital technologies. This finding suggests that the presence of a plan alone does not necessarily ensure effective implementation. While the data do not allow causal conclusions to be drawn, they indicate an association between the existence of system-level requirements or guidance and both the uptake and the perceived effectiveness of school ICT visions/plans.

Figure 3.2: Existence and effectiveness of school ICT visions/plans (%), 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are presented in descending order based on the percentage of students attending schools where principals reported that the school's ICT vision/plan helps improve the effective use of ICT in teaching and learning. The figure is based on data from the ICILS 2023 principal questionnaire and draws on question Q13 ('Does your school have a clear vision/plan for using ICT to support teaching and learning?'), corresponding to variable IP3G13.

Percentages represent the shares of students in schools whose principals reported that the school has no ICT vision/plan, has an ICT vision/plan that helps improve the effective use of ICT and has an ICT vision/plan that does not help improve the effective use of ICT. Results are weighted using student sampling weights (TOTWGTS), so that estimates reflect the student population rather than the number of schools. Median values across participating education systems are approximately 34 % for students attending schools with no ICT vision/plan, 60 % for those attending schools where the ICT plan is perceived as helping to improve the effective use of ICT and 6 % for those attending schools where an ICT plan exists but is not perceived as effective. Exact percentages and standard errors are provided in the Statistical tables.

Country-specific note

Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

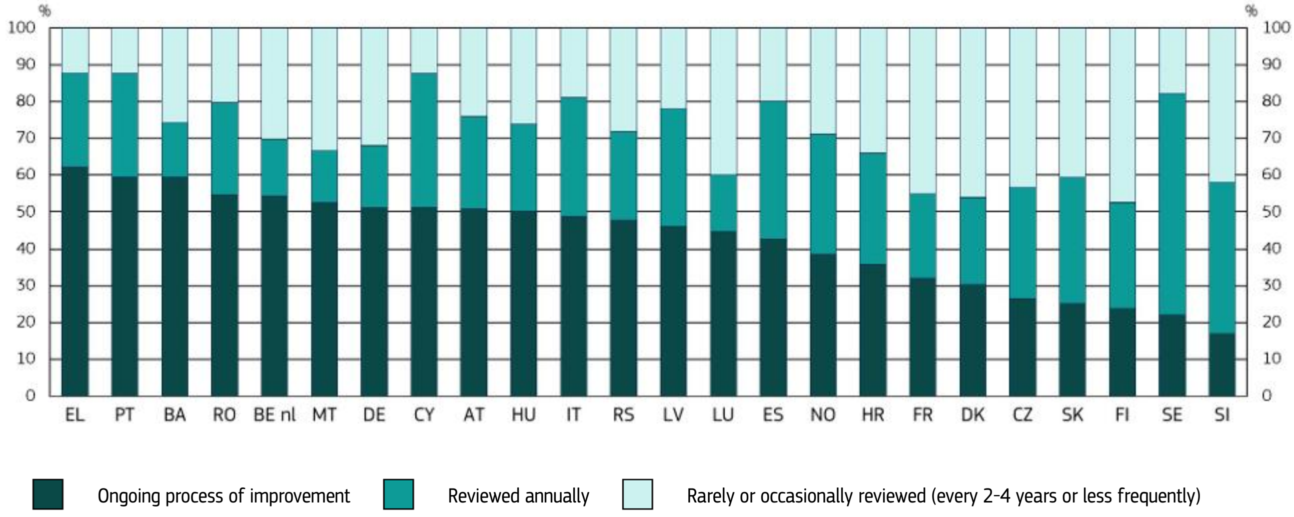
Figure 3.3 examines how frequently schools review and update their ICT visions/plans, as reported by school principals in the ICILS 2023. The figure provides insight into whether ICT planning is treated as a continuous process of improvement, follows a regular review cycle or is revised only infrequently, thereby highlighting differences in how systematically digital planning is embedded in school practice across education systems. Across participating education systems, the most frequently reported pattern is that ICT planning is treated as an ongoing process of improvement. The median share of students attending schools where ICT plans are reviewed on a continuous basis is around 47 %, indicating that, in many systems, digital planning is integrated into ongoing school development processes rather than revised only periodically.

In several education systems, more than half of students attend schools reporting the continuous review of ICT plans. This pattern is most evident in Greece and Portugal, where around 60 % of students are enrolled in schools reporting ongoing review, and also in Romania, the Flemish Community of Belgium, Malta, Germany, Cyprus and Austria, where the shares exceed 50 %. In these systems, ICT planning appears to be relatively well embedded in routine school improvement processes. Bosnia and Herzegovina likewise reports a high share of ongoing review; however, this finding should be interpreted in light of the relatively low overall prevalence of ICT plans in the system, suggesting that continuity applies primarily in the schools where these exist rather than across the system as a whole.

In a second group of education systems, ICT plans are more commonly reviewed on an annual basis. This pattern is particularly pronounced in Sweden, where around 60 % of students attend schools reporting yearly reviews. A relatively high share is also reported in Slovenia (around 40 %), followed by Spain, Cyprus and Slovakia, where roughly one third of students attend schools reporting annual reviews. At the other end of the spectrum, a sizeable share of students attends schools where ICT plans are reviewed only rarely or occasionally (every four years or less). This pattern is most evident in Finland, Denmark and France, where more than 40 % of students are enrolled in schools reporting infrequent reviews. In such systems, digital planning may be less systematically integrated into regular school development processes.

Overall, the findings indicate marked differences between education systems in how ICT plans are monitored and updated. While some systems treat ICT planning as a continuous school-level process integrated into ongoing development activities, others rely more heavily on periodic review cycles or infrequent updates.

Figure 3.3: Frequency of review of school ICT plans (%), 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are presented in descending order based on the percentage of students attending schools where the school's ICT plan is reported as an ongoing process of improvement. The figure is based on data from the ICILS 2023 principal questionnaire and draws on question Q14 ('How often is the school's vision/plan for using ICT to support teaching and learning reviewed and revised?'), corresponding to variable IP3G14.

Percentages represent the shares of students attending schools where principals reported that the ICT plan is reviewed rarely or occasionally (once every four years or less), annually and as an established ongoing process of improvement. The response categories 'once every five years or less frequently' and 'once every two to four years' were combined into a single category labelled 'rarely or occasionally reviewed (every 2–4 years or less frequently). Results are weighted using student sampling weights (TOTWGTS), so that estimates reflect the student population rather than the number of schools. Standard errors were calculated using the square root of the sum of squared standard errors, in line with ICILS reporting practice. Median values across participating education systems are approximately 28.5 % for students attending schools where ICT plans are reviewed rarely or occasionally, 26.8 % for those attending schools where plans are reviewed annually, and 47.0 % for those attending schools where ICT planning is reported as an ongoing process of improvement. Exact percentages and standard errors are provided in the Statistical tables.

Country-specific note

Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

Taken together, Figures 3.2 and 3.3 indicate that school ICT planning is present in many education systems, but not to the same extent. While in most systems the majority of students attend schools that report having an ICT plan, in several systems a substantial share of students are enrolled in schools without one. Principals' perceptions of whether ICT plans improve teaching and learning also vary considerably, as does the frequency with which these plans are reviewed.

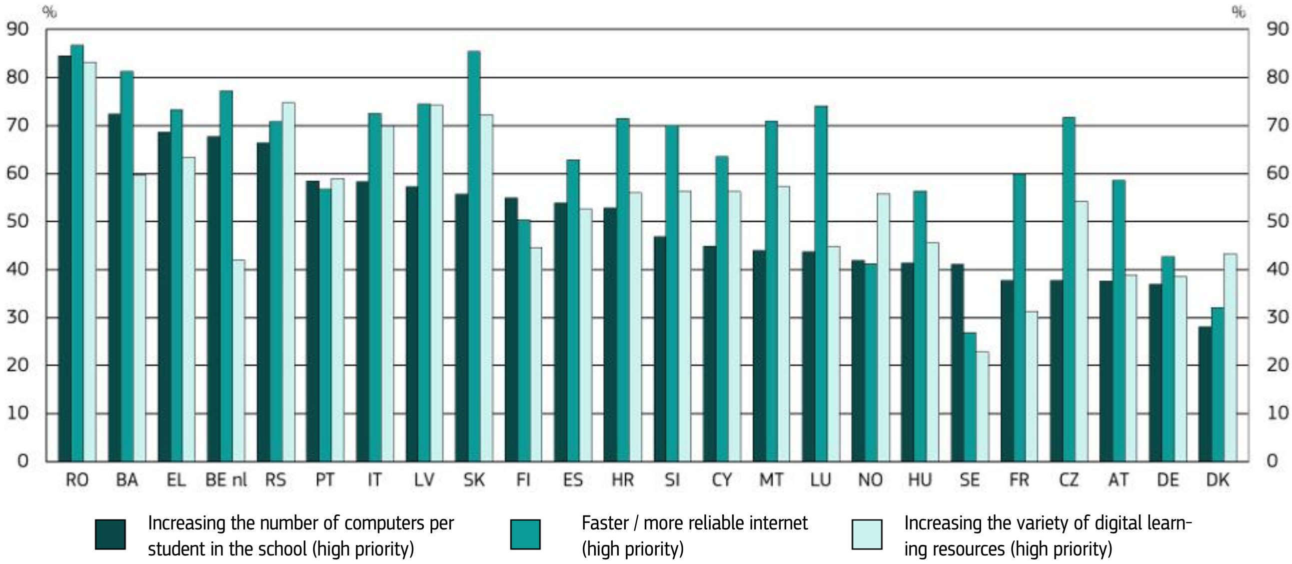
Overall, ICILS data suggest that education systems reporting top-level requirements or guidance often show higher uptake and the more systematic review of school ICT plans. However, patterns vary considerably between systems with mandatory requirements, those relying on non-binding guidance and those without specific provisions, and the data do not allow causal conclusions to be drawn.

In addition to examining the existence and review of school ICT plans, the ICILS 2023 also provides insight into the priorities that schools set within these plans. Figure 3.4 presents principals' views on the priority given to selected ways of facilitating the use of ICT in teaching and learning, highlighting differences in emphasis between connectivity, hardware availability and digital learning resources.

Across education systems, schools are more likely to assign high priority to improving the speed and reliability of internet connectivity than to increasing the number of computers per student or expanding the variety of digital learning resources. The median share of students attending schools where faster or more reliable internet is reported as a high priority is around 70 %, compared with around half for increasing the number of computers per student and just over half for increasing digital learning resources.

In some systems, including Romania and Greece, principals report high priority across all three areas, suggesting a broad approach to ICT development within school planning. In several other systems, such as Denmark and Sweden, comparatively smaller shares of students attend schools reporting high priority across these areas, which may be related to more established levels of ICT infrastructure and provision. By contrast, in systems such as Serbia and Norway, principals place comparatively greater emphasis on expanding the variety of digital learning resources, while in Latvia similarly high levels of priority are reported for both digital learning resources and infrastructure-related measures. These patterns indicate growing attention to the pedagogical use of digital technologies alongside infrastructure provision.

Figure 3.4: Priorities in school-level ICT planning (%), 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

Education systems are presented based on the percentage of students attending schools where principals report that specific areas are given high priority in facilitating the use of ICT in teaching and learning. The data are drawn from the ICILS 2023 principal questionnaire (question Q20) and cover three areas: increasing the number of computers per student (IP3G20A), improving the speed and reliability of internet connectivity (IP3G20B) and increasing the variety of digital learning resources available for teaching and learning (IP3G20C).

Percentages indicate the shares of students in schools where principals reported that each area is given high priority. Results are weighted using student sampling weights (TOTWGTS), so that estimates reflect the student population rather than the number of schools. Median values across participating education systems are approximately 50 % (IP3G20A), 70 % (IP3G20B), and 56 % (IP3G20C). For exact percentages and standard errors, see the Statistical tables.

Country-specific note

Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

Overall, the ICILS 2023 results suggest that, while improving connectivity remains the most widely reported priority across education systems, many schools also assign considerable importance to digital learning resources and their integration into teaching and learning. These findings provide an important backdrop for the following analysis, which examines how top-level authorities guide schools in using digital technologies across different policy domains. The presence of a school digital plan does not necessarily mean that all dimensions of digital education are comprehensively addressed. Section 3.1.2 therefore turns to the specific areas in which top-level authorities establish requirements for or provide guidance on schools' use of digital technologies.

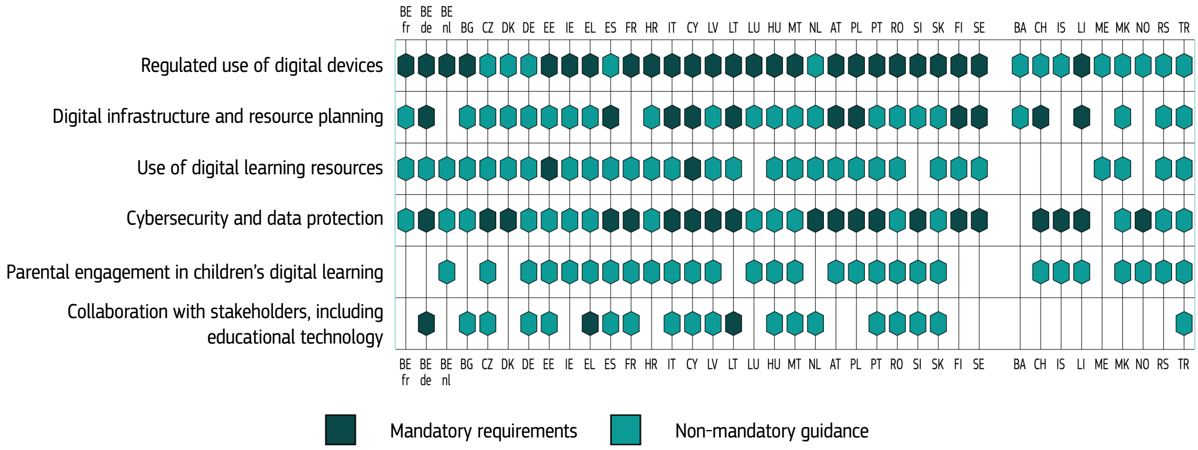
3.1.2. Top-level requirements or guidance for school-level use of digital technologies

Strategic planning provides a framework, but specific requirements and recommendations determine how digital technologies are expected to be used in teaching, school management and collaboration. Research emphasises that a whole-school approach is needed to embed digitalisation across organisational processes and school culture (Kampylis, Punie and Devine, 2015; Boeskens and Meyer, 2025). By setting expectations for classroom practice, online safety, and cooperation with families and external partners, top-level guidance seeks to ensure that digitalisation supports quality and equity, rather than being left entirely to local discretion (UNESCO, 2018; OECD, 2023b). Comparative evidence identifies several policy areas as central to effective digital transformation at the school level. Clear rules on digital device use can help reduce distraction and support students' wellbeing (Livingstone, Mascheroni and Staksrud, 2018; OECD, 2021), while guidance on infrastructure and resource planning helps address variations in local capacity and expertise (OECD, 2023b). The effective use of digital learning resources is also linked to top-level requirements and guidance and to teacher professional learning. At the same time, growing attention is given to cybersecurity, data protection, responsible digital behaviour, and cooperation with parents and external partners (OECD, 2021; Boeskens and Meyer, 2025).

Figure 3.5 shows that top-level provisions on school-level digital governance – including both mandatory requirements and non-mandatory guidance – are the most developed in areas associated with clearly defined risks, legal obligations and operational standards. Regulated use of digital devices is addressed in all 38 education systems, with 25 systems establishing mandatory requirements. Digital infrastructure and resource planning is also widespread, reported by 33 systems, although binding requirements apply in a smaller group of 11 systems, with most relying on non-mandatory guidance or planning frameworks. Cybersecurity and data protection also stands out as a strongly regulated domain. These aspects are addressed in 36 education systems, and in 20 of them schools are subject to mandatory requirements, reflecting the legal and safety-/compliance-driven nature of this policy area. Other aspects of school-level digital governance are covered less consistently and are more often addressed through non-mandatory guidance. The use of digital learning resources is addressed in 31 systems, but only two apply mandatory rules, indicating a strong preference for professional autonomy in pedagogical choices. Parental engagement in children's digital learning appears in 28 systems, while collaboration with external stakeholders, such as universities, businesses and civil-society organisations, is reported in 20 systems, with mandatory requirements remaining rare.

Overall, Figure 3.5 indicates that top-level provisions are most systematic in domains associated with clearly defined risks, standards and regulatory responsibilities, such as device use, infrastructure and cybersecurity. They are less developed in areas requiring longer-term cultural change and shared responsibility, notably parental engagement and partnership work. This pattern echoes earlier Eurydice and OECD findings, which show that, while digital education strategies commonly address technical infrastructure, platforms and regulatory safeguards, the organisational and social dimensions of digitalisation – including school culture, stakeholder engagement and home–school cooperation – are less consistently embedded in policy and practice (European Commission / EACEA / Eurydice, 2019; Boeskens and Meyer, 2025). The following subsections examine these policy domains in turn, focusing on how education systems combine binding requirements, non-binding guidance and school-level discretion in shaping the use of digital technologies.

Figure 3.5: Top-level policy requirements or guidance for school-level use of digital technologies, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory note

The aspect 'regulated use of digital devices' includes top-level policies governing the use of mobile phones and other personal digital devices in schools. The figure covers education systems that had top-level requirements or recommendations on the use of digital devices in force during the 2024/2025 reference year and also systems that adopted legal acts or official policy documents during 2024/2025 establishing such rules, even where their application began in the 2025/2026 school year.

Country-specific notes

Sweden: Following the reference period of the report, the Swedish government presented a proposal introducing a nationwide ban on mobile phones in compulsory schools and after-school centres. The proposal would require pupils to hand in their mobile phones for the entire school day and is expected to enter into force from the autumn term of 2026 if adopted by parliament.

Iceland: Following the reference period of the report, the Icelandic parliament (*Alþingi*) adopted legislation on 5 March 2026 introducing mobile-phone-free schools and mobile-phone-free after-school centres. ([142]).

3.1.2.1. Regulated use of digital devices

Across Europe, schools are expected to manage digital device use in ways that balance the pedagogical benefits of digital technologies with students' wellbeing and concentration. International policy reviews underline the importance of clear and consistent rules governing device use in schools (Burns and Gottschalk, 2020; Goodyear *et al.*, 2025; Nett, 2025). At the EU level, the Digital Education Action Plan (2021–2027) (European Commission, 2020b) similarly stresses the need to couple expanded access to digital technologies with safe, ethical and responsible use.

Within this context, concern has emerged about the impact of non-educational digital device use on students' attention, wellbeing and learning environments, particularly in light of persistent challenges in terms of basic skills. Survey evidence from the European School Education Platform points to increasing public concern about classroom distraction linked to mobile phone use, while the *Education and Training Monitor 2025* highlights a widening range of national policy responses, including restrictions and bans on smartphones in schools (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2025a; European School Education Platform, 2025). At the same time, EU and OECD analyses emphasise that the effects of such measures depend largely on how they are implemented and embedded in school culture and pedagogy, and on their alignment with broader efforts to develop students' digital competences and support the meaningful pedagogical use of digital technologies (Forsström *et al.*, 2025; European Commission: Directorate-General for Education, Youth, Sport and Culture *et al.*, 2026).

As shown in Figure 3.5, all 38 education systems report top-level requirements or guidance governing the use of digital devices in schools. Overall, 25 education systems have established mandatory requirements for regulating digital device use, while the remaining 13 rely on non-binding guidance or largely delegate responsibility to schools or regional authorities.

142 Iceland, Icelandic Parliament (*Alþingi*), Act amending the Compulsory School Act concerning mobile-phone-free schools and after-school centres, adopted on 5 March 2026.

This distinction points to two broad policy approaches across Europe: systems based on mandatory requirements and those promoting school-level discretion supported by guidance. Even where provisions are non-binding, they are often accompanied by curated resources, methodological support or health-based recommendations aiming to foster coherent rule setting and more consistent practices across schools.

In systems with mandatory requirements, provisions are typically anchored in legislation, ministerial decrees, education acts, circulars or compulsory school quality frameworks. Schools are generally required to define and enforce local rules through their internal regulations, although the degree of prescription varies. Some systems introduce explicit prohibitions on mobile phones, while others establish binding frameworks that require schools to regulate device use locally. Three broad regulatory models can be identified.

A first group of systems combines explicit legal restrictions with broader initiatives promoting responsible digital use and digital wellbeing. The French Community of Belgium adopted a 2025 Decree (entering into force in 2025/2026) prohibiting the recreational use of mobile phones and other electronic communication devices in schools. Devices may be used only for educational purposes under the conditions defined in schools' internal regulations ([143]). In the Flemish Community of Belgium, Circular NO/2025/01 introduces a ban on smartphones and other smart devices in schools from the 2025/2026 school year. Schools are required to implement the restriction through their internal regulations, while practical arrangements remain the responsibility of individual schools. Similar developments can be observed in the German-speaking Community of Belgium, where rules are set out in official information and media literacy guidelines (*IMK-Leitfaden*) ([144]), complemented by a 2024 circular introducing a mobile phone ban in secondary schools from the 2025/2026 school year. Comparable approaches combining restrictions with wider digital wellbeing policies can also be observed in Italy and Luxembourg (see country examples).

A second group regulates device use through national legislation, while leaving detailed implementation to schools. In Bulgaria, under the Preschool and School Education Act, the use of mobile phones during class time has been restricted since 2016, except when they are used for educational purposes or in cases of medical need or emergencies ([145]). Schools are responsible for defining detailed procedures for storing and using devices. Similarly, in Greece, national regulations restrict the use of mobile phones during lessons, while allowing limited use under teacher supervision for educational purposes. These provisions are complemented by broader rules on the protection of students' personal data and digital safety ([146]). Other systems adopt comparable legislative approaches. France regulates mobile phone use through Article L511-5 of the Education Code (see country example). In Croatia, unauthorised use of mobile devices during educational activities is defined as unacceptable behaviour under the Ordinance on the Criteria for Imposing Educational Measures. Schools retain responsibility for defining specific rules through their internal regulations ([147]). In Malta, a circular issued in 2023 prohibits the use of mobile phones in state schools, with limited exceptions authorised by school heads, while other types of schools retain autonomy in defining their own policies ([148]).

Several systems have introduced more explicit restrictions while still allowing schools to determine practical arrangements. In Cyprus, mobile phones and other personal smart devices are prohibited throughout the school day, except where authorised for educational purposes or in other specific cases ([149]). Latvia prohibits mobile phone use in grades 1–6, except when used for teacher-authorised educational purposes, and leaves schools responsible for defining procedures for ICT use during programme implementation ([150]). In Lithuania, binding provisions are set out through national hygiene standards, which limit the use of mobile phones and similar devices in schools to educational purposes and under teacher permission ([151]).

143 French Community of Belgium, Decree of 13 March 2025 on the prohibition of the recreational use of mobile phones and any other electronic communications terminal equipment at school (*Moniteur belge*, 1 April 2025).

144 German-speaking Community of Belgium, Framework-oriented guidelines to building information and media literacy in primary and secondary education.

145 Bulgaria, Preschool and School Education Act.

146 Greece, Ministerial Decision 102791/ΓΔ4/10-09-2024 (*Government Gazette* of the National Printing House, issue B, No 5130).

147 Croatia, Ordinance on the Criteria for Imposing Educational Measures (*Narodne novine*, 94/2015 and 3/2017, Article 3, and 22/2026).

148 Malta, Ministry for Education, Sport, Youth, Research and Innovation, Letter circular on students' mobile phones in schools, ref. DES 07/2023.

149 Cyprus, Regulations on the operation of public secondary schools (amendment) (*Official Gazette of the Republic of Cyprus*, No 5905, 1 November 2024).

150 Latvia, Amendments to the Education Law, entered into force on 7 November 2024.

151 Lithuania, Lithuanian Hygiene Standard HN 21:2017 'School implementing general education programmes: General health safety requirements', paragraph 28.

Recent reforms in Hungary, Portugal, Romania and Slovenia follow a similar pattern, introducing national restrictions while maintaining school-level responsibility for implementation. Hungary introduced a national regulation in September 2024 restricting the use of smartphones and other telecommunication-capable smart devices during school hours ([152]). In Portugal, Decree-Law No 95/2025 introduced mandatory restrictions on the use of mobile phones and other internet-enabled devices, applicable from the 2025/2026 school year (see country example). In Romania, Article 106(4) of the Pre-university Education Law (Law No 198/2023) prohibits the use of mobile phones during classes in preschool, primary and lower-secondary education, except for educational purposes authorised by the teacher. Schools may extend these restrictions through their internal regulations ([153]). Similarly, Slovenia amended its Primary School Act in 2025, requiring pupils to store mobile phones upon arrival at school and allowing use only with teacher authorisation ([154]). Taken together, these systems demonstrate how legislation can establish baseline restrictions while leaving operational implementation largely to school-level regulations.

A third model requires schools themselves to establish rules within a binding national framework. In these systems, legislation does not always prescribe specific restrictions but obliges schools to define and enforce their own policies. Estonia, Ireland, Austria, Poland, Slovakia and Liechtenstein follow this approach. In Estonia, a regulation adopted in July 2025 establishes national requirements for schools to define principles governing the use of personal smart devices ([155]). While schools remain responsible for setting detailed rules in their internal regulations, the regulation introduces mandatory baseline requirements and is complemented by national guidelines supporting schools in developing appropriate policies ([156]). Ireland follows a similar model. Circular 0045/2025 requires post-primary schools to adopt policies restricting students' use of and access to personal mobile phones during the school day. Schools determine the practical arrangements for implementing these rules ([157]). Austria regulates device use through a legally binding national framework that requires schools to incorporate specific rules into their internal regulations (see country example). In Poland, Article 99(4) of the Education Law obliges schools to define rules governing the use of mobile phones and other electronic devices in their internal statutes. While national legislation requires schools to regulate this issue, the specific restrictions are determined at the school level rather than through a uniform nationwide ban ([158]). Slovakia introduced the mandatory regulation of mobile phone use in schools through legislative amendments adopted in 2024, requiring age-differentiated rules to be defined at the school level ([159]). Liechtenstein sets detailed binding provisions on ICT security, data protection and device use through its guidelines on the use of ICT in schools.

Two systems – Finland and Sweden – regulate device use directly through national legislation without requiring additional school-level rule setting. In Finland, amendments to the Basic Education Act prohibit the use of mobile phones and other mobile devices during lessons unless explicitly authorised by the teacher (see country example). In Sweden, mobile phones and other electronic communication devices may be used during lessons only when they support learning or form part of special support arrangements, as set out in the Education Act.

Despite differences in the legal form of their provisions, these systems share a common feature: device use is addressed through binding national provisions that ensure accountability and a degree of consistency. However, the level of prescription varies considerably, ranging from explicit bans to frameworks requiring schools to define their own rules.

Mandatory regulation of digital device use

In **France**, Article L511-5 of the Education Code, introduced by Act No 2018-698 of 3 August 2018, prohibits the use of mobile phones and other electronic communication devices in pre-primary, primary and lower-secondary schools, except where authorised for educational purposes or under conditions

152 Hungary, Government Decree No 245/2024 (VIII.8.) on the range of prohibited and restricted objects in educational institutions, as well as on the detailed rules of procedure relating to the subjects, in force from 1 September 2024.

153 Romania, Pre-university Education Law (Law No 198/2023), Article 106(4).

154 Slovenia, Act amending the Basic School Act, published in the Official Gazette 15 July 2025.

155 Estonia, Regulation No 52 – requirements for the learning environment of a general education school with full-time study, the management of health risks and the reduction of risk factors in the study environment, and the organisation of teaching and education, adopted 7 July 2025.

156 Estonia, Guidelines establishing school-level agreements on the use of personal smart devices.

157 Ireland, Department of Education and Youth, Circular 0045/2025 on restricting the use of and access to personal mobile phones by students during the school day.

158 Poland, Act of 14 December 2016 – Education Law (*Journal of Laws* 2017, item 59, as amended, Article 99(4)).

159 Slovakia, Guidance on changes to legislation regarding the use of mobile phones and similar personal devices electronic communications in schools.

defined in school rules (160). The measure aims to reduce distractions and support students' concentration and wellbeing. It is complemented by national guidance promoting responsible and ethical technology use, including the Charter on Education for Digital Culture and Citizenship and resources available through the Éduscol portal (161).

In **Italy**, Ministerial Note No 5274 of July 2024 regulates the use of digital devices during school hours. It prohibits the use of mobile phones and other personal devices during lessons, establishes penalties for non-compliance and requires schools to include these rules in their internal regulations. The note also addresses the use of a digital school register, with the aim of promoting balanced digital practices in class and at home and strengthening communication with families (162).

In **Luxembourg**, the *sécher.digital* initiative introduces a unified framework for responsible smartphone use. Smartphones are banned in all basic schools, and secondary schools are required to adopt strategies ensuring physical separation between students and smartphones during lessons. A national mobile device management system supports the pedagogically sound use of digital tools, and is accompanied by guidance for schools, parents and students. The initiative also promotes a healthy screen–life balance and responsible use of AI in education.

In **Austria**, the use of mobile phones is regulated through a nationwide, legally binding framework. The 2024 School Regulations Ordinance (*Schulordnung*) prohibits the use of mobile phones for pupils in school levels 1–8 during the school day, with limited exceptions for pedagogical purposes authorised by teachers and reflected in school rules (163). In addition, the ICT School Regulation Ordinance *(IKT-Schulverordnung*) (164) provides for technical child protection measures on school-issued digital devices distributed through the Digital learning initiative (165), with schools responsible for configuring safeguards designed to protect students from inappropriate online content when these devices are used for learning activities.

In **Portugal**, Decree-Law No 95/2025, together with supplementary guidelines adopted in August 2025, introduced mandatory restrictions on the use of mobile phones and other internet-enabled devices in lower-secondary education, with application of the decree-law starting from the 2025/2026 school year (166). These measures build on earlier initiatives promoting responsible smartphone use and digital wellbeing and are supported by information materials and awareness campaigns coordinated by the Directorate-General for Education and SeguraNet Centre (167).

In **Finland**, amendments to the Basic Education Act entering into force on 1 August 2025 prohibit the use of mobile phones and other mobile devices during lessons unless explicitly authorised by the teacher. The reform aims to ensure a calm and focused learning environment, while allowing the use of mobile devices for educational purposes under pedagogical supervision. Schools remain responsible for ensuring that digital devices are meaningfully integrated into teaching and learning as part of the learning environment (168).

By contrast, 13 education systems rely primarily on non-binding guidance or decentralised approaches to address the use of digital devices in schools. Rather than prescribing uniform legal restrictions, these systems emphasise pedagogical guidance, digital citizenship and student wellbeing. Top-level authorities typically encourage schools to address device use through strategic planning, curricula, awareness initiatives or health-based recommendations, while leaving detailed rules and enforcement arrangements to be decided at the school level. Within this broad category, several sub-patterns can be distinguished.

In several systems, guidance is closely linked to curriculum frameworks, digital citizenship education or health-based recommendations. In these systems, the focus is less on formal restrictions and more on promoting responsible and balanced technology use. In Czechia, the Catalogue of cyber prevention promotes safe and ethical online behaviour (see country example). Denmark similarly provides health-oriented guidance on children's and young people's screen use. Across these systems, device regulation is addressed mainly through wellbeing, digital citizenship and responsible technology practices.

A second approach is observed in systems with strongly decentralised governance arrangements, where responsibility is largely delegated to regional authorities or individual schools. In Germany, the private use of mobile phones during lessons is generally prohibited, but federal states (*Länder*) determine how this is implemented and link it to media education curricula and teacher training. In Spain, recommendations from the State School

160 France, Article L511-5 of the Education Code, introduced by Act No 2018-698 of 3 August 2018.

161 France, Charter on Education for Digital Culture and Citizenship.

162 Italy, Ministry of Education and Merit, Ministerial Note No 107190 of 19 December 2022 and Ministerial Note No 5274 of 11 July 2024.

163 Austria, 2024 School Regulations Ordinance (Ordinance of the Federal Minister for Education, Science and Research governing conduct in schools) (*Bundesgesezblatt*, Part II, No 126/2024).

164 Austria, Ordinance of the Federal Minister for Education, Science and Research on ICT-supported teaching and data security measures in schools (ICT Schools Ordinance, *Bundesgesezblatt*, Part II No 382/2021.

165 Austria, Digital learning initiative.

166 Portugal, Recommendations to schools for the implementation of rules and recommendations on the use of smartphones in school spaces, (pp 2-14).

167 Portugal, SeguraNet (National Awareness Centre coordinated by the Ministry of Education, Science and Innovation (MECI), promoting safe and responsible digital use in schools).

168 Finland, National Agency for Education (Opetushallitus), Rules on the use of mobile phones and other mobile devices in schools, referring to amendments to the Basic Education Act entering into force on 1 August 2025.

Council and several autonomous communities restrict mobile phone use to educational purposes, with schools incorporating these provisions into their educational projects. In the Netherlands, a nationwide agreement restricts mobile phone use during lessons, combining national coordination with school-level autonomy (see country example).

In Montenegro, regulation is largely delegated to schools. Following a 2025 initiative of the Ministry of Education, Science and Innovation, school boards in primary and secondary schools adopted decisions prohibiting mobile phone use during lessons, except when authorised by teachers for educational purposes ([169]). Similarly, in North Macedonia, top-level guidance addresses digital safety and online learning more broadly, while decisions on device use are left to schools or local authorities. Bosnia and Herzegovina, Switzerland, Norway, Serbia and Türkiye also issue guidance on privacy, wellbeing and screen use, but leave detailed arrangements to local actors.

Recommended approaches to regulating digital device use

In **Czechia**, non-binding national guidance supports the management of digital device use through a strong focus on digital wellbeing and online safety. The Catalogue of cyber prevention, developed by the Ministry of Education, Youth and Sports and the National Pedagogical Institute, provides schools with programmes and teaching materials promoting safe and responsible online behaviour, while leaving decisions on device use rules to be made at the school level ([170]).

In the **Netherlands**, a nationwide agreement introduced in 2024 restricts the use of mobile phones and other personal devices during lessons in primary, secondary and special education, with application extended to primary and special education from the 2024/2025 school year ([171]). Although not based on formal legislation, this approach is coordinated at the national level and supported by guidance and tools developed by Kennisnet ([172]). Schools define the specific arrangements in consultation with teachers, students and parents.

Overall, the analysis highlights considerable variation in how education systems address the use of digital devices at the school level. While some systems rely on binding legal frameworks to structure practice, others emphasise non-binding guidance, decentralised decision-making or school autonomy. Across these approaches, top-level policies most often focus on clarifying expectations around responsible use, attention and wellbeing, while leaving room for schools to adapt rules to their local context. These differences reflect broader governance traditions and policy priorities across Europe and demonstrate the complexity of addressing digital device use within wider processes of schools' digital transformation. Taken together, they suggest that such measures are often embedded within broader strategies on digital wellbeing, safe technology use and the pedagogical integration of digital tools. They also underline the importance of examining not only whether rules exist, but how they are anchored in governance frameworks and translated into school-level practice.

3.1.2.2. Infrastructure and resource planning

Strategic planning for digital infrastructure has become an important component of school digital policy, reflecting both EU-level priorities and national digital education strategies. The Commission's 2023 Staff Working Document accompanying the proposed Council Recommendation on key enabling factors emphasises that sustainable digital transformation requires coherent planning linked to quality assurance, and not simply the provision of equipment (European Commission, 2023). While Chapter 1 examined how education systems govern access to infrastructure and services, this section focuses on whether schools are expected to plan infrastructure and resources as part of school development and quality processes.

According to Figure 3.5, 33 education systems report top-level requirements or guidance for schools to plan their digital infrastructure and resources. Among them, 11 systems report mandatory requirements (the German-speaking Community of Belgium, Spain, Italy, Cyprus, Lithuania, Austria, Poland, Finland, Sweden, Switzerland and Liechtenstein), while 22 systems report non-binding guidance.

In systems with mandatory frameworks, infrastructure planning is typically embedded in school quality or development processes. Italian schools plan their resource provision using the Three-year school educational plan (*piano triennale per l'offerta formativa*). Cyprus combines centralised procurement with structured annual school requests and inventory procedures. In Austria, planning is embedded in the national school quality assurance framework (*Qualitätsmanagementsystem für Schulen*) (see country example). Spain requires schools' digital plans to include an analysis of available connectivity and equipment and their level of fit with the schools' pedagogical frameworks. Lithuania (see country example), Switzerland and Liechtenstein combine national standards and budget procedures with

169 Montenegro, Vijesti, 'Phone use banned during classes in all schools'.

170 Czechia, National Pedagogical Institute, Catalogue of cyber prevention.

171 Netherlands, Ministry of Education, Culture and Science, Mobile devices in the classroom.

172 Netherlands, Kennisnet, School policy on smartphones (national guidance to help schools develop internal smartphone use policies).

planning obligations, while in Finland and Sweden municipalities are responsible for infrastructure planning supported by binding curricular and/or regulatory requirements in specific domains (e.g. assessment-related digital infrastructure).

Mandatory requirements for digital infrastructure planning

In **Austria**, schools are required to address digital infrastructure and resource planning as part of the national school quality assurance framework (*Qualitätsmanagementsystem für Schulen*). Schools regularly analyse their infrastructure needs and align investments with pedagogical objectives within a continuous development cycle, supported by regional school development consultants and monitored through self-evaluations and annual school reports. In practice, these planning processes also serve as a basis for accessing national funding for digital transformation ([173]).

In **Lithuania**, mandatory requirements for digital infrastructure and resources are defined through the Standard for educational provision in preschool, pre-primary and general education schools ([174]). This legally binding standard sets minimum requirements for educational facilities and resources, including digital equipment, which schools must ensure when organising education provision. The standard establishes a common baseline for school-level infrastructure planning, implemented through schools' organisational and funding arrangements.

Across the 22 systems relying on guidance, planning is often supported through templates, self-assessment tools and procurement guidance, combining school autonomy with structured support. Ireland's Digital learning planning framework provides templates and guidance (including procurement-related information) via DLPlanning.ie. Portugal encourages reflection on infrastructure through SELFIE-linked digital development planning. In Luxembourg, schools are supported regarding digital infrastructure and resource planning through national guidance and tools developed under the *sécher.digital* initiative and related government digital education frameworks. In Czechia, Malta and Slovenia, schools are supported through national frameworks, resource portals and diagnostic tools that guide investment decisions, while Denmark and the Netherlands prioritise local decision-making supported by national reference frameworks.

The reported approaches point to more strategic infrastructure planning linked to teaching priorities and organisational development, rather than purely technical decisions. Where planning is binding, it is more often aligned with funding mechanisms, provider responsibilities and/or quality assurance arrangements; where it is recommended, engagement tends to rely on capacity-building tools, guidance and voluntary uptake.

3.1.2.3. Use of digital learning resources

Building on the governance arrangements for digital software, platforms and services described in Chapter 1, this section focuses on the pedagogical use of digital learning resources. In line with European Commission guidance, the term 'digital learning resources' (see the Glossary) – used interchangeably in this report with the term 'digital education content' – refers to learning, teaching and assessment materials aiming to address pedagogical objectives and made available in digital formats through digital tools and platforms (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2025b).

Digital learning resources are distinct from but closely connected to the digital platforms and environments through which they are accessed and the pedagogical approaches they support. They encompass a wide range of materials, including digital textbooks, videos, simulations, serious educational games and interactive exercises. These resources are used within formal school education, both in physical classroom settings and in digital learning environments, for example through school platforms or learning management systems accessed via secure authentication systems.

While digital infrastructure and software provision establish the technical conditions for digital education (see Chapter 1), schools also require guidance on how such resources are selected, accessed, adapted and used in pedagogical practice. The scope of this guidance varies across education systems. Policy initiatives may address different aspects, including the provision of digital textbooks and supplementary materials, the promotion of open educational resources – defined as freely accessible and openly licensed materials that can be used, adapted and shared – and pedagogical guidance on their use in teaching, learning and assessment.

173 Austria, Digital learning initiative.

174 Lithuania, Standard for educational provision in preschool, pre-primary and general education schools (Annex 1).

Figure 3.5 shows that 31 education systems report top-level provisions related to the use of digital learning resources. Only two systems – Estonia and Cyprus – have established mandatory requirements (see country examples); in most systems, the pedagogical use and provision of such resources is guided through non-binding guidance and repositories.

Across education systems, three broad policy approaches can be observed: the centrally mandated provision of digital learning resources; national or regional repositories or platforms providing access to digital learning resources, often combined with guidance for schools; and decentralised arrangements where authorities primarily support access to platforms or open educational resources. These approaches pursue different objectives. Some frameworks focus on ensuring curriculum alignment and quality assurance, while others prioritise facilitating teachers' access to repositories or supporting the development and sharing of resources.

Mandatory approach to the use of digital learning resources

In **Estonia**, the Regulation on Educational Literature [175] defines binding technical and accessibility standards for all approved digital learning resources and digital educational materials, ensuring compatibility across devices and usability for learners with special educational needs.

In **Cyprus**, the Ministry of Education, Sport and Youth provides digital textbooks and supporting materials for all subjects through the schools.ac.cy portal. These materials are mandatory in state schools, ensuring alignment with the national curriculum and common quality standards. Central provision simplifies updates, version control and copyright management and is complemented by professional development help from the Cyprus Pedagogical Institute to support effective classroom use.

In most education systems, however, the use of digital learning resources is supported through guidance, repositories or open educational resource platforms rather than being mandated, allowing schools a degree of autonomy in selecting materials.

In the French and Flemish Communities of Belgium, Bulgaria, Czechia, Denmark (see country example), Germany and Ireland, authorities provide access to curriculum-aligned digital learning resources through dedicated platforms. In the Flemish Community of Belgium, KlasCement operates as a long-established platform enabling educators to share and access open educational resources, supporting peer exchange and professional collaboration. France's Éduscol portal and the Réseau Canopé network provide access to materials created by teachers and regional academies. In Ireland, Scoilnet offers a large repository of teaching resources, while Webwise.ie supplements these with materials on safe and ethical digital use. Portugal expects schools to address digital learning resource integration in their digital action plans, supported by mentoring and SELFIE results. Finland's Library of Open Educational Resources provides open access learning objects hosted on a platform maintained by the Finnish National Agency for Education. In Türkiye, schools are additionally supported through the 'Innovative classroom' project, implemented through the nationwide platform, which promotes the pedagogical use of digital learning resources in technology-rich classroom environments, accompanied by curriculum-aligned activity plans, digital teaching scenarios and professional development for teachers.

Balancing top-level guidance and school autonomy in the use of digital learning resources

In **Denmark**, national repositories support schools in selecting and using digital learning resources, including the Materialeplatformen (Material platform), managed by the National Agency for IT and Learning, and EMU Danmarks Læringsportal (Danish national learning portal), which provides teaching materials, tools and examples of good practice. Together with *Fælles Mål* (Common goals) – a national framework defining subject-specific learning objectives – these platforms ensure consistent access to high-quality resources, while preserving school-level autonomy.

In systems with a high level of school autonomy, structured top-level frameworks frequently support alignment between local decisions and national objectives. In Germany, Spain and Austria, regional or cantonal authorities manage repositories and quality processes linked to curricula. In Germany, federal states' platforms are supported by a joint state-level repository, MUNDO (The open education media library of the federal states), launched as part of the *DigitalPakt Schule*, which provides access to digital educational content for schools in general education. In addition, the Federal Ministry supports the provision, use and collaborative development of open educational resources through its national strategy

175 Estonia, Minister of Education and Research, Regulation on educational material.

on open educational resources and platforms such as wirlernenonline ('we learn online'). Spain promotes open educational resources through the national Procomún repository ([176]) complemented by regional platforms such as Recursos CREA in Extremadura and the cREAgal ('Create in Galician') project in Galicia. Austria's eEducation network and Eduthek initiative encourage schools to create and share open materials within a national digital-badging system.

Similar arrangements exist in Greece, Italy, the Netherlands, Poland and Portugal, where national programmes support the development and sharing of digital learning resources. In Greece, the *Photodentro* ([177]) and digital school ([178]) initiatives provide open educational resources and interactive materials for all subjects. In Italy, the national digital school plans in previous years and *Piano scuola 4.0* today have encouraged schools to produce and share digital learning resources. Some of them can be found in a dedicated section of the *Scuola futura* platform. In the Netherlands, the Open educational resources impulse programme supports collaboration among schools in developing open learning materials ([179]). In Poland, the Zintegrowana Platforma Edukacyjna (ZPE) (Integrated educational platform) provides free, curriculum-aligned materials for teachers and students and operates as a core component of the national digital education ecosystem, supporting teaching, learning, content management and assessment. In Portugal, the Ministry of Education, Science and Innovation (MECI)'s School support platform is a portal developed in 2020 to support schools, teachers, students and families, initially in the context of distance learning during the COVID-19 pandemic, and subsequently maintained as a permanent resource providing access to digital learning resources and guidance supporting their use in teaching and learning.

Overall, top-level approaches to digital learning resources combine central provision or national platforms with varying degrees of school-level flexibility. While only a small number of systems impose binding requirements, most rely on repositories, guidance and support frameworks to facilitate access to curriculum-aligned resources and support their pedagogical use. At the same time, the scope and nature of support differ across education systems, reflecting varying policy priorities, governance arrangements and levels of system maturity. As a result, while access is supported at the system level, effective integration into teaching and learning depends on local capacity and implementation conditions. Teachers' use of digital technologies and digital learning resources in teaching is examined further in Chapter 5.

3.1.2.4. Cybersecurity and data protection

Cybersecurity and data protection are among the most consistently regulated areas of digital education policy. All schools must comply with the General Data Protection Regulation (GDPR) ([180]), but education systems differ in how they translate these obligations into school-level procedures, pedagogical expectations and support.

Figure 3.5 shows that 36 education systems provide either mandatory requirements or non-binding guidance on cybersecurity and data protection, while 2 report no education-specific provisions. Overall, 20 systems apply mandatory requirements and 16 offer structured but non-mandatory support. Systems with mandatory requirements typically seek to guarantee minimum safeguards through legal, curricular or procedural obligations, whereas systems relying on guidance tend to emphasise awareness, training and capacity-building measures.

In several countries with binding requirements, cybersecurity and data protection are embedded in compulsory curriculum content and complemented by training and methodological materials, including Czechia, Italy, Cyprus, Latvia, Lithuania and Slovenia. In Czechia, cybersecurity and data protection form part of compulsory subjects within the national curriculum and are supported by methodological materials and targeted training initiatives ([181]). Poland combines GDPR obligations with statutory requirements on filtered internet access and security software in schools (see country example). Sweden, Iceland and Liechtenstein also apply legally binding rules on organisational and technical safeguards.

176 Spain, National Institute for Educational Technologies and Teacher Training (INTEF), Procomún repository.

177 Greece, Photodentro (national repository of open educational resources coordinated by the Greek Ministry of Education and the Institute of Educational Policy).

178 Greece, Digital school (national initiative supporting digital content, infrastructure, and teacher training in Greece).

179 Netherlands, Open educational resources impulse programme (Dutch national programme promoting the creation and sharing of open learning materials).

180 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1, ELI: http://data.europa.eu/eli/reg/2016/679/oj).

181 Czechia, National Pedagogical Institute, Cybersecurity guidance.

A second set of education systems introduces binding procedures related to secure data processing, infrastructure protection and GDPR [182] compliance. In the German-speaking Community of Belgium, centrally provided digital resources should meet security standards at the network and device levels. Denmark requires municipalities and schools to ensure lawful data processing. Spain enforces protocols on data protection and network security through national and regional authorities. France has strengthened security around digital learning environments through the *Bouclier numérique* ('Digital Shield'), a set of compulsory measures introduced after cyberattacks (see country example). In Austria, cybersecurity and data protection are regulated through binding legal provisions and complemented by awareness-raising and capacity-building initiatives implemented in cooperation with the national Safer Internet Centre, targeting school leaders, teachers and students [183]. The Netherlands is in the process of implementing a national information security and privacy standards framework, which is expected to become binding for all schools by 2027, while Portugal and Slovenia combine GDPR compliance with coordinated national awareness activities through their safer internet centres. Finland treats responsible and secure ICT use as a binding element of digital competence, with municipalities acting as data controllers. Switzerland and Norway also apply mandatory requirements linked to national privacy regulations.

Mandatory approaches to cybersecurity and responsible data use

In **France**, the *Bouclier numérique* applies binding cybersecurity obligations to all digital learning environments (ENT). It covers user account management, network access controls, the monitoring of illicit use and dark web surveillance. These services can be fully reopened only once providers demonstrated compliance. Awareness initiatives, such as *Opération Cactus* ('Operation Cactus') complement these measures through large-scale pedagogical phishing simulations for pupils and staff.

In **Poland**, mandatory rules derive from both the Education Law and the GDPR. Schools are legally required to install and regularly update filtering and security software to protect students from harmful content, with free filtered access provided through the National education network (*Ogólnopolska Sieć Edukacyjna* - OSE). Schools must also maintain GDPR-compliant records of data-processing activities and ensure the secure handling of personal data.

In **Finland**, GDPR compliance is legally required, and mandatory obligations are combined with national pedagogical requirements. The National Core Curriculum defines responsible and safe ICT use as a binding part of digital competence. The Finnish National Agency for Education (Opetushallitus) supports implementation with national Guidance on basics of cyber security competence in basic education, ensuring that data ethics and online safety are embedded in everyday school practice [184].

In the 16 systems with non-binding guidance, three broad patterns can be seen. A first group – including Estonia, Ireland, Croatia and Luxembourg – relies on national awareness programmes, safer internet centres and training initiatives to support schools, without imposing additional legal obligations (see country examples).

Recommended approaches to cybersecurity and responsible digital use

In **Luxembourg**, the BEE Secure initiative supports training, workshops and awareness campaigns for pupils, parents and teachers. Implemented with the support of the Ministry of Education, Children and Youth, it promotes safe and responsible digital use as part of national media literacy strategies. Participation is voluntary and no education-specific binding procedures apply beyond general GDPR obligations.

A second group integrates cybersecurity themes into curricula or strategies, while leaving procedures to schools, as in Greece, Romania, Serbia and Türkiye. In Greece, cybersecurity and digital citizenship appear in the national curriculum, but school-level procedures remain flexible. Romania is developing activities as part of its national digitalisation strategy, while Serbia and Türkiye offer awareness-raising resources and training through national digital education platforms.

A third group, including the French and Flemish Communities of Belgium, Bulgaria, Germany, Malta and Slovakia, provides model documents and guidance on GDPR compliance but few education-specific mandatory requirements. The French and Flemish Communities of Belgium offer model documents and GDPR handbooks but no binding school-level requirements. Bulgaria links GDPR compliance with a cybersecurity component in its national security programme. Germany also fits this pattern, as relevant provisions are framed through federal and sub-national (*Land*-level) recommendations rather than binding school protocols. Slovakia requires compliance with national

182 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1, ELI: http://data.europa.eu/eli/reg/2016/679/oj).

183 Austria, for example, Cybersecurity quiz initiative.

184 Finland, Basics of cyber security competence in basic education.

data protection laws but provides only non-binding guidance in the organisational guidelines for the 2024/2025 school year (*School Year Guide*).

Finally, Bosnia and Herzegovina, and Montenegro report no education-specific requirements or recommendations, although broader national cybersecurity strategies may nonetheless reference the online protection of children and young people.

Despite these differences, cybersecurity and data protection are widely recognised as core elements of safe and well-governed digital learning environments. Mandatory approaches emphasise structured compliance, whereas non-binding approaches focus more on awareness, training and digital skills. In both cases, the objective is to protect learners' personal data and support safe and responsible digital behaviour.

3.1.2.5. Parental engagement in children's digital learning

There is growing recognition that parents and families are key partners in promoting children's safe, responsible and effective use of digital technologies. Recent European and international guidance highlights the role of the home environment in supporting digital wellbeing, online safety and competence development (European Commission, 2022; Boeskens and Meyer, 2025). As shown in Figure 3.5, 28 education systems report top-level measures supporting parental engagement in digital education, typically through information resources, awareness initiatives or platform-based support rather than formal obligations applicable to schools.

The first identified approach is to provide centralised national resources for parents, giving schools and families a clear reference point while leaving implementation to local practice. This model is evident in the Flemish Community of Belgium (veiligonline.be), Ireland (Webwise.ie Parents Hub (see country example)), Greece (where platforms such as that of the Photodentro initiative and the *eParents* application support home–school communication and access to digital learning materials) and France (through parent-oriented resources made available via Éduscol and initiatives linked to the Educational digital territories (TNE) initiative.

In Spain and Croatia (see country examples), centrally developed training materials, guidance and awareness campaigns complement regional and school-level initiatives. Similar arrangements exist in Cyprus, where national safer internet initiatives actively involve families in digital wellbeing activities. In Malta, parental engagement is supported through centrally provided templates (e.g. acceptable use policies) and information sessions linked to device provision. Luxembourg supports parental awareness through national initiatives such as Eltereforum, which operate alongside but are not formally embedded within digital education policy frameworks ([185]). Poland reinforces parental participation through extensive resources and campaigns delivered via the national education network (*Ogólnopolska Sieć Edukacyjna - OSE*) and Safer Internet Centre initiatives. Together, these systems present a coordinated model in which national authorities provide trusted parent-facing resources and platforms, while schools retain flexibility in how these are used locally.

A second group integrates parental engagement within broader media education programmes or cyber prevention programmes. This approach is evident in Czechia, Estonia, Italy, Latvia, Hungary, Portugal, Romania and Slovenia. In these systems, parental engagement is commonly supported through a combination of school-based activities and national online resources. Czechia's cyber prevention catalogue includes dedicated materials for parents, while Estonia's 'Smartly on the internet' initiative offers webinars and guidance on online safety for families. Italy promotes parental engagement through mentoring actions and awareness campaigns linked to National Recovery and Resilience Plan investments. Latvia and Hungary situate parental involvement within national media literacy strategies, providing schools with adaptable guidance. Portugal promotes digital wellbeing through parental information sheets and national campaigns (see country example). Romania aligns parental engagement with child protection and online safety policies, while Slovenia supports families through workshops and awareness-raising initiatives coordinated by the Safe.si awareness point.

Examples of top-level initiatives supporting parental engagement in digital learning

In **Ireland**, the Webwise.ie Parents Hub provides practical guidance on cyberbullying, screen time management, parental controls and respectful online communication. It offers videos, conversation guides and downloadable resources for use in school-based workshops. Department of Education and

185 Luxembourg, Digital4education strategy.

Skills Circular 0038/2018 encourages schools to consult parents when developing digital technology policies, thereby systematically promoting parental engagement.

In **Croatia**, parental engagement forms part of the digital maturity framework developed under the e-schools programme. Schools are expected to inform families about students' digital learning practices and online safety. The Croatian Academic and Research Network, the national digital education agency, supports implementation through webinars, guidance materials and awareness campaigns.

In **Portugal**, the Digital academy for parents enables schools to organise training sessions in which pupils often act as co-trainers. This initiative, together with national recommendations on digital wellbeing (186) and the activities of the SeguraNet Centre (187), provides flexible tools for involving families in digital education.

The third identified approach embeds digital topics within general frameworks for home–school cooperation, with schools deciding to what extent digital issues are prioritised locally. Germany, Austria, Switzerland, Iceland, Liechtenstein, Norway, Serbia and Türkiye follow this model, supporting parental engagement mainly through general guidance, campaigns and locally organised information sessions. Austria integrates parental information sessions into device roll-out programmes in lower-secondary education and maintains regular consultation through parent associations (188). Finland, Switzerland and Liechtenstein include parental engagement in curriculum frameworks but leave digital-specific initiatives largely to schools. Iceland supports digital safety work through the campaigns of the Icelandic Centre for Internet Safety, while Norway's guidance on home–school cooperation naturally extends to digital learning through dedicated national resources for parents (189).

Across all three approaches, the underlying objective is similar: to strengthen parents' capacity to support children's digital learning and wellbeing, and to improve communication between schools and families. While governance models differ, most systems recognise parental engagement as a component of digital education policy, albeit with varying degrees of formalisation.

3.1.2.6. Collaboration with stakeholders, including educational technology

Collaboration with external stakeholders – including educational technology (EdTech) providers, universities, research institutes and industry – is recognised as an important component of digital education policy frameworks. Such partnerships can stimulate innovation, improve the quality of digital resources and strengthen teachers' capacity to use digital technologies effectively (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2023). Figure 3.5 shows that 20 systems report requirements or recommendations on collaboration with external partners. Three systems – the German-speaking Community of Belgium, Greece and Lithuania – make such collaboration mandatory; elsewhere, it is encouraged through non-binding frameworks and support measures.

In the German-speaking Community of Belgium, the top-level guidelines (*IMK-Leitfaden*) (190) embed collaboration within a coordinated support model involving the Euregional Centre for Digital Education and the Autonomous College East Belgium, which provide media education expertise, technical assistance and training. In Greece, cooperation is embedded in the governance of the national school network, with university-based teams and research institutes responsible for infrastructure and services. Lithuania's National Agency for Education, through its EdTech unit, oversees pilot projects and cooperation with universities and technology providers. Despite differences in governance models, in these systems, collaboration is framed as an operational policy requirement rather than an optional activity, supporting access to tools and content as well as capacity building and professional development.

Among the 17 systems with non-binding frameworks, several have developed structured but voluntary cooperation models. This group includes Bulgaria, Czechia, Germany, Estonia, Spain, France, Italy, Latvia, Hungary, the Netherlands, Portugal, Romania, Slovenia and Slovakia. In Italy, schools are encouraged to develop partnerships with different stakeholders (see country example).

186 Portugal, Recommendations on promoting digital wellbeing in schools.

187 Portugal, SeguraNet, 'Férias: um lugar tecno saudável!' ('Holidays: A tech-healthy place!').

188 Austria, 'Tablets and smartphones in the classroom'.

189 Norway, Parents' Committee for Primary and Secondary Education (FUG), 'Digital skolehverdag' ('Digital school life').

190 German-speaking Community of Belgium, Framework-oriented guidelines to building information and media literacy in primary and secondary education.

Non-mandatory partnerships between schools, EdTech providers and public institutions

In **Italy**, schools are encouraged to develop partnerships with institutional and non-institutional stakeholders. This process is also favoured at the central level by the Ministry of Education and Merit, which maintains memoranda of understanding with organisations such as the National Inter-University Consortium for Informatics (CINI) through *Programma il Futuro* ([191]) and the Italian Communications Regulatory Authority (AGCOM) to promote digital and media literacy initiatives. These partnerships link school-level practice with broader innovation strategies.

These systems typically support collaboration through platforms, consortia, memoranda of understanding and project-based funding. Participation at the school level remains voluntary. Examples include Czechia's Digikoalice platform, Estonia's Memorandum of understanding with EdTech Estonia ([192]) and Portugal's partnerships between schools, university-based ICT competence centres and EdTech companies under the Action plan for the digital transition ([193]). In France, the Educational digital territories ([194]) initiative encourages cooperation between schools, research bodies and EdTech providers, supported by resource catalogues and platforms provided by Réseau Canopé. In the Netherlands, cooperation is voluntary but highly structured through the SIVON cooperative and the EDU-V Foundation (see country example). In the remaining systems within this group, cooperation is supported through a combination of project-based initiatives, broader innovation frameworks and established partnerships with public agencies or innovation bodies, rather than through dedicated national coordination structures.

Non-binding guidance for stakeholder involvement

In the **Netherlands**, SIVON ([195]) and the Edu-V Foundation ([196]) coordinate cooperation between schools, suppliers and public authorities. SIVON facilitates joint procurement, improving purchasing conditions and data protection safeguards, while Edu-V develops standards for secure data exchange between educational tools. Participation is voluntary, but these structures strengthen schools' negotiating position and help establish a coherent digital education ecosystem without imposing new legal requirements.

Although only three systems make collaboration legally binding, most others support partnership models through consortia, platforms or project-based funding. Overall, these approaches indicate that cooperation with EdTech companies, universities and research organisations is used to strengthen schools' innovation capacity, support teacher professional learning and align school-level practice with wider digital transformation agendas.

Taken together, the evidence across the different aspects of school-level digital governance examined in this section indicates that school-level digital planning has become a common feature across European education systems. Around a quarter of systems require schools to adopt a digital strategy, while most others rely on recommendations and guidance. The ICILS 2023 data suggest an alignment between the presence of top-level requirements or guidance and patterns in the reported uptake and review of school ICT plans, without implying a causal relationship.

Within this framework, policy coverage appears most developed in areas linked to risk management, regulatory responsibilities and core enabling conditions. The regulated use of digital devices is addressed in all education systems, while cybersecurity and data protection are also widely covered through mandatory requirements or guidance. Expectations regarding infrastructure and resource planning are similarly well established. By contrast, the pedagogical use of digital learning resources, collaboration with external stakeholders and parental engagement are more often addressed through non-binding measures and supported through platforms, partnerships and project-based initiatives.

This reflects a broader governance pattern within the areas examined in this section: binding requirements tend to focus on safeguards and essential infrastructure, while non-binding approaches are more commonly used to support pedagogical practices, family engagement and collaboration.

191 Italy, *Programma il Futuro* ('Programme the Future') (national initiative of the Ministry of Education and Merit and the National Inter-University Consortium for Informatics (CINI) promoting the teaching of informatics, computational thinking, and coding skills in schools).

192 Estonia, Memorandum of understanding with EdTech Estonia.

193 Portugal, Directorate-General for Education, Action plan for the digital transition (PATD).

194 France, Ministry of National Education, Éduscol, Territoires numériques éducatifs (TNE) ('Digital education territories').

195 Netherlands, SIVON (Dutch school ICT procurement and ICT service organisation).

196 Netherlands, Edu-V Foundation, Dataspace for secure, flexible and futureproof digital learning environments.

3.2. Governance structures and quality assurance of digital education in schools

While school-level planning sets the immediate framework for digital transformation in practice, its effectiveness also depends on how quality assurance, monitoring and evaluation are organised at the system level to support schools. Governance in this context refers not only to the allocation of responsibilities but also to the arrangements through which schools are guided, reviewed and supported in their digital transformation (Burns and Köster, 2016).

The Commission Staff Working Document accompanying the Digital Education Action Plan 2021–2027 emphasises the importance of coherent governance arrangements, clearly assigned responsibilities and monitoring mechanisms to support effective and sustained implementation (European Commission, 2020a). Evaluation and monitoring play a central role in determining whether digital strategies move beyond formal requirements and become embedded in everyday school practice. International evidence indicates that systematic review processes, feedback mechanisms and follow-up support are critical for sustaining policy implementation and enabling continuous improvement in complex education systems (Burns and Köster, 2016; OECD, 2023b).

This section examines how these conditions are reflected in national arrangements. It first explores the governance structures supporting digital education, particularly the dedicated bodies or agencies to which responsibilities are assigned (Section 3.2.1). It then analyses the extent to which digital education is embedded in quality assurance frameworks (Section 3.2.2) and, finally, the mechanisms used to support evaluation, feedback and continuous improvement at the school level (Section 3.2.3).

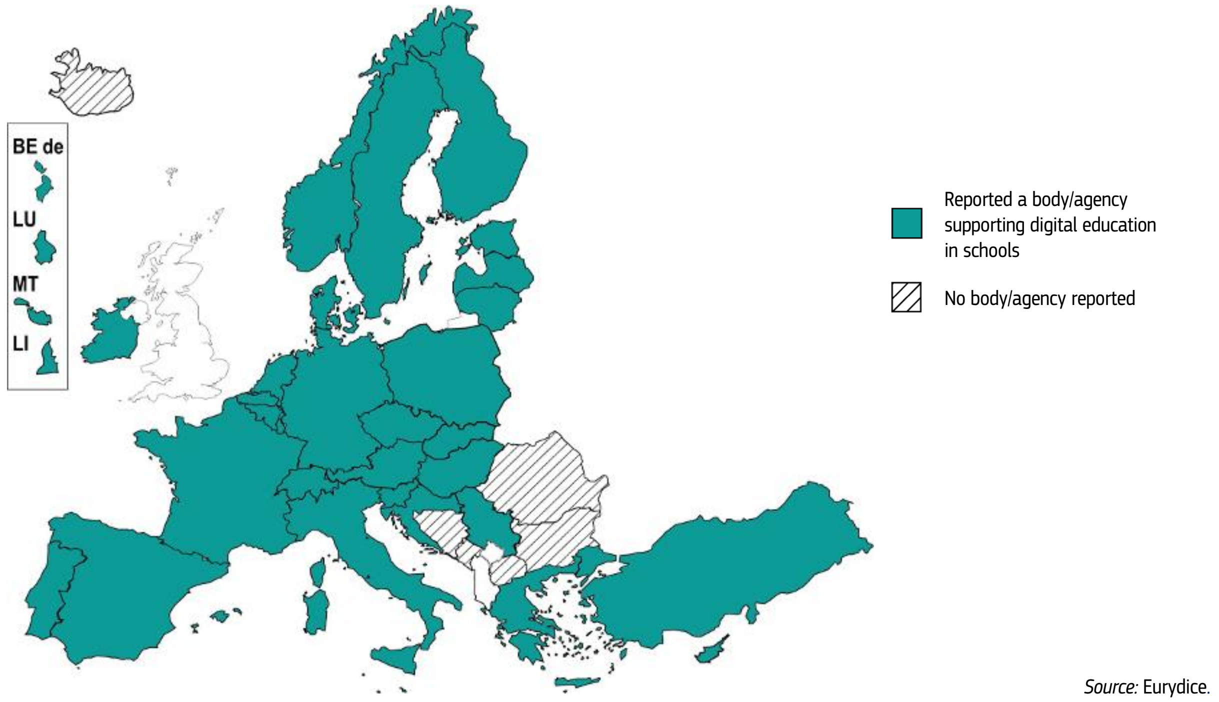
3.2.1. Governance structures and assigned responsibilities

Building on the findings of the 2019 Eurydice report *Digital Education at School in Europe*, which showed that almost two thirds of European education systems relied on one or more external agencies to translate national digital strategies into school practice, the 2024/2025 Eurydice survey adopts a broader perspective (European Commission / EACEA / Eurydice, 2019). The earlier study focused primarily on external organisations; the present survey also includes ministerial directorates and other internal bodies with a formal mandate to coordinate digital education in schools.

Within this broader scope, the 2024/2025 Eurydice survey captures a wider range of governance arrangements than the 2019 study, including both external agencies and internal ministerial structures with formal responsibilities for digital education. These entities typically combine policy implementation, teacher professional development, digital infrastructure management and, in some cases, evaluation or quality assurance functions. A full list of the reported bodies and agencies and official sources is provided in Annex 2.

Figure 3.6 shows that the vast majority of education systems now report at least one designated body or agency with specific responsibilities for digital education in lower-secondary education. Eight systems report more than one organisation with complementary mandates (Greece, Italy, Luxembourg, Hungary, Austria, Poland, Slovenia and Serbia). Although the two datasets are not directly comparable due to differences in scope, the broader coverage of the 2024/2025 Eurydice survey provides a more complete picture of the institutions involved in governing digital education.

Figure 3.6: Dedicated bodies/agencies supporting digital education in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory note

This figure identifies education systems that report at least one national body or agency created or supported by the top-level education authority and holding a formal mandate to coordinate, implement or support digital education in schools (ISCED 24). Both external agencies and internal ministerial structures (e.g. dedicated directorates) are included when they have explicit responsibilities for digital education. Systems that do not report a dedicated body either integrate digital education tasks within existing departments of the top-level education authority or assign these responsibilities to regional or municipal authorities. A detailed overview of these bodies/agencies is provided in Annex 2.

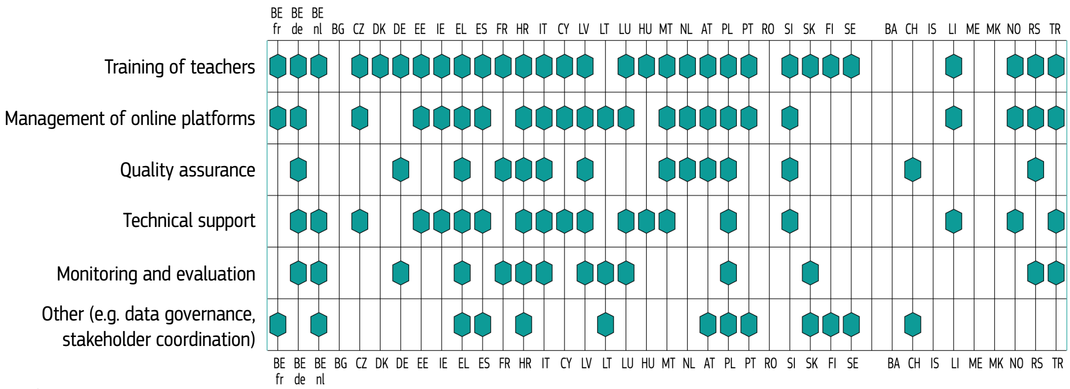
The reported arrangements differ considerably in legal status, scope and degree of autonomy. Nevertheless, three broad governance approaches can be identified across European education systems. These categories are analytical and not mutually exclusive, as some education systems combine elements of more than one approach. In some systems, digital-specific agencies or dedicated ministerial directorates act as the main national interface between ministries, schools and stakeholders. This is the case for Estonia's Centre for Engineering and Digital Education within the Estonian Education and Youth Board (HARNO), France's Directorate for Digital Education (Direction du numérique pour l'éducation), Ireland's Oide Technology in Education, the Croatian Academic and Research Network (CARNET), the Netherlands' Kennisnet, Malta's Directorate for Digital Literacy and Transversal Skills, Portugal's Educational Resources and Technologies Team of the Directorate-General for Education (ERTE) and Türkiye's Directorate General for Innovation and Educational Technologies (YEĞİTEK). These organisations typically combine strategic, pedagogical and technical roles, and they often lead the implementation of national digital strategies.

In a second group, broader education structures incorporate digital education into a wider portfolio covering curriculum, assessment and innovation. Lithuania's National Agency for Education, the Finnish National Agency for Education (Opetushallitus) and the Norwegian Directorate for Education and Training (Utdanningsdirektoratet) exemplify this approach. In these systems, digital transformation is integrated within the general responsibilities of national education structures, which support schools in areas such as curriculum implementation, teacher development and educational resources. Switzerland's National Competence Centre for Digital Education (Educa) similarly supports the integration of digital technologies within the broader governance framework of the education system. Here, digital transformation is embedded in existing institutional arrangements for curriculum development, teacher support and quality assurance rather than being entrusted to a dedicated digital education agency.

A third group of systems has developed multi-actor ecosystems in which several organisations share responsibilities for digital education. Greece, Luxembourg, Austria and Slovenia illustrate this model: separate institutions provide pedagogical guidance, manage infrastructure and platforms, deliver teacher professional development or support evaluation and research. This division of labour allows for specialisation but requires strong coordination to avoid fragmentation or overlap.

As shown in Figure 3.7, the responsibilities of these bodies typically cover a combination of areas, such as support for teacher training, management of online platforms, technical assistance for school infrastructure, quality assurance, monitoring and evaluation of digital strategies and, in some cases, other emerging functions such as data governance or stakeholder coordination. The data show that nearly all bodies perform at least two functions, and more than half combine four or more. However, functions related to quality assurance and monitoring are less widely reported, with responsibilities more often concentrated in pedagogical support and platform management.

Figure 3.7: Responsibilities of dedicated bodies/agencies for digital education in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory note

This figure presents the main functional areas assigned to the national bodies or agencies responsible for digital education in schools. Each system could indicate one or more functions, reflecting the combination of roles typically performed by these entities. The figure includes only bodies created or supported by the top-level education authority and formally mandated to fulfil one or more of these functions. Where several bodies share complementary roles (e.g. technical and pedagogical support), all functions are aggregated at the system level.

Training of teachers is the most widespread function of dedicated bodies, reported in 30 systems. In the French Community of Belgium, the General Directorate for Digital Education (SGNE) manages teacher training initiatives linked to the Pix platform. In the German-speaking Community, the Media Education Advisory Service (Fachberatung Medien) at the Autonome Hochschule in Ostbelgien offers tailored support for teachers and schools. In France, the Directorate for Digital Education (Direction du numérique pour l'éducation) supports teacher training in digital competences and promotes the Pix and Pix+ Édu platforms for developing and certifying teachers' digital skills. Other bodies with similar mandates include Oide Technology in Education in Ireland, the Institute of Educational Policy in Greece, the Institute for Educational Technologies (CNR-ITD) and the National Institute for Documentation, Innovation and Educational Research (INDIRE) in Italy, the Directorate for Digital Literacy and Transversal Skills in Malta and the Virtual University of Teacher Education in Austria. Many provide blended or online courses, mentoring schemes and school-based support. In Luxembourg, the Centre for Educational IT Management (CGIE) and the National Institute for Teacher Training (IFEN) jointly train in-school digital facilitators, while Austria's Virtual College of Teacher Education offers online training options for teachers. In Poland, the Centre for Education Development (ORE) supports teacher professional development and produces pedagogical resources, including materials related to digital education and technology-enhanced learning.

Twenty-three systems report that dedicated bodies are responsible for the **management of online platforms**, repositories or digital identity services. These platforms support equitable access to high-quality digital resources, communication tools and digital learning environments, and they often function as hubs for professional communities and awareness-raising initiatives (see country examples).

Top-level bodies responsible for the management of online platforms

In **Greece**, the Computer Technology Institute and Press Diophantus (CTI) operates the Greek School Network, connecting schools, learners and teachers and offering a wide range of e-learning and e-governance services.

In **Croatia**, the Croatian Academic and Research Network (CARNET) provides national networking, virtual learning and content management systems, and user support and training.

In **Luxembourg**, the Centre for Educational IT Management (CGIE) ensures the technical management of national school platforms and secure digital identities, underpinning access to digital resources.

In the **Netherlands**, Kennisnet delivers shared infrastructure, interoperability frameworks and open-resource portals for schools and teachers and supports the development of common standards for platforms and services.

Nineteen education systems make their bodies responsible for **technical support**. The Croatian Academic and Research Network (CARNET) operates the national backbone network and provides a helpdesk for schools; the Centre for Educational IT Management (CGIE) in Luxembourg offers user support and device management; and the Directorate General for Innovation and Educational Technologies (YEĞİTEK) in Türkiye coordinates school equipment programmes and connectivity projects. In many cases, central help desks are complemented by regional support teams, reflecting the growing recognition that reliable and interoperable infrastructure is a precondition for effective digital learning. In Poland, the National Research Institute NASK manages the national educational network, which provides secure internet connectivity, digital services and cybersecurity support for schools.

Quality assurance functions are reported in 14 systems, usually in the form of monitoring the implementation of standards, reviewing digital school plans or supporting external evaluation processes. Elsewhere, digital aspects of quality assurance remain primarily embedded in general school evaluation frameworks rather than assigned to specialised bodies (see country examples).

Top-level bodies responsible for quality assurance

In **France**, the Directorate for Digital Education (DNE) contributes to the national quality assurance frameworks by analysing platform usage and supporting monitoring.

In **Serbia**, the Centre for Educational Technology within the Institute for the Evaluation of Quality of Education supports schools in integrating digital indicators into self-evaluation and national assessment processes.

Fourteen systems report that dedicated bodies contribute to the **monitoring or evaluation** of digital strategies, either by collecting data on infrastructure and platform use, conducting surveys and thematic reviews, or supporting the evaluation of specific programmes. For example, in Slovakia, the National Centre for Digital Transformation of Education aims to build a sustainable ecosystem for evidence-based implementation. Similar functions are carried out in other systems through bodies responsible for quality assurance, platform management or system-level evaluation.

In addition, 13 systems report broader cross-cutting responsibilities such as data governance, cybersecurity, legal guidance or stakeholder networking. In the French Community of Belgium, the General Directorate for Digital Education (SGNE*)* links education digitalisation with wider public-sector policies on inclusion and administrative simplification. In Czechia, the National Pedagogical Institute (Digikoalice) acts as a partnership platform uniting ministries, ICT companies and non-governmental organisations to promote digital literacy and innovation. In Switzerland, Educa functions as a competence centre for the use and protection of data in education, helping to ensure compliance with national and European standards.

A comparative reading of the reported structures indicates that three broad governance models have emerged across Europe, echoing and expanding the patterns identified in the 2019 *Digital Education at School in Europe* report. A first model centres on **national agencies with comprehensive mandates**, where a single institution combines pedagogical support, infrastructural management and monitoring functions. France's Directorate for Digital Education (Direction du numérique pour l'éducation (DNE)), the Croatian Academic and Research Network (CARNET) and the Netherlands' Kennisnet illustrate this approach, operating as national hubs that link strategic direction with technical capacity and school-level support.

A second model reflects **multi-actor governance ecosystems**, in which responsibilities are shared across complementary organisations. In Greece, for instance, the Institute of Educational Policy leads on pedagogical guidance, while the Computer Technology Institute and Press Diophantus manages infrastructure and services; similar arrangements exist in Austria, where the eEducation Competence Centre and the Virtual College of Teacher Education collectively support digital education, and in Luxembourg and Slovenia, where technical and pedagogical roles are clearly distributed across institutions that collaborate closely.

A third model involves **broad mandate education agencies** that incorporate digital transformation within wider responsibilities for curriculum, assessment and innovation. Lithuania's National Agency for Education and the Finnish National Agency for Education (Opetushallitus) exemplify this approach, embedding digital transformation within general education governance rather than creating stand-alone structures.

The analysis points to a governance landscape characterised by differentiated institutional roles and varying combinations of pedagogical, technical and coordination functions across systems. Mechanisms related to data protection and interoperability are also widely reported. However, quality assurance and systematic evaluation remain uneven, as monitoring of digital education strategies is in many cases embedded within general school evaluation processes rather than entrusted to dedicated bodies. As digitalisation becomes a prominent dimension of school quality, the further development of evaluation frameworks and feedback mechanisms may therefore play an important role in how governance arrangements support sustained improvement in schools' digital practices. The next section (Section 3.2.2) examines how these structures are reflected in national quality assurance and evaluation frameworks.

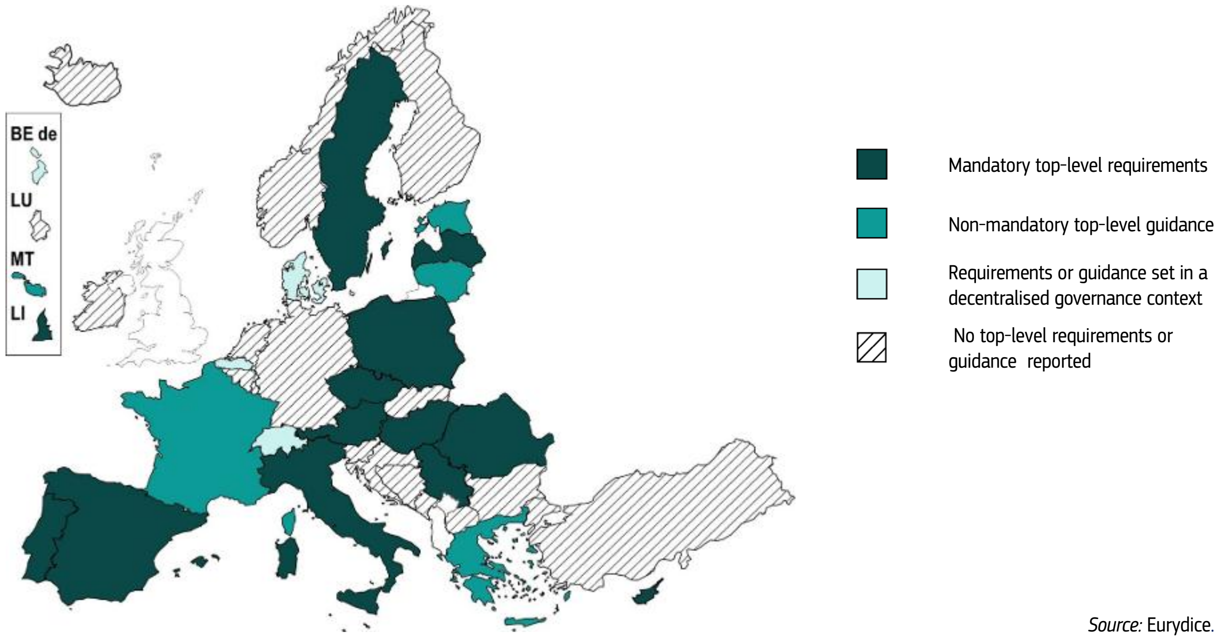
3.2.2. Top-level requirements or guidance on quality assurance of digital education in schools

As digital technologies become more embedded in school practice, education systems are expected to ensure that their use supports learning effectively and equitably. The Eurydice report *Digital Education at School in Europe* showed that digital aspects were rarely addressed through dedicated quality assurance criteria and were more often considered indirectly within general school evaluation frameworks. Monitoring of digital strategies was also identified as a weak point: only eight education systems undertook regular reviews, and many had no structured evaluation mechanisms, despite having national strategies (European Commission / EACEA / Eurydice, 2019).

Against this background, the 2024/2025 data show that digital education is referenced more frequently within quality assurance arrangements than in earlier Eurydice analysis, although approaches remain highly uneven. As shown in Figure 3.8, a small majority of education systems now report some form of framework addressing the quality of digital education in lower-secondary schools, although the degree of obligation varies considerably. Thirteen systems have introduced mandatory requirements, most frequently by integrating digital priorities into existing school evaluation criteria, planning obligations or inspection frameworks. Five systems (Estonia, Greece, France, Lithuania and Malta) issue non-mandatory guidance, typically designed to support self-evaluation and reflective practice without imposing legal obligations. In 16 systems, no digital-specific requirements exist at the top level; in these cases, digital aspects may be considered during general school evaluations, but this depends largely on the priorities of evaluators or individual schools. In the German-speaking and Flemish Communities of Belgium and in Denmark and Switzerland, responsibilities for digital quality assurance are defined mainly at the regional or local level, reflecting decentralised governance traditions.

Thirteen education systems have introduced mandatory requirements relating to the quality of digital education. In most cases, these do not take the form of stand-alone digital quality frameworks but are embedded within existing school evaluation criteria, inspection procedures or planning obligations. Digital aspects are therefore assessed alongside other dimensions of school quality, such as teaching and learning, leadership or the learning environment. Latvia, Austria, Poland and Romania illustrate this approach: in these systems, digital infrastructure, pedagogical use of technology and/or staff competences are examined as part of compulsory school evaluation or accreditation processes, thereby positioning digitalisation as an integral, though not stand-alone, component of school quality.

Figure 3.8: Top-level requirements or guidance on quality assurance of digital education in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory note

This figure distinguishes between education systems that have introduced mandatory requirements on the quality of digital education (e.g. by embedding digital criteria in school evaluation frameworks or school planning obligations), those that provide non-binding recommendations or guidelines, and those without digital-specific provisions. It also identifies systems where digital quality requirements are determined in a decentralised context, with responsibilities located at the regional or local level.

Country-specific note

Belgium (BE de, BE nl), Denmark and **Switzerland:** These systems operate in a decentralised context where digital quality requirements are determined at the regional or cantonal level.

Five systems – in Estonia, Greece, France, Lithuania and Malta – rely primarily on non-mandatory guidance from the top level. These systems typically support schools through recommended indicators, evaluation guidelines, dashboards or self-assessment tools rather than through legally binding requirements. In Greece, for example, digital education is not a mandatory evaluation criterion but is addressed through indicators within both internal and external school evaluations. Estonia adopts a similarly developmental approach, encouraging schools to use voluntary self-evaluation tools such as the 'Digital Mirror' to reflect on digital maturity and integrate digital objectives into school development plans. In France, methodological guidance for school evaluations and the development of a national digital education dashboard aim to strengthen monitoring and institutional steering, while leaving implementation decisions largely to schools and local authorities.

In 16 education systems, no digital-specific quality assurance requirements or guidance are reported at the top level. In these contexts, digital education may still be present in curricula, infrastructure programmes or national digital strategies, but it is not explicitly framed as an object of school quality assurance. Instead, digital aspects may be addressed indirectly within general evaluation processes, depending on the priorities of evaluators or individual schools. Importantly, the absence of formal top-level requirements does not necessarily imply a lack of evaluative activity related to digital education. Several systems in this group report preparatory work, pilot initiatives or draft criteria that address digital education without constituting binding quality assurance frameworks. For example, Croatia applies a framework for the digital maturity of schools ([197]) under the e-Škole (e-schools) programme, combining school self-assessment with selective external validation, but without mandatory evaluation requirements. In Iceland, draft criteria including digital indicators are currently under consultation, with the intention of integrating them into internal and external evaluation processes. These cases illustrate that, for some systems, digital quality assurance remains at a developmental or transitional stage rather than fully embedded in regulatory frameworks. Türkiye belongs also to this

197 Croatia, Croatian Academic and Research Network (CARNET), *e-Škole* framework and questionnaire.

group, as it does not report digital-specific quality assurance requirements or guidance for schools. Although public institutions are subject to general strategic-planning and monitoring requirements, digital education is not covered by dedicated quality assurance criteria.

Four systems operate within decentralised governance contexts, where responsibilities for quality assurance – including digital aspects – lie primarily at the regional, municipal or cantonal level. This is the case in the German-speaking and Flemish Communities of Belgium, and in Denmark and Switzerland, where national authorities do not prescribe digital quality requirements for schools. Instead, regional frameworks, local guidelines or school-level concepts determine whether and how digital education is addressed within quality assurance processes, leading to considerable variation in scope and emphasis.

Beyond their formal status, top-level frameworks and guidance also differ in how they conceptualise 'digital quality'. In systems with mandatory frameworks, digital education is more often positioned as a core component of overall school quality, embedded in inspection criteria and development planning. By contrast, in systems relying on recommendations or decentralised arrangements, digital quality is more frequently framed as a supporting dimension, addressed through guidance, tools and voluntary self-evaluation rather than through regulatory mechanisms.

Many systems now articulate expectations that go beyond infrastructure – the primary focus identified in the 2019 Eurydice analysis – and also encompass digital pedagogy, data protection and organisational readiness. Beyond the existence of frameworks, their content also reveals important differences in emphasis. Figure 3.9 groups quality assurance provisions into several commonly reported domains. The most prevalent concern is the integration of digital technologies into teaching and learning, including the quality of digital resources and their alignment with curriculum goals.

Seventeen education systems expect schools to demonstrate how digital learning resources can be integrated into pedagogical practice and support equitable access to high-quality learning materials. Austria and Portugal demonstrate this approach by embedding digital pedagogy within mainstream school evaluation criteria, and digitalisation is considered an integral dimension of instructional quality.

A second group of provisions relates to the quality and reliability of digital infrastructure, addressed in 14 systems. For example, in Latvia, quality assurance processes include expectations concerning connectivity, device availability and technical conditions, assessed within broader inspection or pedagogical supervision frameworks. This reflects a growing recognition that effective pedagogical use of digital technologies depends on stable and well-maintained infrastructure.

Data privacy, cybersecurity and ethical use of technology constitute another important domain addressed in 14 systems. In France and Spain, expectations related to secure handling of personal data and responsible use of digital tools are reflected within evaluation, planning or regulatory frameworks for schools. In France, the digital work environments (*espaces numériques de travail* (ENT)) are required to comply with the binding *Schéma Directeur des Espaces Numériques de Travail (*SDET*)*, which establishes national technical, interoperability and security standards for digital school management platforms. In other systems, data protection and digital safety are addressed indirectly, for example through general school evaluation processes, data protection regulations or guidance linked to school development planning, rather than through digital-specific quality assurance frameworks.

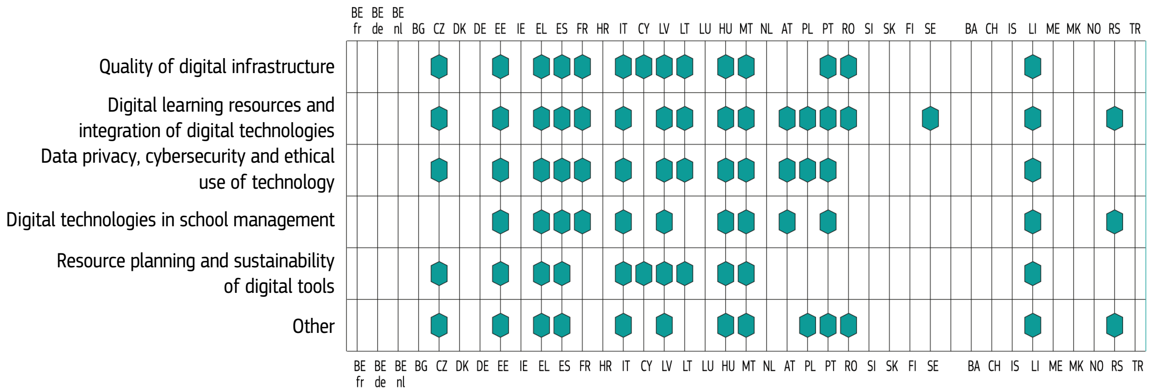
Other domains appear less consistently. Digital technologies in school management, such as administrative platforms or digital communication systems, are included in 12 systems. Resource planning and sustainability, including equipment renewal and long-term maintenance, are also explicitly addressed in 11 systems.

Finally, 13 systems report other digital quality dimensions, most often relating to teacher digital competences, inclusive access or responsible use. In Greece, schools are encouraged to reflect on staff digital skills, infrastructure readiness and the accessibility of digital learning environments through indicators included in school evaluation guidance. In other systems, such reflections occur mainly within school development planning or voluntary self-evaluation, rather than as part of formal quality assurance frameworks.

The distribution across domains indicates a clear hierarchy of policy attention. Digital learning resources and the integration of digital technologies are the most consistently addressed dimensions, suggesting a growing recognition that quality relates not only to access but to instructional practice. By contrast, resource planning, school management and organisational processes appear less systematically embedded in quality assurance frameworks, suggesting that pedagogical aspects of digital education are more commonly addressed than broader organisational dimensions.

Country examples further illustrate how these domains are addressed within top-level quality assurance frameworks.

Figure 3.9: Aspects of top-level frameworks or recommendations on quality assurance (QA) of digital education in schools, ISCED 24, 2024/2025



Source: Eurydice.

Country-specific note

Belgium (BE de, BE nl), Denmark and **Switzerland:** In education systems with fully decentralised governance structures, where quality assurance responsibilities are defined at the regional or local level, no central top-level requirements were reported for the aspects covered by this figure. Blank cells indicate that no top-level requirement was reported.

Quality assurance aspects covered in top-level frameworks

In **Lithuania**, digital aspects are included in the top-level quality assurance guidance but remain advisory. They focus on infrastructure readiness, pedagogical use of digital technologies and teacher digital competence development, supporting school self-reflection and alignment with national digital education objectives ([198]).

In **Malta**, digital education aspects are included within a non-mandatory national quality assurance guidance for schools, covering digital infrastructure, pedagogical use of technologies, school information systems and teacher digital competences, with review findings expected to inform school development planning ([199]).

In **Austria**, digital education aspects are embedded within the mandatory national school *Qualitätsmanagementsystem*. Evaluation indicators cover digital infrastructure, pedagogical use of digital technologies and the integration of digitalisation objectives into school development planning, positioning digital education as a formal quality criterion within overall school performance evaluation.

In **Portugal**, the mandatory quality assurance framework includes expectations concerning the quality of digital infrastructure, the pedagogical use of digital tools and digital learning resources, and the organisational readiness of schools to deliver digital learning effectively, including in the context of national digital assessments ([200]).

Overall, the 2024/2025 Eurydice data show that digital education considerations are more frequently referenced within national quality assurance frameworks than they were in 2019, although integration remains uneven across systems. While a growing number of systems define expectations of how digital technologies should support teaching and organisational development, others continue to rely on general evaluation processes or developmental initiatives in which digital aspects may receive limited or uneven attention. The scope of what constitutes ‘digital quality’ also varies substantially, ranging from infrastructure readiness to pedagogical integration and data governance.

198 Lithuania, Procedure for the organisation and conduct of the external evaluation of the performance of schools providing general education programmes, Law on Education.

199 Malta, Quality assurance framework for education in Malta (0-16 years).

200 Portugal, Digital familiarisation tests for schools.

The next subsection (Section 3.2.3) examines how these requirements and recommendations are implemented in practice, focusing on the mechanisms through which schools receive feedback, plan improvements and monitor progress over time.

3.2.3. Implementation mechanisms and monitoring at the school level

Top-level expectations on digital quality have practical effects only when they are supported by clear evaluation mechanisms and structured follow-up at the school level. The Eurydice report *Digital Education at School in Europe* showed that monitoring and evaluation were among the least developed areas of digital governance: only a few systems reviewed digital strategies regularly, digital aspects of school evaluation were limited and often indirect, and available self-evaluation tools were inconsistently used. External evaluation rarely assessed digital pedagogy or infrastructure in a systematic way (European Commission / EACEA / Eurydice, 2019).

Implementation and monitoring mechanisms determine how digital education policies are translated into school practice and whether progress is systematically reviewed. Across European education systems, quality assurance arrangements vary considerably. In some systems, digital education is addressed through dedicated monitoring frameworks or specific indicators, while in others it is embedded within broader school evaluation or development planning processes. In such cases, digital aspects are typically reviewed as part of general school self-evaluation, external evaluation or school development planning rather than through digital-specific requirements.

Against this background, the 2024/2025 data indicate modest but notable progress. As shown in Figure 3.10, combined internal and external evaluation has become the most common approach, reported in 15 education systems. This represents an important shift from 2019, when internal and external mechanisms rarely operated in tandem and digital aspects were often optional rather than embedded features of review processes. In these 15 systems, digitalisation is examined both during national inspections and through regular internal monitoring. Although arrangements differ, several shared patterns can be identified.

First, many systems require schools to embed digital priorities within annual or multi-year development plans. This is the case in Greece, Italy, Latvia, Lithuania and Serbia. These plans are subsequently reviewed internally and externally; these priorities become part of an ongoing school improvement cycle.

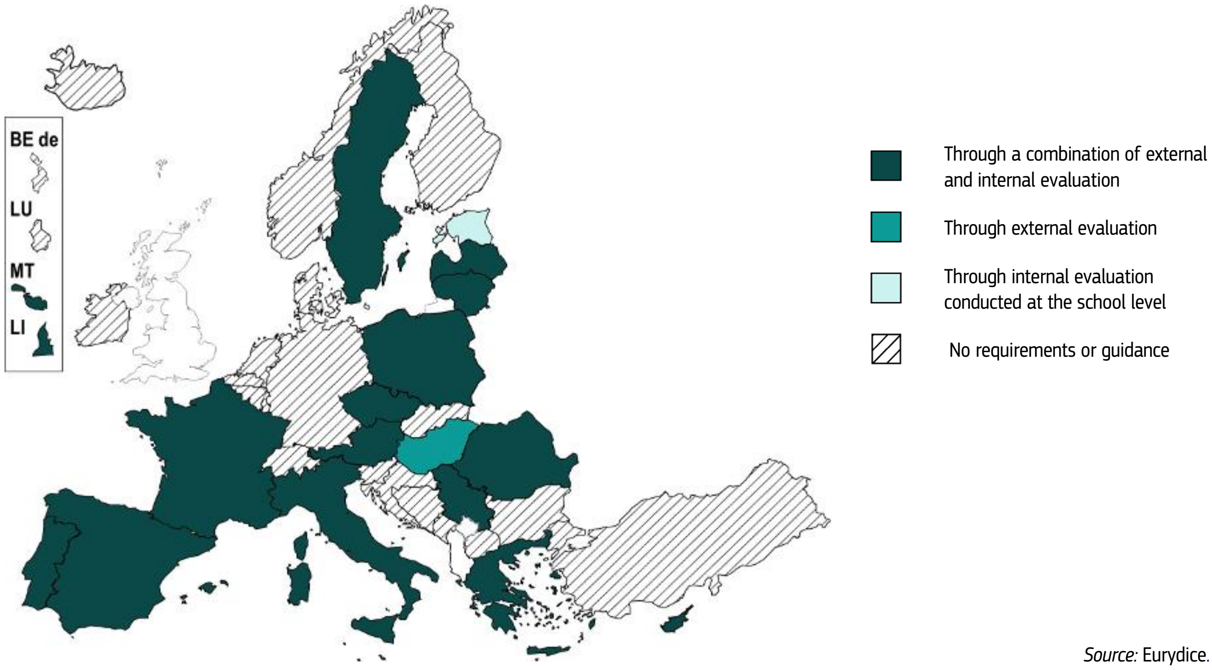
Second, external evaluators commonly apply national guidelines or defined indicators relating to digital pedagogy, infrastructure, data protection or organisational readiness. For example, Lithuania uses clearly defined performance indicators, while Austria and Poland assess digital standards within broader quality framework criteria.

Third, several systems encourage structured internal reflection through the use of self-evaluation tools. Schools in several systems, including those in Estonia, Spain and Greece, draw on national or EU instruments such as SELFIE to diagnose digital readiness and track progress over time.

Taken together, these practices suggest that combined evaluation creates feedback loops in which internal monitoring informs external review, and external findings reinforce the visibility of digital priorities within school development processes.

One system – Hungary – relies predominantly on external evaluation. Digital aspects are examined during standard inspection visits, where evaluators review infrastructure, pedagogical use and staff competences within the general quality framework. Recommendations then inform school planning and regional support. By contrast, Estonia relies primarily on internal evaluation, with digital aspects reviewed within school self-evaluation and development planning rather than through external inspection.

Figure 3.10: Approaches to evaluation of digital education in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory note

This figure distinguishes three approaches to evaluating digital education in schools:

- combined internal and external evaluation, where digital aspects are reviewed through both internal school self-evaluation and external inspections;
- external evaluation, where digital aspects are assessed mainly through inspection visits;
- internal evaluation, where digital aspects are reviewed within school self-evaluation or development planning only.

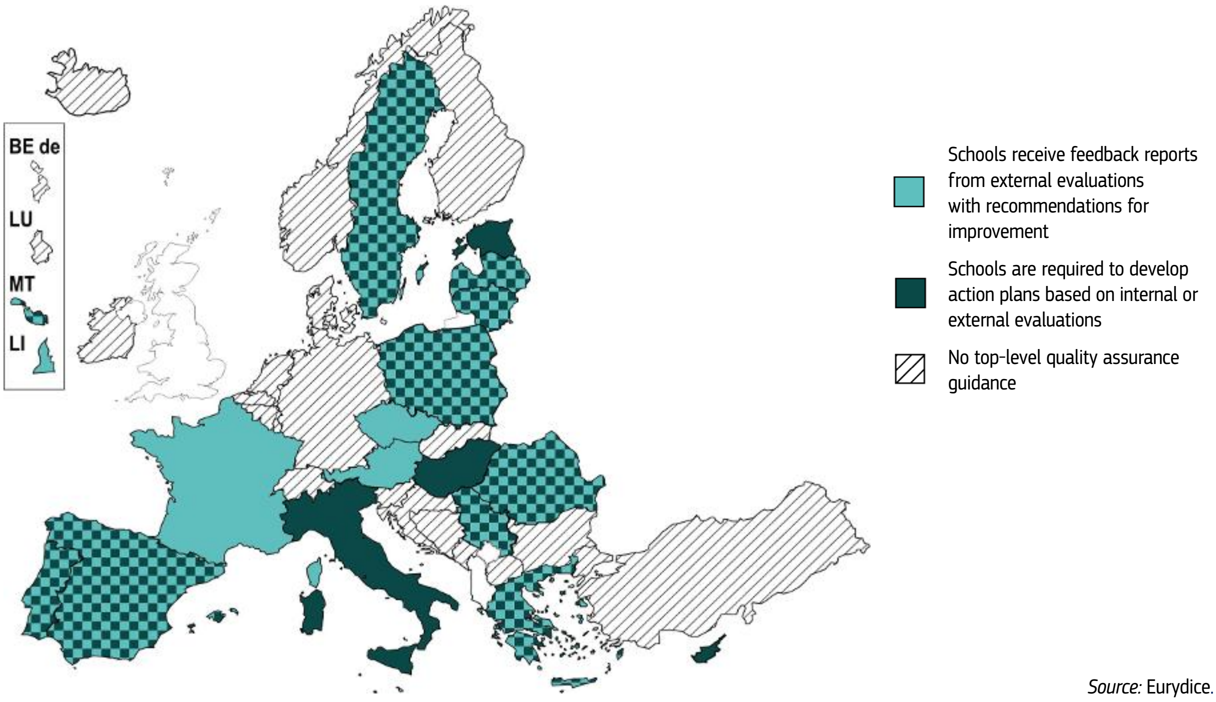
A key finding is that structured feedback and follow-up are becoming more common, addressing a gap identified in the 2019 report, which noted that schools often received little targeted feedback on digital education and that action planning was sporadic. As shown in Figure 3.11, most systems now provide schools with written reports that identify priorities such as connectivity, digital pedagogy or staff competences.

Where follow-up mechanisms are mandatory, the link between evaluation and improvement is particularly strong. Poland and Serbia require schools to act on inspection recommendations, prepare improvement plans and report on progress, ensuring that evaluation results translate into concrete measures. Croatia reinforces inspection outcomes with targeted assistance for schools with lower digital maturity scores.

Other systems have developed structured advisory mechanisms. In France, Austria and Latvia, follow-up inspections or advisory visits monitor progress and may direct schools to specific continuing professional development or technical support. Latvia and Lithuania also use external evaluation to verify whether improvement measures align with national digital education priorities.

Together, these arrangements illustrate how evaluation, feedback and follow-up are connected, allowing quality assurance mechanisms to function not only as oversight tools but as drivers of continuous improvement in digital education (see country examples).

Figure 3.11: Mechanisms to support monitoring and continuous improvement in digital education in schools, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory note

This figure distinguishes between systems where schools receive feedback reports with recommendations for improvement, those where schools are required to prepare action plans on the basis of internal or external evaluations, and those where there is decentralised or no top-level guidance on digital-specific quality assurance. Multiple mechanisms may coexist in a given education system.

Integrating digitalisation into school evaluation and continuous improvement

In **Italy**, the integration of digital technologies into teaching and school development is considered within the national self-evaluation process (*rapporto di autovalutazione*). Schools assess the pedagogical use of digital resources, staff competences and the digital learning environment, and they include related objectives in their three-year improvement plans. External evaluation by Italy's National Institute for the Evaluation of the Education and Training System (INVALSI) and school inspectors may examine digital aspects as part of broader quality reviews, focusing on how digital innovation contributes to teaching and learning ([201]). Digital infrastructure may also be considered through observation during evaluations, but it is not a central or questionnaire-based component of the evaluation process.

In **Latvia**, digital aspects form part of mandatory external evaluation carried out by the State Education Quality Service. Schools must develop improvement plans addressing findings from inspections or internal reviews, and progress is monitored through follow-up checks. National guidance specifies performance indicators for the effective use of digital technologies in teaching and learning ([202]).

In **Austria**, digital aspects are assessed within the national *Qualitätsmanagementsystem*. External evaluators review the implementation of digital priorities included in school development plans, and recommendations are shared with regional education boards responsible for follow-up support and monitoring. Repeated evaluation cycles encourage sustained improvement over time.

In **Poland**, digital aspects are embedded in both external pedagogical supervision and internal school evaluation. After an external inspection, the Regional Board of Education provides a report that may include findings on infrastructure, accessibility or the pedagogical use of digital resources, together with mandatory recommendations and a deadline for implementation. School leaders must report back on corrective actions, and internal supervision processes monitor progress, keeping digital priorities visible in continuous improvement cycles ([203]).

201 Italy, National Evaluation System (Sistema Nazionale di Valutazione).

202 Latvia, Guidelines for ensuring the quality of education in general and vocational education and Annex 1. Performance indicators of the implementation of educational institutions and educational programme, 11.2023.

203 Poland, Education Law Act (*Journal of Laws* 2017, item 59) and Regulation on Pedagogical Supervision (*Journal of Laws* 2024, item 15).

In **Serbia**, digital quality criteria are assessed during external evaluation and complemented by structured internal school development processes. External reviews consider the use of digital tools in teaching, communication practices and alignment with school digital priorities. Based on the findings, schools prepare a plan for improving the quality of work, which often includes professional development and technology-integration measures. Inspectorates follow up on implementation, and school development plans are adjusted to sustain progress [204].

Overall, the Eurydice evidence indicates a gradual but meaningful shift towards embedding digital dimensions within national quality assurance processes. Digital aspects – once confined mainly to infrastructure or pilot projects – are now more frequently linked to pedagogy, organisational development and data governance. However, integration remains uneven. Where monitoring, feedback and follow-up are well established, digital evaluation functions as a lever for improvement; where guidance remains limited, progress continues to depend on school initiatives or participation in short-term or project-based initiatives.

The findings also indicate that the effectiveness of quality assurance depends not only on the existence of frameworks, but on how monitoring, feedback and follow-up mechanisms are operationalised. Where evaluation processes are linked to action planning, support measures and professional development, digital quality assurance is more likely to function as a driver of improvement rather than solely as a compliance mechanism. In systems without digital-specific quality assurance provisions, progress continues to depend largely on school initiatives or participation in time-limited programmes, echoing implementation gaps identified in earlier Eurydice analysis.

Overall, the evidence presented in this section suggests that European education systems are at different stages in embedding digital aspects within quality assurance and evaluation. While governance arrangements have become more structured, the transition from strategic intent to routine evaluative practice remains a work in progress.

3.3. Conclusions

This chapter examined how European education systems guide, organise and evaluate digital education at the school level, with a particular focus on school digital planning, governance arrangements and quality assurance mechanisms. Drawing on Eurydice policy data and ICILS 2023 evidence, it explored how top-level requirements and guidance are reflected in school-level practices and how these practices are supported, monitored and reviewed.

With regard to school digital planning, the analysis shows that around one quarter of education systems require schools to adopt a digital plan/strategy or to integrate digital objectives into formal school development planning, while most others rely on non-binding guidance, templates and diagnostic tools. The ICILS 2023 data indicate that, in many systems, a majority of students attend schools with an ICT vision or plan that principals perceive as supporting the effective use of digital technologies in teaching and learning. However, differences remain across systems, both in the extent of digital planning and in its perceived effectiveness. Systems reporting mandatory requirements or more structured guidance tend to show higher uptake and more systematic reviewing of ICT plans, although patterns vary considerably, and no causal relationship can be established.

The chapter also highlights differences in how digital planning is embedded as an organisational process. Policy attention is most developed in areas related to risk management. In many education systems, mandatory requirements apply in at least one such domain, most commonly the regulated use of digital devices, often reflecting concerns about student wellbeing, concentration and safe technology use, and, in a substantial number of cases, cybersecurity and data protection. These measures are typically anchored in legislation, compulsory procedures or national regulations. By contrast, the use of digital learning resources, parental engagement and collaboration with external stakeholders are more often addressed through non-binding guidance, leaving greater scope for school-level interpretation and local initiative.

Governance arrangements for digital education are established in most education systems. The majority report at least one designated body or unit responsible for supporting schools in digital education, typically combining technical coordination with pedagogical guidance and professional development. However, the extent to which these responsibilities include quality assurance and oversight varies considerably, and such functions are often embedded within general school evaluation structures rather than addressed through digital-specific arrangements.

204 Serbia, 2018 By-law on Standards of Quality of Work of Institutions.

Quality assurance and evaluation therefore remain uneven across education systems. While digital education is included within inspection, accreditation or self-evaluation frameworks in a number of systems, approaches differ in scope. In some cases, digital practices are reviewed through structured internal and external processes linked to feedback and follow-up support; in others, evaluation remains indirect and dependent on school initiatives or participation in projects. This variation suggests that, although governance structures are in place, the systematic evaluation of digital education at the school level is still developing in many systems.

Overall, the analysis points to a gradual consolidation of governance and planning frameworks for digital education at the school level, alongside continued variation in implementation capacity, institutional coordination and evaluation practices. While device regulation, safeguards and infrastructure planning are widely addressed through binding requirements, other dimensions – such as the pedagogical use of digital learning resources, parental engagement and collaboration with external partners – are more often addressed through non-binding measures. Taken together, the evidence suggests that education systems are progressing at different speeds in integrating digital aspects within school planning, governance and quality assurance arrangements. At the same time, the findings highlight the importance of alignment between these dimensions in shaping how digital education is implemented across European education systems.

Chapter 4: Digital competence in national curricula and assessment frameworks

Navigating daily life, studying and working in a technology-driven and rapidly evolving society undoubtedly requires the development and regular updating of digital competences. Societal awareness about the importance of being digitally skilled is extremely high. In 2025, the Flash Eurobarometer 'Future needs in digital education' demonstrated widespread agreement that digital skills are essential for participation in society, to have a successful career and for learning and education (European Commission, 2025f). Moreover, more than three quarters (78 %) of respondents believe that digital skills should receive the same amount of attention at school as reading, mathematics and science.

Today, children are often exposed to technology from a young age, providing them with numerous opportunities to observe adults using digital devices or to interact with these tools themselves. As early as 2001, Prensky referred to today's students as 'digital natives', suggesting they have mastered the 'digital language of computers, video games, and the Internet' (Prensky, 2001). However, growing up in a digital world does not automatically make one competent in and confident with digital technologies. According to the 2023 International Computer and Information Literacy Study (ICILS) of the International Association for the Evaluation of Educational Achievement, 43 % of students in their eighth year of schooling (the average age being 13.5 years or above) across EU countries do not reach the CIL level 2 ([205]) of digital skills in computer and information literacy (CIL) (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2024).

European and national policies have long acknowledged the need for all citizens to develop digital competences throughout life. Digital competence has featured among the key competences for lifelong learning since the first European Recommendation on this issue published in 2006 ([206]). In 2021, the European education area strategic framework ([207]) set the ambitious goal of reducing the proportion of low achievers among 8th-grade students in CIL to less than 15 % by 2030. In 2022, the Council recommendation on pathways to school success ([208]) indicated that basic digital skills are part of basic skills; then in 2025 the Action plan on basic skills (European Commission, 2025c) explicitly extended its initiatives to improve basic digital skills. At the national level, the European education systems have continually evolved and revised their strategic policies and measures to meet the demand for high-quality digital education. This includes supporting the digital transformation of schools and ensuring equal access to digital technologies (see Chapters 1–3). Over the past decade, integrating digital education into school curricula has been a central focus of curriculum reforms in many education systems. As a result, almost all education systems foster the development of digital competence across all education levels, often recognising them as key competence (European Commission / EACEA / Eurydice, 2019).

205 Students below CIL level 2 usually require explicit step-by-step instructions to perform simple CIL actions associated with information location and communication in the digital environment.

206 Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning (OJ L 394, 30.12.2006, ELI: http://data.europa.eu/eli/reco/2006/962/oj).

207 Council Resolution of 19 February 2021 on a strategic framework for European cooperation in education and training towards the European education area and beyond (2021–2030) (OJ C 66, 26.2.2021, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2021_066_R_0001), p. 15.

208 Council Recommendation of 28 November 2022 on pathways to school success and replacing the Council Recommendation of 28 June 2011 on policies to reduce early school leaving (OJ C 469, 9.12.2022, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=oj:JOC_2022_469_R_0001), p. 1.

The European policy documents define digital competence as the confident, critical and responsible use of, and engagement with, digital technologies for learning, work and participation in society ([209]). Based on this definition, the European digital competence framework for citizens (DigComp 2.2) identified 21 competences grouped in five key areas: information and data literacy, communication and collaboration, digital content creation, safety and problem-solving (Vuorikari, Kluzer and Punie, 2022).

The ICILS, while measuring the CIL of students, refers to 'an individual's ability to use computers to investigate, create, and communicate in order to participate effectively at home, at school, in the workplace, and in society' (Fraillon, 2025). It brings together technical competence and intellectual capacity and includes four areas: understanding computer use, gathering information, producing information and digital communication. Despite slightly different formulations, DigComp 2.2 and ICILS both rely on the same key elements of digital competence such as information literacy, communication, content creation and safety. DigComp 2.2 defines competences as a combination of knowledge (concepts and facts), skills (the ability to perform tasks) and attitudes (a mindset or disposition to act), which are to be developed throughout life. Although the concept of competence is broader than that of skills, the terms 'digital competence' and 'digital skills' are often used interchangeably in EU policy documents, the ICILS and academic literature. Although the term 'digital skills' is frequently used throughout ICILS, the students' assessment framework encompasses the elements of digital knowledge, skills and attitudes (Fraillon, 2025).

Considering the abovementioned policy context, this chapter explores various aspects related to the development of digital competence within general lower-secondary education programmes (ISCED 24). The first section investigates how digital competence is incorporated into national curricula and identifies the required starting grade for teaching digital skills. It also provides an overview of competence areas included in national curricula, with particular focus on the digital skills related to understanding and using of technologies driven by artificial intelligence (AI). The analysis is complemented by information from the ICILS survey on where students are most likely to acquire some skills related to information and communications technology (ICT) and the internet, either in the classroom or outside the school.

The second part of the chapter explores top-level assessment frameworks to identify whether they include any requirement or recommendations regarding the assessment of students' digital competences. In particular, it looks at the existence of national/standardised tests assessing the digital competences of lower-secondary education students.

The analysis focuses on general lower-secondary education (ISCED 24), which is a part of compulsory formal education in all European education systems. This period is essential for developing key competences. The ISCED 24 programmes typically enrol students aged 10 to 15 years old, and the duration of these programmes can range from three to six years (European Commission / EACEA / Eurydice, 2025b). This variation should be considered when comparing different education systems. The indicator on compulsory starting grade to teaching digital competence covers ISCED levels 1, 24 and 34.

4.1. Digital competence in school curriculum

Students can develop digital competences and acquire new skills through various pathways: formal education and training, extracurricular activities, family experiences and experimenting with technology on their own. Nevertheless, school education undeniably plays a crucial role in laying the foundations for the development of digital competence, while also providing equitable access to digital technologies for teaching and learning (see Chapter 2). In 2023, the Council Recommendation on improving the provision of digital skills and competences in education and training further emphasised the need to '[f]urther strengthen the provision of digital skills and competences in school education and [vocational education and training]' ([210]).

One way to address the extent of the provision of digital skills to students is by examining national curricula. The curriculum serves as the primary top-level policy document that outlines a structured plan for what students are expected to learn and achieve at each stage of their education. It provides a framework for teaching and learning, ensuring that learning objectives are consistently met across various grades and subjects. National curricula may include learning content, learning objectives, attainment targets, syllabus and assessment guidelines, and it may be published in any type and in any number of official documents. More than one

209 Council Recommendation of 22 May 2018 on key competences for lifelong learning (OJ C 189, 4.6.2018, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)), p. 9.

210 Council Recommendation of 23 November 2023 on improving the provision of digital skills and competences in education and training (OJ C, 2024/1030, 23.1.2024, ELI: http://data.europa.eu/eli/C/2024/1030/oj), p. 6.

type of curriculum document may contain provisions relating to digital education, and these may impose different levels of obligations for schools to comply, depending on whether they are regulations or recommendations (e.g. guidelines). Whatever the level of obligation, the curriculum establishes the basic framework around which schools develop their teaching and learning.

This section presents an analysis of national curricula to demonstrate how digital competence is integrated into school education, highlighting the specific competence areas. It does not consider curricula developed by individual schools or local education authorities.

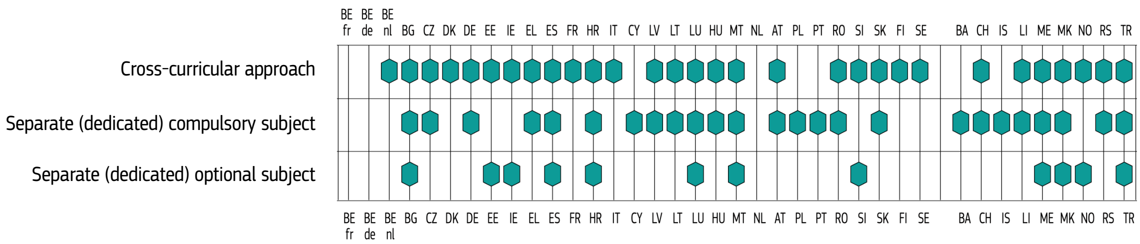
4.1.1. Curriculum approaches to teaching digital competence

This section looks at the structure of the national curricula to determine how digital competences are expected to be taught. Digital competence can be incorporated into the school curriculum in different ways. One of the possibilities is to teach it as a separate dedicated subject that can be compulsory for all students, or it can be an optional subject from which only some students would benefit. Digital competence can also be defined as a cross-curricular theme. This means that educational content and objectives related to digital competence are understood to be cross-cutting and therefore expected to be taught across all subjects and curriculum activities. In 2023, the Council Recommendation on improving the provision of digital skills and competences in education and training suggested expanding the cross-curricular approach for the provision of digital skills and competences, to '[f]oster an interdisciplinary approach that integrate[s] the development of digital skills and competences across different subject areas, especially within science, technologies, engineering, art and mathematics (STEAM) education' (211).

The curricular approaches to teaching digital skills outlined above may be combined in different ways. For example, some digital skills may be taught through a cross-cutting approach across all subjects, while others may be taught within a single, dedicated subject or through several subjects.

Figure 4.1 shows that digital competence is widely integrated into national curricula for lower-secondary education, with most education systems employing multiple approaches to achieve effective integration. The French Community of Belgium has recently integrated digital education into the updated curriculum across all education levels. In lower-secondary education, the implementation of this curriculum starts in the 2026/2027 school year. Similarly, the German-speaking Community of Belgium has incorporated information and media literacy as a cross-curricular competence area within its updated educational frameworks, applicable to all levels of education. Its implementation is planned for 2028/2029 school year. In the Netherlands, the core objectives for digital literacy have been recently piloted in schools.

Figure 4.1: Curriculum approaches to teaching digital competence, ISCED 24, 2024/2025



Source: Eurydice.

Explanatory notes

This figure displays different approaches to integrating digital competences into the curriculum. **Cross-curricular** approach means that digital competences are expected to be taught in a cross-cutting way (i.e. across all subjects in the curriculum). **Separate (dedicated) compulsory subject** means that the subject dedicated to digital education is compulsory for all students. **Separate (dedicated) optional subject** means that the subject is offered in certain education pathways or school types and therefore is compulsory only for some students.

The figure provides a general picture of curriculum approaches in general lower-secondary education (ISCED 24) and does not make any distinction between grades. This means that one or another curriculum approach may apply for all or some grades within the ISCED 24 level.

Annex 3 includes the names of the subjects dedicated to digital competences both in national languages and translated in English.

211 Council Recommendation of 23 November 2023 on improving the provision of digital skills and competences in education and training (OJ C, 2024/1030, 23.1.2024, ELI: http://data.europa.eu/eli/C/2024/1030/oj), p. 7.

Country-specific notes

Germany: The standing conference strategy 'Education in the digital world', which can be considered the national curriculum for primary and lower-secondary education, mandates integrating digital competences across all subjects. Owing to the German federal structure, the responsibility for implementing digital education concepts for students falls to the individual federal states. The specific design of curricula and lesson content for general secondary education schools is not coordinated by the standing conference. Instead, it is managed by the *Länder* ministries of education and cultural affairs, which determine how to integrate the competences outlined in the 'Education in the digital world' strategy into the framework curricula.

Spain: In addition to the subjects set in the national curriculum, autonomous communities can create and include other subjects (compulsory or optional) in their curricula. For example, in Valencia, the subject 'programming, AI and robotics' is an optional subject in the second and third years of compulsory secondary education (grades 8 and 9).

Portugal: While official documents do not explicitly designate digital competence as a cross-curricular area, lower-secondary schools and teachers are encouraged to develop students' digital competences in a cross-cutting way. For instance, the guidelines for integrating digital education laboratories into the classroom encompass both discipline-specific and interdisciplinary learning scenarios.

As shown in Figure 4.1, the cross-curricular approach is the most prevalent way of teaching digital competence. In Cyprus, Poland, Portugal, Bosnia and Herzegovina, and Iceland, the steering documents do not explicitly mandate a cross-curricular approach to teaching digital competence at the lower-secondary education level, although they may recommend it, as is the case in Portugal. Instead, the development of digital competences is primarily facilitated through dedicated subjects. In the Flemish Community of Belgium and in Denmark, France, Italy, Finland and Sweden, the only way to teach digital competence at ISCED 24 is by following a cross-curricular approach. Denmark, however, is undergoing changes in its curricular approach to teaching digital competence. During the 2024/2025 academic year, the information technology and media theme was still being integrated across all compulsory subjects in primary and secondary schools. However, following curriculum reforms in 2025, this cross-curricular approach will be discontinued. Instead, a new theme called 'technological comprehension' will be developed and integrated into existing subjects at certain grades only. Moreover, this theme will be offered as an optional subject at the lower-secondary level starting in the 2027/2028 academic year. In Cyprus, current curriculum reforms are focused on integrating digital skills across curricula at both lower- and upper-secondary education levels.

Although digital competence is understood as a cross-cutting competence in most education systems, official documents refer to it in diverse ways. In some education systems, digital competence is explicitly stated as an overarching teaching principle, a key competence, an educational aim, a pillar or an essential element. For example, in Sweden, developing digital competences is clearly defined as part of the 'mission of the school'. In Czechia, Estonia, Spain, France, Croatia, Italy, Lithuania, Hungary, Romania, Slovenia, Liechtenstein, Montenegro, Serbia and Türkiye, digital competence is outlined in the national curriculum as one of the key competences to be taught in a cross-curricular manner, while in Norway, digital skills are considered one of five basic skills. In Slovakia, the development of digital competences is one of the main objectives of the education and training, with digital literacy recognised as one of the basic skills.

In some other countries, national education programmes refer to certain areas of digital competence or include some components of digital competence in the other, broad, cross-curricular areas. For example, in Latvia and Türkiye, the curriculum emphasises digital literacy as a cross-cutting competence. In Finland, curricula prescribe teaching ICT skills across all curricular subjects and activities. Digital competence as a cross-curricular theme is also referred to as 'digital and media literacy' (in Bulgaria), 'information and media literacy' (in France), 'information technology and media' (in Denmark), 'digital culture' (in Hungary), 'media literacy' (in Austria) and 'media education' (in Slovakia). In Ireland, eight key skills are embedded in all subjects in the Junior Cycle curriculum, some of which include elements of digital competence, such as the use of technology and digital media for learning and communication and for collaborative and ethical thinking.

A cross-curricular approach to teaching digital competence offers numerous advantages. It allows for the integration of related skills such as data evaluation and management, digital communication and collaboration, and awareness of safety and ethical concerns across all subjects and activities. This holistic approach ensures that students develop essential competences in a seamless manner throughout their education. However, certain digital skills – such as programming, content development, technical problem-solving and the use of specific digital tools and technologies – could be better suited to disciplines like mathematics, science, technology or engineering.

The analysis shows that eight education systems ([212]) that promote digital competence through a cross-curricular approach have explicitly integrated certain digital skills into mathematics. In Bulgaria, France, Italy and Sweden, the inclusion of digital technologies within technology-related subjects also contributes significantly to the development of digital skills. Natural sciences are frequently cited as another key area for integrating digital competences. For instance, France, Malta, Latvia, Slovenia, Finland and North Macedonia have embedded digital skills within various sciences subjects, including biology, chemistry, physics and geography.

Cross-curricular approach to teaching digital competences in France

Digital competence is integrated into the common core of knowledge, skills and culture. For example:

in the **mathematics curriculum**, there is an emphasis on using dynamic geometry software, spreadsheets and programming with Scratch;

in **geography**, students are introduced to the principles of cartography and digital imagery.

In addition to a cross-curricular approach, in around three quarters of education systems (29), digital competence is taught as a separate subject, compulsory for all students or optional. While the collected information does not allow for a deep analysis of the content within dedicated subjects, some insights can be gained from their names. In many countries where digital competence is taught as a separate subject, the focus is on informatics. Various terms are used to refer to this discipline, including 'informatics' (Czechia, Estonia, Greece, Croatia, Lithuania, Luxembourg, Poland, Romania, Slovakia, Bosnia and Herzegovina, Switzerland, Liechtenstein, Montenegro, North Macedonia and Serbia), 'computing' (Cyprus and Malta), 'computer science' (Germany and Latvia) and 'information technologies' (Bulgaria). Some countries also focus on specific areas of informatics while offering optional subjects or short courses, such as 'coding' in Ireland and Türkiye, 'programming' in Montenegro and Norway, and 'AI applications' in Türkiye. In contrast, other countries use titles emphasising a broader approach to digital education, such as 'ICT', 'digital education', 'digital science', 'media literacy', 'media education', 'digital culture' and 'digital basic education' (see Annex 3).

Twenty-five education systems teach digital competence through a separate subject compulsory for all students. Eight of them ([213]) offer also a separate optional subject. In Bulgaria, the subject 'computer modelling and information technologies' is compulsory for all students. Additionally, students seeking to deepen their knowledge and skills can opt to attend extra classes in the same subject. A similar approach is taken in Montenegro, North Macedonia and Türkiye, where compulsory stand-alone subjects dedicated to informatics coexist with optional subjects that focus on developing skills in specific areas of informatics education. These optional subjects are 'programming' in Montenegro and North Macedonia, and 'AI applications and robotic coding' in Türkiye. In organising their curricula, Spain, Luxembourg and Malta distinguish between digital education and informatics education. All students are required to take the stand-alone compulsory subjects focused on the development of digital competences – 'digital science' in Luxembourg and 'ICT' in Malta. Meanwhile, subjects dedicated to informatics in Luxembourg and computing in Malta are offered as elective. Conversely, in Spain, the subject 'technologies and digitalisation' is mandatory, while 'digital education' as a subject remains optional. In Croatia, 'informatics' is compulsory for grades 5–6 in lower-secondary education but becomes an elective in grades 7–8.

In Estonia, Ireland, Slovenia and Norway, digital competence taught through a separate subject is offered only in certain education pathways or schools. In all these countries but Ireland, elective subjects are dedicated to informatics education. Ireland offers two optional short courses: 'coding' and 'digital literacy'. Slovenia plans to introduce in the 2028/2029 academic year a new 'informatics and digital technologies' subject, which will be mandatory for all students in grade 7.

Although the analyses in this section focus on the most common curriculum approaches, some countries provided other inspiring examples of the integration of digital competences into general lower-secondary education (see box).

212 France, Latvia, Slovenia, Finland, Sweden, North Macedonia, Serbia and Türkiye.

213 Bulgaria, Spain, Croatia, Luxembourg, Malta, Montenegro, North Macedonia and Türkiye.

Integration of digital competences into general lower-secondary education

In **Greece**, digital competence is incorporated into the national curriculum not only through the subject of 'informatics', compulsory for all students, but also through two programmes: skills labs (*Εργαστήρια Δεξιοτήτων*) and actions for active citizens (*Δράσεις Ενεργού Πολίτη*).

Although these programmes are not solely dedicated to digital education, both play a significant role in integrating digital competences into the broader educational framework in Greece.

Skills labs (*Εργαστήρια Δεξιοτήτων*) are part of the weekly schedule in all compulsory education schools, including at the pre-primary, primary and secondary levels. These labs aim to develop students' soft skills, life skills and proficiencies in technology and science. Within the skills labs, digital competences are fostered through modules focusing on basic digital literacy, safe and responsible internet use, an introduction to coding and computational thinking, and the use of digital tools for collaboration and problem-solving. These modules are designed to be interdisciplinary, enabling students to apply digital skills across various subjects and in real-life scenarios.

Another programme illustrates the interconnectedness of key competences, including digital literacy and civic education.

Actions for active citizens (*Δράσεις Ενεργού Πολίτη*) aims to enhance digital competences by encouraging the use of digital platforms for community engagement and activism. It teaches students to critically evaluate digital information concerning social and environmental issues and promotes digital storytelling and content creation to advocate for sustainable practices. These activities are designed to help students become informed digital citizens, capable of effectively participating in democratic processes and driving societal change.

Overall, the analysis indicates that digital competence is extensively integrated into lower-secondary education curricula across Europe. Most countries recognise digital competence as a cross-curricular theme while also providing a distinct subject specifically dedicated to the development of digital skills.

4.1.2. Compulsory starting grade

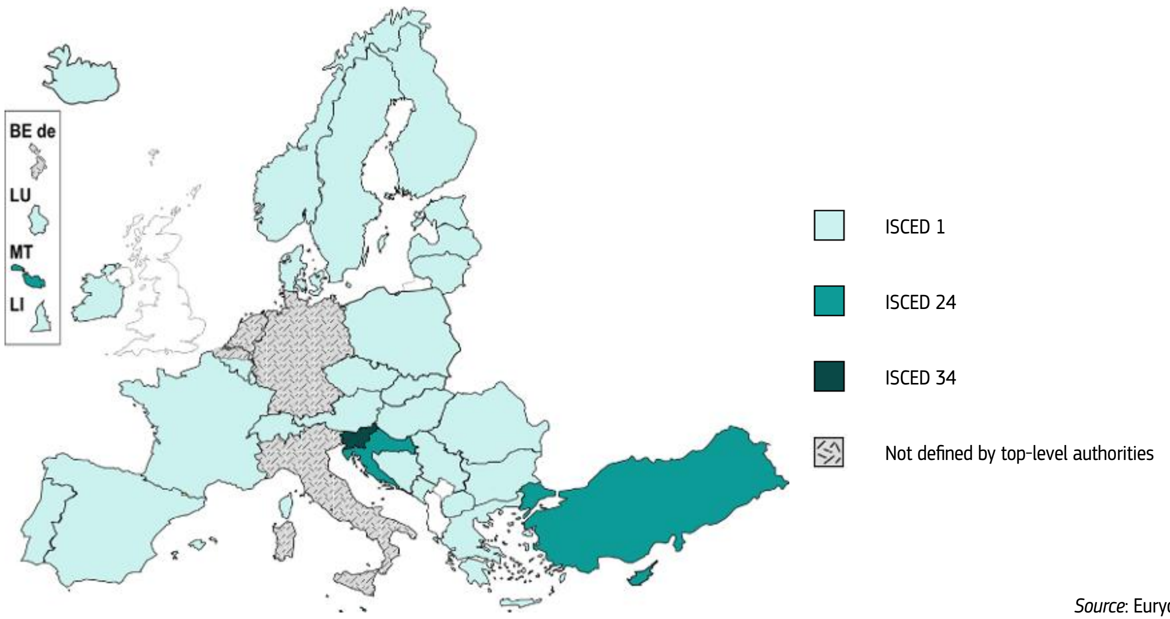
The digitalisation of education raises the question of the most appropriate starting age for introducing digital literacy education. The 2023 OECD study emphasises that engaging children in digital literacy early is vital for bridging the digital skills divide (OECD, 2023a). The Council Recommendation on enhancing the provision of digital skills and competences in education and training advocates for introducing age-appropriate educational activities starting from pre-primary education ([214]).

While some elements of digital education can be incorporated into preschool curricula, the compulsory school education period is the most crucial phase for building a strong foundation in students' key competences, including digital competences. Although compulsory education in some countries begins at the preschool level (ISCED 0), this discussion is focused on school education ranging from ISCED 1 to ISCED 34.

Figure 4.2 shows that in most education systems top-level authorities regulate the point of the educational process in compulsory school education at which schools have to start teaching digital competences.

214 Council Recommendation of 23 November 2023 on improving the provision of digital skills and competences in education and training (OJ C, 2024/1030, 23.1.2024, ELI: http://data.europa.eu/eli/C/2024/1030/oj), p. 6.

Figure 4.2: Compulsory starting level for teaching digital competence, ISCED 1–34, 2024/2025



Source: Eurydice.

ISCED levels and grades at which the compulsory teaching of digital competence starts

	BE fr	BE de	BE nl	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU
ISCED level	1	(-)	(-)	1	1	1	(-)	1	1	1	1	1	24	(-)	24	1	1	1	1
Grade	3	(-)	(-)	3	4	1	(-)	1	1	1	1	1	5	(-)	7	3	1	1	4
	MT	**NL**	**AT**	**PL**	**PT**	**RO**	**SI**	**SK**	**FI**	**SE**	**BA**	**CH**	**IS**	**LI**	**ME**	**MK**	**NO**	**RS**	**TR**
ISCED level	24	(-)	1	1	1	1	34	1	1	1	1	1	1	1	1	1	1	1	24
Grade	7	(-)	(-)	1	1	1	10	3	1	1	1	5	(-)	1	5	1	1	1	5

(-) = not defined by top-level authority / school autonomy.

Country-specific notes

Belgium (BE de): The guidelines for teaching information and media literacy suggest starting to incorporate elements of digital education at the ISCED 0 level, which refers to early childhood education and care.
Denmark: Primary education (ISCED 1) covers grades 0–6. Grade 0 corresponds to grade 1 in the table.
Cyprus: A curriculum reform is under way with the goal of enhancing the compulsory teaching of digital competences. The initiative plans to introduce digital education to all students, beginning at ISCED level 1.
Romania: Primary education (ISCED 1) covers grades 0–4. Grade 0 in the Romanian system corresponds to grade 1 in the table.
Slovenia: Following the ongoing curriculum reform in primary and secondary education, teaching digital competences will be mandatory from year 1 at the ISCED 1 level, starting in the 2026/2027 school year.
Slovakia: In the 2026/2027 academic year, digital literacy will be introduced as a cross-curricular theme, starting from the 1st grade of primary education.

According to the information displayed in Figure 4.2. and in the accompanying table, in most education systems, where top-level authorities regulate the starting point for compulsory digital education, the teaching of digital competences for all students begins at the primary education level (ISCED level 1). In 18 education systems, this is done as early as in grade 1, while in eight countries this happens several grades later in primary education: grade 3 in Belgium (French Community), Bulgaria, Latvia and Slovakia; grade 4 in Czechia and Hungary; and grade 5 in Switzerland and Montenegro. Croatia and Türkiye also start compulsory teaching of digital competences in grade 5, which, however, is part of ISCED 24. In Cyprus and Malta, top-level education authorities set the compulsory starting grade at ISCED level 24 in grade 7.

Finally, in the remaining seven education systems, top-level education authorities have not established a mandatory starting grade for teaching digital competences to all students. In the Flemish and German-speaking Communities of Belgium and in Germany, Italy and the Netherlands, the decision regarding the starting education level and grade is taken at the school, local or regional level. In Austria and Iceland, digital competences must be developed starting from primary education (ISCED 1). However, schools have autonomy to determine in which grades this competence is taught.

4.1.3. Digital competence areas

This section examines whether key areas of digital competence, as defined in DigComp 2.2, are explicitly incorporated into national curricula. As mentioned previously, DigComp 2.2 identifies 21 competences grouped in five key areas (information and data literacy, communication and collaboration, digital content creation, safety and problem-solving) (Vuorikari, Kluzer and Punie, 2022). Then, the section shows the students' perceptions regarding learning about ICT and some internet-related tasks in and outside school. The last part examines whether and how national curricula are keeping pace with the rapid advancement of technologies and the resulting need to integrate AI-related digital skills.

The data collected through Eurydice reveal that, in every education system where digital competence is a part of the general secondary education curriculum, all five key competence areas outlined in the DigComp 2.2 are included in the curricula. Slovenia is the only exception, as its curriculum does not explicitly reference the 'problem-solving' area. This supports the conclusions of the 2019 *Digital Education at School in Europe* report, which indicated that most European education systems explicitly incorporate learning outcomes related to all five digital competence areas into their national curricula for general lower-secondary education (European Commission / EACEA / Eurydice, 2019).

4.1.3.1. Learning about ICT- and internet-related tasks in and outside school

Overall, students are expected to develop digital competences within the school environment, as evidenced by Eurydice data indicating that national curricula have been designed and updated to facilitate this development (see Section 4.1.1). However, with the rapid digitalisation of society, students have ample opportunities to explore various ICT- and internet-related topics beyond the classroom, such as at home or through participation in extracurricular activities.

The ICILS survey offers insight into students' perceptions regarding learning some ICT- and internet-related tasks both in and outside schools. Figure 4.3 displays the percentage of students who responded that they had acquired three internet-related competences to a moderate or large extent at school and/or outside school. These competences are:

- assessing reliable information on the internet;
- managing privacy settings for internet accounts and ICT devices;
- responsible social media usage (including the use of images and personal information).

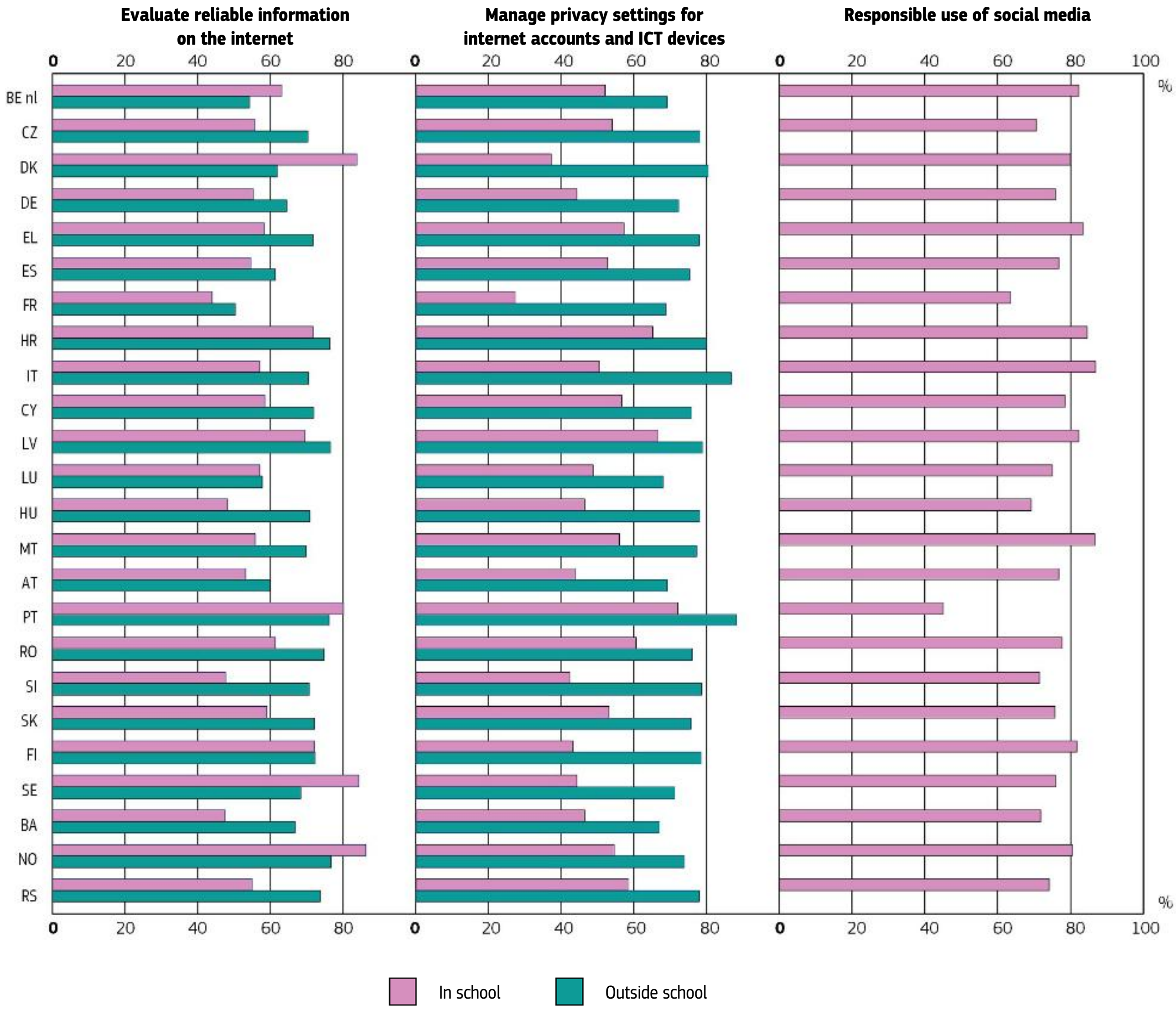
For many adults and young people, the internet has become an important source of information and a hub for social media interaction. It offers multiple opportunities for learning and communication, but it also presents several risks, including cyberbullying, online scams, misinformation, inappropriate content and personal data theft. Using the internet safely and responsibly requires individuals to develop the ability to evaluate reliable information, manage privacy settings for online accounts and ICT devices, and use social media cautiously and responsibly. These skills are typically expected to be developed within a classroom environment. However, as shown in Figure 4.3, students' perceptions may differ from these expectations.

According to ICILS survey, the majority of students (50 % or more) report having developed skills on evaluating the reliability of online information and using social media responsibly at school across most participating education systems (in 20 out of 25 education systems for the first item and in 24 out of 25 education systems for the second item). The percentage exceeds 80 % in Denmark, Norway, Sweden and Portugal for assessing the reliability of online information, and exceeds 80 % in Italy, Malta, Croatia, Greece, Latvia, the Flemish Community of Belgium, Finland, Norway and Denmark for using social media responsibly.

Conversely, the school environment appears to be a less common place for students to learn how to manage privacy settings for internet accounts and ICT devices. The majority of students (50 % or more) reported learning about managing privacy setting in schools in 14 out of 25 education systems only.

Overall, the out-of-school environment appears to offer several learning opportunities for developing both the competence to manage privacy settings and the competence to evaluate the reliability of online information. Regarding the latter, in nearly all education systems (in 24 out of 25), the majority of respondents (50 % or more) reported having opportunities to learn how to evaluate reliable information outside school. Learning outside school is even substantial for managing privacy settings: more than 60 % of students reported learning such skills at least to a moderate extent outside school in all participating education systems. Moreover, in all countries, a larger proportion of students indicated that they learnt managing privacy settings for internet accounts and ICT devices outside school than in the school environment.

Figure 4.3: Percentage of grade 8 students learning ICT- and internet-related items in and outside school at least to a moderate extent, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

The first two columns are based on question Q20a of the ICILS student questionnaire ('To what extent have you learnt how to do the following internet-related tasks at school and outside of school?'), option (c) 'Evaluate the reliability (trustworthiness) of information on the internet' and option (f) 'Manage privacy settings for internet accounts and ICT devices (e.g. control who can contact you and what information about you is shared with advertising companies)'.

The third column reflects data related to in-school learning only and is based on question Q20c of the ICILS student questionnaire ('To what extent have you learnt about the following topics at school?'), option (a) 'Responsible and respectful use of social media (including the use of images and personal information)'.

The percentages include students who responded either 'to a large extent' or 'to a moderate extent'. Please consult the Statistical tables for the exact percentages, for the relative size of the two subgroups and for the standard errors.

Country-specific note

Netherlands: Not depicted in the figure due to low participation rates. However, percentages are presented in the Statistical tables.

4.1.3.2. Artificial-intelligence-related competences in the national curricula

With the rapid advancement of technology and the resulting need for new skills to engage confidently, critically and safely with AI systems, DigComp 2.2 ([215]) outlines the essential requirements for citizens interacting with these systems. The requirements are structured around three areas: knowledges, skills and attitudes. The knowledge component involves understanding what AI systems are, along with their benefits, limitations and challenges. The skills section focuses on the abilities needed to use AI systems, such as interacting with, configuring, supervising and adapting AI systems. The attitudes element encompasses human agency, control, and critical and ethical considerations involved in AI usage. Moreover, the European Commission and OECD have developed an AI literacy framework for primary and secondary education. The framework outlines 22 competences across four main domains: engage with AI, create with AI, manage with AI and design with AI (OECD, 2025a).

At the international level, the United Nations Educational, Scientific and Cultural Organization (UNESCO) AI competency framework for students (UNESCO *et al.*, 2024) provides a global reference model for AI-related competences. This framework identifies four essential elements of AI competence for students: a human-centred mind, ethics of AI, AI technics and applications, and AI design.

All the abovementioned frameworks emphasise the importance of understanding the benefits and risks of AI-driven and other emerging technologies. They advocate for the ability to use these technologies safely and responsibly, while also fostering a critical and ethical attitude towards their use. In this report, both DigComp 2.2 and the UNESCO framework have served as reference points for Eurydice data providers and analyses.

Figure 4.4 highlights the education systems where national curricula reference AI-related competences.

Figure 4.4: Competences related to AI in national curricula, ISCED 24, 2024/2025

Source: Eurydice.

215 DigComp 3.0, published in 2025, provides a more systematic and cross-cutting integration of AI across the framework. Available at https://op.europa.eu/en/publication-detail/-/publication/d1ed6c89-cb9c-11f0-8da2-01aa75ed71a1/language-en.

Figure 4.4 shows that around one third of the education systems (12) have integrated AI-related competences into their national curricula, predominantly in western and southern Europe.

In nine countries ([216]), AI-related learning outcomes, varying in detail, are integrated into subjects specifically dedicated to digital education. The inclusions of comprehensive and detailed learning outcomes related to AI-driven technologies and emerging technologies appears to be closely associated with the provision of an informatics subject, whether compulsory or optional. This indicates that the competences related to AI-driven technologies are generally taught within distinct disciplines focused on informatics or information technologies.

In Estonia, Greece, Spain, Lithuania and Luxembourg, the informatics curriculum encompasses fundamental learning outcomes related to the understanding and the application of emerging technologies including AI, its risks and its benefits. In Lithuania, the informatics curriculum establishes learning objectives assessing the reliability and privacy of data and information generated by AI, understanding AI applications, and recognising its benefits and potential risks. Additionally, the curriculum covers the ethical, legal and social principles associated with AI usage and examines key national and EU legislation governing the use of AI in education, the arts and other sectors. In Spain, AI-related competences are incorporated into the 'technology and digitalisation' subject across two competence areas: algorithms and software development and the responsible and ethical use of technologies. The curriculum outlines the following competences: developing an understanding of the foundations of emerging technologies including AI, assessing the eco-social conditions and impact of technological development, and evaluating the challenges and risks associated with the implementation of AI-related technologies. In Greece, the informatics curriculum currently includes foundational knowledge of AI. However, a comprehensive update is being planned to align the curriculum with DigComp 2.2 and the UNESCO framework. In Luxembourg, both digital sciences and informatics subjects incorporate several AI-related components. These include raising awareness of AI's presence in daily life, exploring its applications and functions, examining the human factor, and addressing the moral and ethical considerations of generative AI technologies.

In Cyprus, competences related to the safe and responsible use of AI were originally part of the ISCED 34 curriculum. Since the beginning of the 2024/2025 academic year, AI-related competences have been incorporated into the ISCED 24 level within the subject 'computing' and are subject to evaluation. Recognising that computing is a continually evolving field, long-term plans include expending the range of AI competences covered, contingent upon the availability of instruction time (see box).

Competences related to artificial intelligence in national curricula in Cyprus

First-year objectives

Recognition of AI systems in daily life

- State the basic characteristics of an AI system.
- Identify the main categories of AI systems based on their technological approach.
- State the main application categories of AI systems.
- Identify and classify examples of AI systems from daily life and human activity in general.

Third-year objectives

Use of AI as learning tool

- Formulate prompts for an AI system.
- Evaluate the results and rephrase/refine the prompt.
- Use the capabilities of an AI system to solve a problem (e.g. code generation).
- Compare the solution provided by the AI system with their own and critically comment on both solutions.

In Türkiye, an optional course on AI application is available at the ISCED 24 level. Furthermore, AI-related learning content is also incorporated in other subjects such as mathematics.

In Austria and Iceland, some aspects of AI are incorporated into separate compulsory subjects that focus on the development of digital skills. In Austria, within the 'digital literacy' course, 7th-grade students develop the ability to explain how AI governs various software and physical systems, while 8th-grade students are encouraged to reflect on AI's limitations and possibilities. In Iceland, the 'information and technology' curriculum focuses on the understanding and using of AI in an ethical and respectful manner.

216 Estonia, Greece, Spain, Cyprus, Lithuania, Luxembourg, Austria, Iceland and Türkiye.

In Germany and France, AI-related skills are not specified as learning outcomes for specific subject or areas. Instead, they are embedded in top-level policy documents on digital education guiding lower-secondary programmes, forming part of broader digital teaching and learning objectives. In both countries, these objectives emphasise understanding and the responsible use of AI-driven technologies. Additionally, Germany's Recommendations for education administration on handling AI in school education processes highlights the ethical dimension of AI interactions. Similarly, In France, the digital strategy for education for 2023–2027 supported by the usage framework identifies cybersecurity and ethics of AI as key competences to be acquired in secondary education. In Italy, the AI-related skills are integrated in the guidelines for teaching citizenship education (*Linee guida per l'insegnamento dell'educazione civica*) with the focus on the opportunities and challenges presented by AI.

Some education systems have been progressively introducing appropriate AI-related skills in curricula. This is the case, for example, in Czechia and Slovakia. Both countries have recently started integrating AI-related skills into their education curricula. In Czechia, the Ministry of Education, Youth and Sports has approved a revised framework educational programme for basic education that incorporates AI competences. This new curriculum will be gradually implemented from 2028 to 2032, covering all grades of ISCED 1–24. Slovakia has introduced a new curriculum for general lower-secondary education, approved in 2023, which includes a standard on AI, and its possibilities and limitations, within the informatics subject. The first schools began adopting this curriculum in the 2023/2024 school year, with a full roll-out required by the 2026/2027 school year. Meanwhile, in Ireland, explicit reference to AI has been included in updated specifications for the short courses in coding and digital media literacy, which will be rolled out in schools in September 2026.

Croatia is currently piloting two new curricula titled 'artificial intelligence: from concept to application', with one tailored for extracurricular activities and the other designed as an optional subject (see box).

Introducing competences related to artificial intelligence in national curricula: pilot projects in Croatia

In 2024, as part of the 'application of artificial intelligence-based digital technologies in education' project, two new curricula have been developed under the title 'artificial intelligence: from concept to application'. One curriculum is designed as an extracurricular activity for basic schools, and the other as an elective subject for secondary schools. Regular implementation of the curricula for extracurricular activities and elective subject will begin in the 2025/2026 school year and continue until the end of the project (August 2029).

The new curricula are designed around two interrelated areas, which include the following elements:

1. the application of AI and emerging technologies, including:

(a) an understanding of AI and emerging technologies;

(b) the development and progress of AI;

(c) the use of AI-based tools, especially for personal learning;

(d) the creation of simple digital content using AI;

2. the safe and responsible use of AI and emerging technologies, including:

(a) valuing wellbeing and critical thinking in the context of AI, including understanding the impact of digital technologies and AI on social and personal development;

(b) recognising rules of behaviour in the digital environment, especially in the context of AI;

(c) valuing online safety, with an emphasis on reducing the risks associated with using AI;

(d) recognising and preventing cyberbullying;

(e) recognising and applying copyright when using content created by AI.

Portugal established the Working Group on Digital and AI in Education, which has been working to integrate AI-related competences into their national curricula, while in Malta, discussions are ongoing about the need to incorporate AI-related competences into their national curricula. In Malta, following the launch of the digital education strategy for 2024–2030 and discussions on age-specific digital competences, a consensus was reached to integrate AI into the ISCED 24 curriculum.

The analysis of various examples of AI integration into national curricula reveals a common consensus on the essential AI-related competences. These include understanding of AI-driven technologies, recognition of their benefits and risks, having an ability to use and even design such technologies, and addressing all safety and ethical considerations.

4.2. Assessing students' digital competences

Student assessment is an integral component of the teaching and learning process. It encompasses a variety of instruments and methods, each serving distinct purposes, such as evaluating individual student achievements or assessing the performance of entire schools or educational systems. Assessments can be administered at the school level, take the form of national tests or involve international evaluations, such as ICILS. By measuring student achievements, assessments provide insights into learning progress, help in identifying potential learning gaps and thereby enhance the overall teaching process.

Student assessment can be ongoing or conducted at the conclusion of an instructional period, such as a semester or academic year, and serves both formative and summative purposes. Formative assessment is an integral component of the classroom learning process performed by teachers throughout the school year. Through this approach, teachers assess student performance, either formally or informally, to identify learning needs, track academic progress and provide feedback. This feedback helps students recognise their strengths and pinpoint areas in need of improvement. In some countries, student self-assessment has been introduced as a component of formative assessment. This relatively new concept empowers students to evaluate their own performance, gaining feedback and guidance for enhancement. On the other hand, summative assessment is traditionally associated with grading, marking or certification. It aims to evaluate student learning at the end of an instructional unit by comparing achievements against established standards, benchmarks or learning outcomes, typically taking the form of tests or examinations. Both types of assessments have their own advantages and disadvantages and, ideally, should be combined and tailored to fit their intended purpose.

The evaluation process is typically regulated by specific legislative acts, national curricula or stand-alone assessment frameworks that outline the core principles of assessment. These legislative documents may define the objectives of assessment, mandate or suggest approaches and methods, enumerate the competences or learning outcomes to be evaluated, establish assessment criteria and determine the grading systems for students. The guidelines related to student assessment can be either mandatory or advisory in nature.

Including digital competence in assessment frameworks would signify recognising its importance on a par with traditional subjects like mathematics and science. In 2023, the Council Recommendation on improving the provision of digital skills and competences in education and training highlighted the importance of keeping track of progress in developing digital skills and promoted 'the cross-curricular assessment of digital skills with a mean and frequency comparable to the assessment of other basic skills' ([217]).

This section begins by examining the overarching documents that shape the educational process to determine whether digital competence is explicitly required or recommended for assessment in general lower-secondary education. In addition, it identifies whether these documents enumerate the competences, specify assessment criteria, and establish assessment tools or mechanisms. The final part explores the inclusion of digital competence in national standardised tests.

4.2.1. Assessment frameworks for students' digital competence

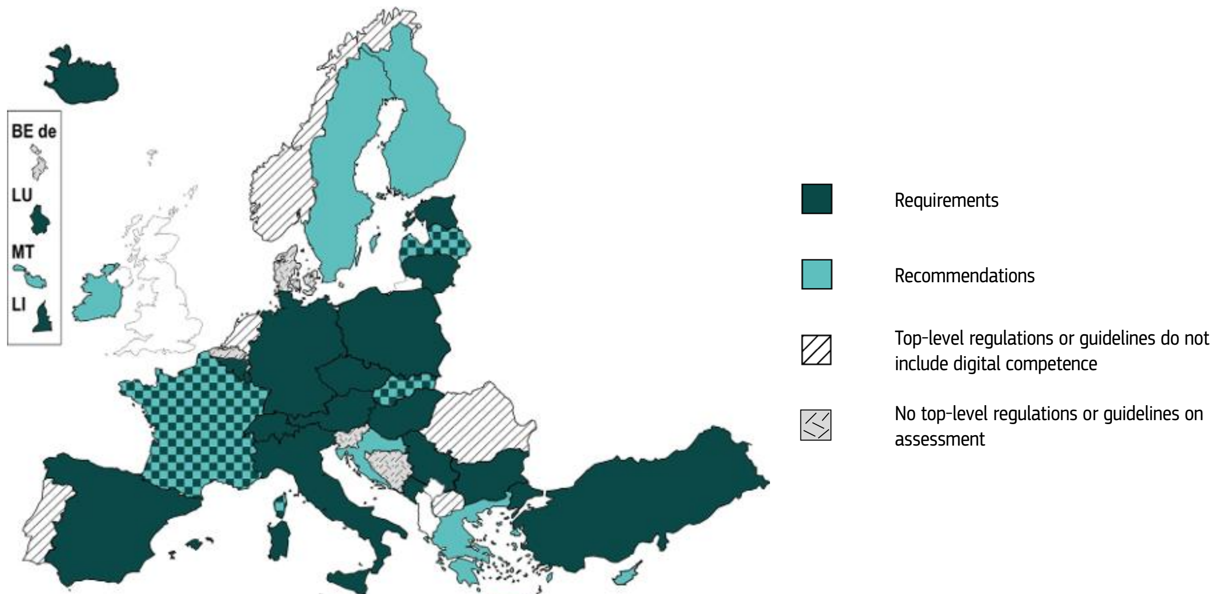
As demonstrated in Section 4.1.1, digital competence can be incorporated into school curricula as a cross-curricular theme, as a stand-alone dedicated subject or through a combination of both approaches. The complexity of curricular organisation is mirrored in the intricacy of assessment frameworks.

Generally, students are assessed based on the learning outcomes specified in the curricula. This principle tends to extend to digital competences, meaning that when digital competences are included in the curricula, students are expected to be evaluated on their achievements related to these competences.

The following analysis provides an overview of how digital competence is integrated into national assessment frameworks. It does not explore the differentiation between grades within ISCED 24, nor does it consider the context in which these competences should be assessed, such as whether they should be evaluated as part of a separate subject or integrated as a cross-curricular theme. The table below the figure outlines the specific assessment provisions specified by these top-level regulations or recommendations.

217 Council Recommendation of 23 November 2023 on improving the provision of digital skills and competences in education and training (OJ C, 2024/1030, 23.1.2024, ELI: http://data.europa.eu/eli/C/2024/1030/oj), p. 7.

Figure 4.5: Assessment frameworks for students' digital competence, ISCED 24, 2024/2025



Source: Eurydice.

Provisions set in top-level regulations/recommendations

	BE fr	BE de	BE nl	BG	CZ	DK	DE	EE	IE	EL	ES	FR	HR	IT	CY	LV	LT	LU	HU
Competences to be assessed	●			●	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Assessment criteria				●	●			●	●		●	●	●		●	●	●		
Assessment tools					●			●	●		●	●			●				●
	MT	**NL**	**AT**	**PL**	**PT**	**RO**	**SI**	**SK**	**FI**	**SE**	**BA**	**CH**	**IS**	**LI**	**ME**	**MK**	**NO**	**RS**	**TR**
Competences to be assessed	●		●	●				●	●	●		●	●	●	●			●	●
Assessment criteria	●		●	●				●					●		●			●	
Assessment tools	●			●				●										●	

Country-specific notes

France: All students at the end of grades 6 and 9 must assess their digital skills through the Pix platform. This platform is based on the digital skills reference framework and offers several types of certifications depending on the proficiency level and subject area. Moreover, the digital skills reference framework accompanying document provides resources for teachers, management staff, pupils and their families. For each skill, it describes the levels of proficiency and suggests ways of implementing and evaluating it.

Latvia: The common framework for the assessment of basic digital skills, based on DigComp, defines expected learning outcomes and assessment principles that must be applied in formal education. The education development guidelines, which is a non-binding national strategic policy document, outline the development and assessment of digital competence.

Slovakia: The Education Act stipulates that students' progress in achieving the educational goals, including digital competences, should be assessed. The school curriculum, aligned with the state education programmes, includes the content and educational standards for each grade, while the non-binding guidelines for assessing students' competences provide advice on assessment methodologies.

Figure 4.5 shows that, in most European education systems, provisions for student assessment are embedded into top-level steering documents that govern education processes. In 21 countries, the assessment of digital competence is set in top-level regulations. Conversely, seven countries ([218]) have established only non-binding guidelines for assessing students' digital competence.

In five countries ([219]), top-level steering documents related to students' assessment do not explicitly mention digital competence, while the Flemish and German-speaking Communities of Belgium, Denmark, Slovenia, and Bosnia and Herzegovina lack any regulations or recommendations in their top-level steering documents concerning the assessment of students.

Typically, the provisions related to assessing digital competences are incorporated within national curricula. Bulgaria and Italy, however, have developed stand-alone assessment frameworks. In Bulgaria the Regulation on the Assessment of Student Learning Outcomes, and in Italy the Decree on the Adoption of Competence Certification Models, guide the overall assessment process for all student competences.

In certain education systems, the provisions for students' assessment can be spread across multiple regulations documents. Czechia serves as example of this approach (see box).

Official documents regulating students' assessment in Czechia

Two key documents guide the student assessment process: the 'Criteria for evaluation of the conditions, course, and results of education for the school year 2024/2025', issued annually by the school inspectorate, and the national curriculum titled 'Framework educational programme for basic education'.

The 'Criteria for evaluation of the conditions, course, and results of education for the school year 2024/2025' mandate that schools and teachers continuously monitor and evaluate students' achievements to ensure alignment with the expected outcomes specified in the framework educational programme for basic education . They also outline general criteria for the assessment process, including the following points.

- Criterion 4.3: teachers systematically monitor the educational progress of each pupil considering their individual needs when planning and implementing teaching.
- Criterion 5.1: schools systematically acquire information regarding each student's progress across all areas of learning and adapt their educational offers accordingly.
- Criterion 5.2: students' educational outcomes align with the expected learning outcomes of the curriculum.
- Criterion 5.4: schools monitor and assess student performance throughout and at the conclusion of their education and careers, using results actively to enhance education quality.

The Framework Educational Programme for Basic Education outlines the expected learning outcomes for digital education and informatics and stipulates general methodological principles. The evaluation of student learning outcomes is based on assessing the level of achievement for each subject within the school educational programme. This evaluation must be pedagogically sound, professionally accurate and well documented, while also respecting the individual learning needs of students. Consequently, teachers are required to conduct ongoing evaluations of students' digital competences.

Beyond the aforementioned documents, schools' internal regulations may offer additional guidelines and methodologies for student assessments and self-assessments, including supplementary assessment criteria.

While countries appear to adopt similar approaches in selecting official documents that integrate provisions for student assessments, the level of detail provided varies significantly (see the table in Figure 4.5). Top-level regulations and requirements usually delineate the competences to be assessed and sometimes establish assessment criteria. However, the methodology for evaluating digital competence is rarely specified, probably due to the autonomy granted to schools and teachers in organising continuing student assessment. For example, the autonomy of schools and teachers is explicitly outlined in top-level regulations and guidelines in countries such as Poland, Sweden, Switzerland and Liechtenstein.

In all countries, top-level steering documents explicitly outline what aspects are to be assessed, occasionally specifying proficiency levels. As previously mentioned, incorporating learning outcomes or competences into curricula commonly necessitates their assessment. For instance, in the French Community of Belgium, the competence framework for manual, technical, technological and digital training includes all relevant knowledge, skills and attitudes, emphasising the importance of assessing each component. Similarly, Estonia's curriculum underscores that formative assessment should provide students with oral or written feedback on their knowledge and skills related to the specific subject or field.

In some education systems, the timing for assessing digital competence is clearly defined. For instance, in Lithuania, students' digital competences are evaluated at the end of each semester and at the conclusion of the academic year. Meanwhile, in Austria, student performance in the compulsory subject of digital literacy is assessed and accompanied by a report mark at the end of each school level.

In 11 countries (see the table in Figure 4.5),

218 Ireland, Greece, Croatia, Cyprus, Malta, Finland and Sweden.

219 the Netherlands, Portugal, Romania, North Macedonia and Norway.

top-level regulations or guidelines outline the principes, methods, techniques and/or tools for student assessment. However, the level of detail provided varies significantly across these countries. In some countries, national curricula determine general principles for student assessment, while more detailed methods, tools and practices are specified within regional or school-level regulations. In Czechia, for example, the top-level regulations require schools and teachers to systematically monitor each student's educational progress and assess their achievement in accordance with the expected outcomes outlined in curricula. This requires teachers to continuously evaluate students' digital competences. The legislation further specifies that assessments should be pedagogically justified, professionally accurate, well documented and considerate of individual learning needs. The detailed rules governing student assessment are included in the school's internal regulations. In Spain, the national curriculum establishes general principles for student assessment, emphasising continuity, inclusiveness, the achievement of learning objectives and the use of varied, accessible and adaptable assessment tools. Detailed assessment methods and tools are provided in specific regulations set by the autonomous communities. Similarly, in Poland, students' digital competences at the ISCED 24 level are assessed by internal assessment conducted by schoolteachers throughout the school year. Each school adopts its own detailed assessment system based on the national legislation acts. Students' digital skills are evaluated within the learning outcomes of the informatics subject, using proficiency levels ranging from 1 to 6.

Additional examples of assessment methodologies, rules and tools are provided below (see box).

Assessment methodologies, rules and tools (ISCED 24)

In **Estonia**, 6th grade students assess their digital competences using a self-evaluation tool. Similarly, in **France**, the Pix platform serves as a knowledge and performance assessment tool specifically designed to evaluate and certify students' digital competences.

The **Irish** curriculum indicates that during the second and third years of the Junior Cycle (ISCED 24), students should complete several classroom-based assessments. In addition, students complete state examinations at the end of their three-year Junior Cycle and receive a Junior Cycle profile of achievement.

The **Croatian** curriculum recommends a variety of methods and techniques for assessing learning in informatics, including oral exams, written tests, computer-based assessments and e-portfolios. Both individual and group work are assessed equally. Individual achievements are evaluated based on predefined learning outcomes and the student's progress over the school year. Group work is assessed through students' participation in collaborative projects, considering factors such as involvement, activity levels, communication, collaboration, project documentation and presentation. For each curriculum learning outcome, four levels of proficiency are specified: satisfactory, good, very good and exceptional. Specific criteria are defined for each level to guide students in achieving the corresponding standards.

In **Luxembourg**, the digital education curriculum encourages innovative assessment methods, including the use of project portfolios and digital passes, to evaluate students' achievements.

In **Cyprus**, the national curriculum recommends assessing students' digital skills through continuous evaluation. This includes tests and small projects reflecting the skills acquired.

In **Austria**, the schools are encouraged to use the standardised competence testing tool digi.check.

In **Serbia**, the Law on the Education System Foundations supports the development and assessment of key competences, including digital skills, as cross-curricular elements. The Serbian curriculum requires continuous assessment of students' digital competences, integrating project-based tasks within subjects like 'informatics' and 'techniques and technologies'. It includes evaluations through tests and practical assignments. For instance, students might be tasked with creating a presentation using digital tools, with the evaluation focusing on both technical proficiency and ethical practices, such as correctly citing online sources.

The analysis presented above provides an overview of how student digital competence assessments are integrated into top-level policy documents across

European education systems. It reveals that most of these systems either require or recommend the evaluation of students' digital skills, often emphasising ongoing school-based assessments. Typically, these evaluation requirements are incorporated into national curricula and articulated within specific subject areas, such as ICT and informatics. While top-level legislative documents generally specify the basic principles of assessment and list digital competences and evaluation criteria, the methods for conducting these assessments are covered less thoroughly or delegated to the discretion of regional authorities, individual schools or teachers.

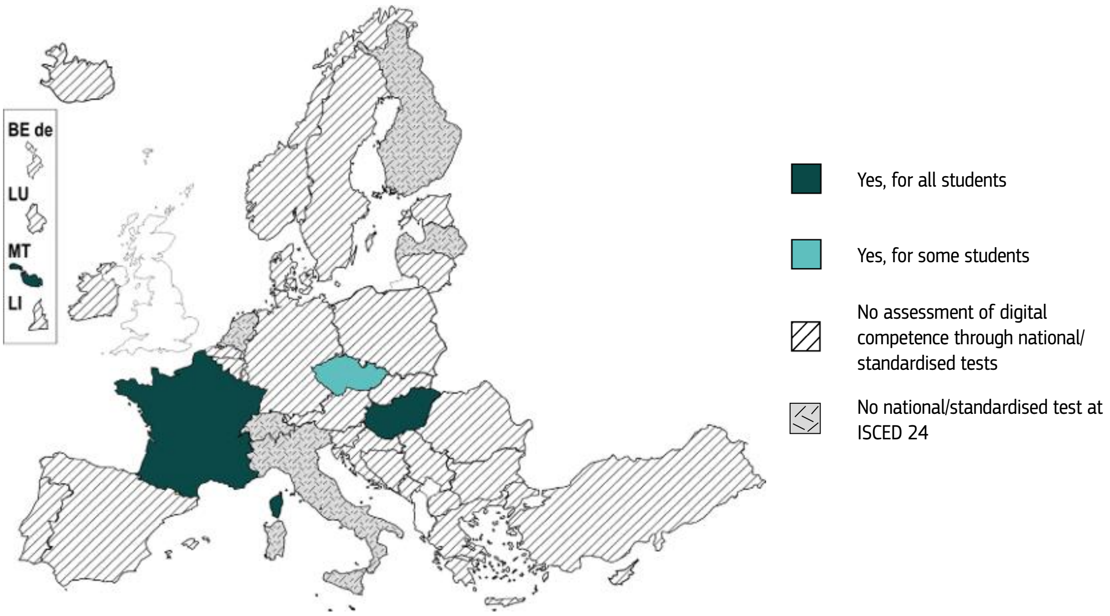
4.2.2. Assessment of digital competence through national/standardised tests

The European Commission staff working document on assessment of key competences underlines the need to assess key competences (European Commission, 2012). It also recognises that assessing cross-cutting key competences, such as digital competence, presents more challenges than assessing traditional competences like reading literacy, science and mathematics.

A comprehensive evaluation of key competences requires the integration of various assessment types, each serving a distinct purpose and posing its own challenges (European Commission: Directorate-General for Education, Youth, Sport and Culture *et al.*, 2017). Despite certain limitations associated with nationally standardised tests in evaluating cross-cutting competences, these tests remain an important source of information for assessing students' performance. They facilitate the comparison of student achievements, enable data analysis over time and help determine whether all pupils have developed the same competences.

This section looks at the assessment of students' digital competences through standardised tests conducted at the national level. These tests are administered by the top-level educational authority, which oversees the procedures for both administration and grading, sets the content and determines how the results will be interpreted and utilised. Consequently, all students take these tests under similar conditions, allowing for straightforward comparisons of individual performance. National standardised tests are frequently conducted alongside national examinations, which are required to obtain certification at the conclusion of an ISCED level.

Figure 4.6: Assessment of digital competence through national/standardised tests, ISCED 24, 2024/2025



Explanatory notes

The category **'yes, for all students'** means that all students' digital competences are assessed through a specific separate national test (e.g. in ICT or informatics) or through the assessment of other competences/subjects that include digital competences (e.g. mathematics or science).
The category **'yes, for some students'** refers to a national test based on samples of students aiming to monitor the quality of the education system rather than measuring the attainment levels of individual students.
Tests designed at the school level on the basis of a centrally designed framework of reference and international surveys such as the Programme for International Student Assessment and ICILS are not considered national standardised tests and therefore are not displayed on the map.

Country-specific note

Spain: The assessment of digital competences through national testing will be piloted in 2027, with full integration into national testing planned for 2028.

As illustrated in Figure 4.6, only four countries currently assess students' digital competences using national tests. In France, Hungary and Malta, all students undergo such evaluations, whereas Czechia employs sample-based surveys to assess the level of digital competence. In Hungary and Malta, these national tests at the lower-secondary education level specifically target the competences acquired in distinct compulsory subjects, digital culture and ICT, respectively. In France, students' competences in programming skills are assessed as part of the national mathematics testing process.

Assessment of digital competence

In **Czechia** digital competence is regularly assessed through biennial sample-based surveys conducted by the Czech School Inspectorate. Every two years, one of five basic skills – reading, mathematics, foreign language, information/digital and science literacy – is selected as the focus for testing in predetermined grades across primary and secondary education. According to this cycle, digital competence is evaluated every five years at ISCED levels 1, 24 or 34. The latest assessments of digital competence and computational thinking occurred in the 2023/2024 academic year for students in 5th grade (ISCED 1), 9th grade (ISCED 24) and 11th grade (ISCED 34). Although the primary aim of these tests is to monitor the quality and effectiveness of the education system, they also provide valuable feedback for both teachers and students.

In the remaining education systems, either digital competence is not included in national tests (27 education systems) or national test are not conducted in lower-secondary education.

The data shown in Figure 4.6 do not reflect the circumstances in countries where digital competence is evaluated through national tests at the conclusion of the learning period. In countries like Bulgaria, Spain and Romania, students' digital competences, developed during their education, are assessed through national exams at the end of compulsory education (at ISCED 34). In Bulgaria, all grade-10 (ISCED 34) students take a national digital competence test at the end of compulsory education to evaluate their achievements in computer science and information technology. By the end of grade 12, students who have opted to study digital-technology-related subjects, or fields requiring these skills, undergo a state matriculation examination in informatics. Similarly, in Romania, digital competences are evaluated within the framework of the national baccalaureate examination at the conclusion of upper-secondary education in grade 12, corresponding to ISCED 34 grade 10. In Latvia, the compulsory subject of informatics begins in lower-secondary education and concludes in grade 10, which marks the first year of upper-secondary education. Consequently, the informatics matriculation exam is administered at the ISCED 34 level to evaluate the digital competences students have developed over four years of study.

Overall, it can be concluded that most European education systems recognise the importance of assessing students' digital competences. However, only a limited number of countries in Europe administer national standardised tests to assess digital competences at the lower-secondary education level. This means that the majority of students in lower-secondary education do not engage in large-scale assessments of digital skills.

4.3. Conclusions

The digitalisation of society has expanded the role of schools to ensure that all students become digitally literate citizens. Developing digital competence is now as crucial as cultivating reading and numeracy skills. Recognised as a key competence that all students should acquire, digital competence is defined at the EU level as the confident, critical and responsible use of and engagement with digital technologies for learning, work and social participation. DigComp 2.2 highlights that digital competence goes beyond technical proficiency to encompass cognitive, social and emotional dimensions of interaction with the digital environment. This complexity makes its instruction and acquisition even more challenging. This concept of digital competence includes a broad spectrum of basic and advanced skills, some specific to digital competence, like programming, and others applicable to transdisciplinary teaching, such as information and data literacy and digital citizenship.

This analysis shows that digital competence is prominently integrated into lower-secondary education curricula across Europe. In most education systems surveyed, digital competence or specific aspects of it are designated as cross-curricular themes intended to be taught across all subjects and school activities. While some countries explicitly categorise digital competence as a key competence, others focus on specific components, such as digital literacy or ICT skills, or incorporate digital skills into broad areas like civic education or media literacy. In addition to teaching digital competence in a cross-cutting way, most education systems offer a distinct subject dedicated to the development of digital skills. The data collected suggest that, in lower-secondary education, digital competences are often linked to the teaching of informatics and are therefore integrated into subjects focused on this discipline.

In most education systems, where top-level authorities regulate the starting point for compulsory digital education, the teaching of digital competence for all students begins at the primary education level (ISCED level 1).

Overall, the majority of education systems employ a combination of cross-cutting and subject-based approaches to teach digital competence, incorporating all major competence areas into their national curricula in various forms. Additionally, one third of these systems, predominantly in western and southern Europe, have integrated AI-related competences into their curricula. These competences typically involve key elements such as understanding AI-driven technologies, recognising their benefits and risks, developing the ability to use and design these technologies, and addressing safety and ethical considerations.

While school education is essential in establishing the foundation for developing digital competence, the out-of-school environment seems to provide numerous opportunities for acquiring new skills.

According to ICILS, students learn certain internet- and ICT-related skills, such as evaluating reliable information online and managing privacy settings for internet accounts, both at school and outside it. Moreover, in all countries surveyed, a larger proportion of students reported learning how to manage privacy settings for internet accounts and ICT devices outside school than within the school environment. However, responsible use of social media appears to be a topic effectively addressed in schools, with more than 60 % of students in nearly all participating countries stating that they have learnt about this subject in school.

Most of the European education systems either require or recommend the evaluation of students' digital competences. While top-level legislative documents typically outline fundamental assessment principles and specify digital competences along with evaluation criteria, the methods for implementing these assessments are often determined by regional authorities, individual schools or teachers. Moreover, very few countries include digital competences in national or standardised tests in lower-secondary education.

Chapter 5: Integrating digital technologies into teaching

The integration of digital technologies has become a cornerstone of contemporary teaching and learning, offering opportunities to enhance student outcomes, expand accessibility and foster innovative pedagogical practices (Forsström *et al.*, 2025). While earlier chapters explored the regulation and use of digital technologies in school practice and the integration of digital skills into the curricula, this chapter focuses specifically on the pivotal role of teachers. Teachers' digital competences are not only essential for the effective implementation of these technologies in classrooms but also critical for empowering students to navigate and thrive in digital environments. Reflecting this priority, the 2023 Council Recommendation on the key enabling factors for successful digital education and training calls for a holistic approach spanning initial teacher education (ITE) through to continuing professional development (CPD) to ensure educators are equipped with the necessary skills and competences [220].

This chapter offers a comprehensive analysis of strategies aimed at strengthening teachers' digital competence through ITE, high-quality CPD and supportive institutional environments. These elements are critical for the effective integration of digital technologies into teaching and learning. The analysis centres specifically on lower general secondary education (ISCED 24) teachers, drawing from data collected from the Eurydice network (across 38 education systems) for the 2024/2025 school year. It also incorporates complementary indicators for 22 European education systems [221] built from teachers' responses to the 2023 International Computer and Information Literacy Study (ICILS) survey. Additionally, the chapter integrates key insights from the 2024 Teaching and Learning International Survey (TALIS), offering a multifaceted perspective on challenges and opportunities in fostering teachers' digital readiness.

The chapter is organised into four main sections. The first section investigates the integration of digital competences into regulatory frameworks and guidelines for ITE across European countries. It also examines teachers' self-reported learning experiences during their initial education and their relationship with subsequent engagement in CPD. The second section analyses digital competence frameworks for CPD, teacher participation rates across competence areas and their self-perception of professional development gaps. The third section delves into support measures such as initiatives to promote the continuing development of teacher digital competence, the development of guidelines to support teachers on key emerging issues related to the use of digital technologies and strategies to enhance digital leadership at school. The final section assesses teachers' access to supportive conditions (e.g. infrastructure, connectivity, digital content) and how these conditions can influence the integration of digital technologies into teaching. It concludes by examining teachers' perspectives on the key challenges and benefits of the use of digital technologies in education.

5.1. Initial teacher education

Receiving training in the use of digital technologies during ITE can contribute to increasing teachers' confidence, their interest in using such technologies in their teaching and their motivation to continue upgrading these competences once in employment. The 2023 Council Recommendation on the key enabling factors for successful digital education and training underlines the importance of introducing digital pedagogy into all ITE programmes.

220 Council Recommendation of 23 November 2023 on the key enabling factors for successful digital education and training (C/2024/1115).

221 Flemish Community of Belgium, Czechia, Denmark, Germany, Greece, Spain, France, Croatia, Italy, Cyprus, Latvia, Hungary, Malta, Austria, Portugal, Romania, Slovenia, Slovakia, Finland, Sweden, Norway and Serbia.

This section first explores how teacher digital competences are integrated into ITE frameworks across European countries. It subsequently analyses the digital competence areas covered in ITE programmes according to teachers. It then investigates the relationship between the integration of digital competences in ITE and CPD participation rates.

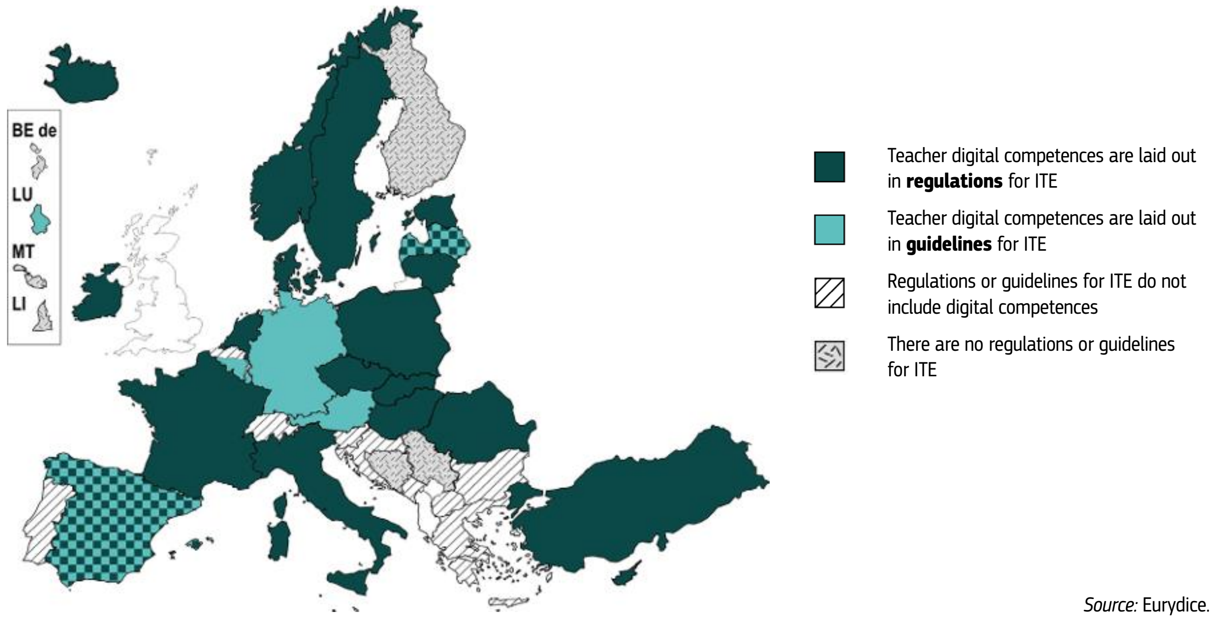
5.1.1. Digital competence frameworks for initial teacher education

Digital competence frameworks for ITE refer to the requirements and recommendations established by education authorities regarding the digital competences that teachers are expected to acquire during their ITE or have when entering the profession.

Digital competence frameworks for ITE can be laid out in regulations or guidelines. While regulations establish mandatory requirements, guidelines outline recommendations on the digital competences that entry-level teachers should have, providing a more flexible framework for ITE providers and candidate teachers. This section examines the digital competence frameworks applicable to all lower-secondary teachers in the 2024/2025 reference year. Competence frameworks that only apply to certain specialisations are excluded.

Figure 5.1 illustrates the 23 education systems that have established regulations or guidelines specifying the digital competences that pre-service teachers should develop during their ITE or possess upon entering the teaching profession.

Figure 5.1: Digital competence frameworks for ITE, ISCED 24, 2024/2025



Source: Eurydice.

Country-specific note

Liechtenstein: There is no ITE. Teachers take their teaching qualification in other countries such as Austria and Switzerland.

Most commonly, teacher digital competences are outlined in regulations that specify the requirements for ITE programmes or for getting a teaching qualification. This occurs in 19 education systems. In Denmark, Estonia, Ireland, Italy, Hungary, Poland, Slovakia, Sweden and Norway, the general regulations laying down the requirements for ITE programmes specify the digital competences that student teachers should acquire. In Czechia, the Netherlands, Iceland and Türkiye, digital competence is one of the areas in the general teacher competence framework setting the standards to enter the profession. In France, Lithuania and Romania, there is a specific digital competence framework, which is mandatory for entry-level teachers. In Cyprus, all ITE students must take a mandatory course on computer skills and their use in teaching.

In Spain, the use of digital technologies in teaching is included in the national education law, while the specific digital competences are laid out in implementing guidelines. In Latvia, the National standards for higher education set mandatory credits for information and communications technology (ICT), while the 2021–2027 Education development guidelines include recommendations on the digital competences that all teachers should have (see box for further details). In four other education systems, recommendations on the digital competences required for candidate teachers are outlined in the general guidelines for ITE (French Community of Belgium), the general teacher competence framework (Luxembourg) or dedicated teacher digital competence frameworks (Germany and Austria).

Finally, in nine education systems, regulations or guidelines for ITE do not specify the digital competences required for starting lower-secondary teachers, while in six systems there are no regulations or guidelines for ITE. Nevertheless, ITE programmes may include digital competences even in the absence of centrally defined standards.

Digital competences in general teacher competence frameworks

In **Czechia**, digital competences are embedded in the six areas of the recently introduced teacher competence framework, which applies to both ITE graduates and in-service teachers. Graduate teachers should be able 'work appropriately with digital and physical learning environments and work responsibly with information and digital tools'. In particular, they should be able to 'ensure the appropriate design of the physical space and digital environment where learning takes place' and 'work responsibly with information and digital tools, guide students towards democratic values and act in accordance with professional ethics' ([222]).

In **Italy**, the 2023 decree defining the university and academic training path of teachers of lower- and upper-secondary schools in compliance with the national recovery and resilience plan ([223]) includes digital competences in both the set of professional competences and the minimum professional standards. Specifically, teachers should have the ability to promote media education; use digital technologies for communication, collaboration and professional development; identify, evaluate and select digital resources for teaching (taking into account learning objectives, the context and students' needs); use digital technologies to promote inclusion, personalised learning and student engagement; help students use digital technologies creatively and responsibly for activities related to information, communication, content creation, personal wellbeing and problem-solving; leverage digital technologies to support self-regulated learning processes (planning, monitoring, metacognitive reflection); and employ digital tools and strategies to improve assessment.

Teacher digital competence frameworks drawing on DigCompEdu

National teacher digital competence frameworks often align with the digital competence framework for educators (DigCompEdu) (Redecker, 2017), which covers 22 competences organised in six areas: (1) professional engagement (including communication, collaboration, reflection, CPD); (2) digital resources (including the ability to select, create and modify, manage, protect and share digital resources); (3) teaching and learning (including teaching, guidance, collaborative learning, self-regulated learning); (4) assessment (including strategies, analysis, feedback and planning); (5) empowering learners (including accessibility and inclusion, differentiation and personalisation, active engagement); and (6) facilitating learners' digital competences (including information and media literacy, communication, content creation, responsible use and problem-solving).

In **France**, the integration of the digital elements necessary for the teaching profession is one of the competences in the general teacher competence framework ([224]). The specific digital competences are outlined in the Digital competence framework for education (CRCN-Edu), which draws on DigCompEdu ([225]).

In **Spain**, the national education law underlines the importance of ICT and virtual learning environments for teaching and learning and establishes the obligation of the Ministry of Education, Vocational Training and Sports to draft and periodically revise a digital teaching competence framework to guide ITE and CPD, after consulting the autonomous communities, and promote digital culture at schools ([226]). The central education authorities published the Digital teaching competence framework (MRCDD) in January 2022, covering the six areas and 22 competences in DigCompEdu ([227]).

In **Latvia**, the National standards for higher education establish 81 mandatory European credit transfer and accumulation system for ICT for university degrees ([228]), while the 2021–2027 Education development guidelines lay out the digital competences that candidate and in-service teachers should have drawing on DigCompEdu ([229]).

222 Czechia, Competence framework for teacher graduates, 2023.

223 Italy, Decree defining the university and academic training path of teachers of lower and upper secondary schools for the purposes of complying with the objectives of the national employment plan recovery and resilience, 2023.

224 France, Professional competences for teachers and other education staff, 2013.

225 France, Digital competence framework for education.

226 Spain, Law 2/2006 on Education (LOE), amended by Law 3/2020 (LOMLOE).

227 Spain, 2022 Digital competence reference framework for teachers.

228 Latvia, 2023 National standards for higher education.

229 Latvia, Education development guidelines (2021-2027); Digital transformation guidelines (2021-2027); and DigCompEdu: European digital competence framework for educators in Latvian.

In **Lithuania**, the regulation describing the requirements for digital literacy for ITE programmes builds on DigCompEdu [230]. It is also recommended for the professional development of in-service teachers.

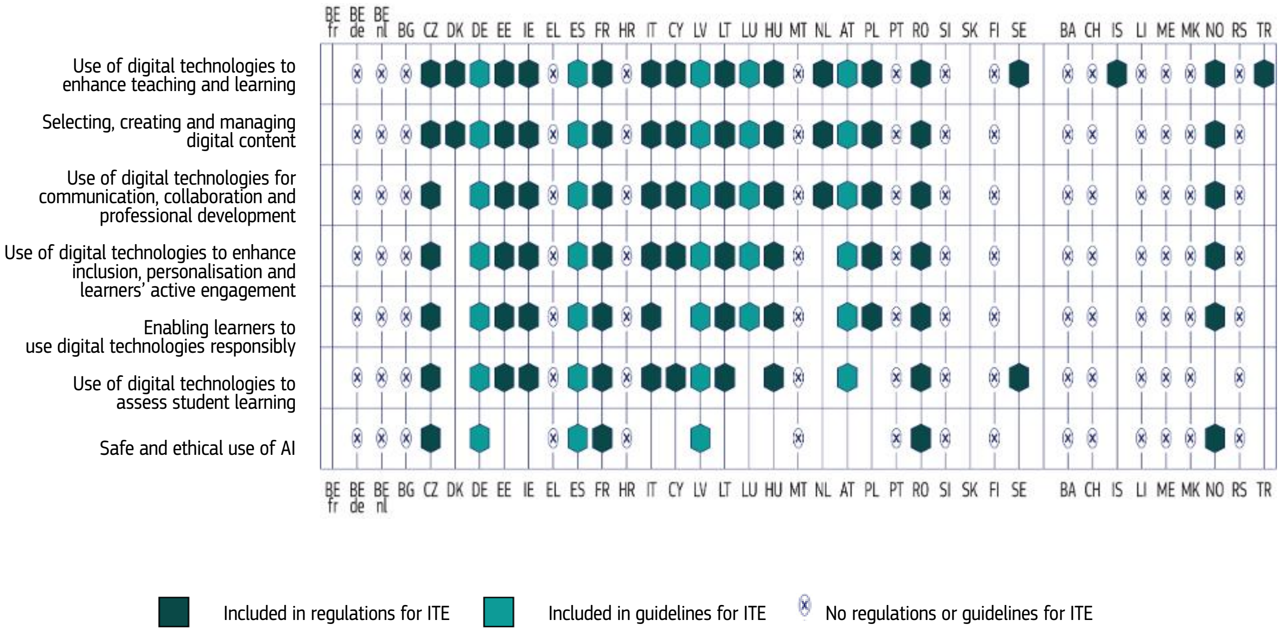
In **Romania**, the teacher digital competence framework mirrors DigCompEdu [231] and constitutes the seventh area of the Profile and professional standards of teachers [232].

Figure 5.2 examines the inclusion of seven digital competence areas in regulations and guidelines for ITE in these 23 education systems. These competences were identified based on the DigCompEdu digital competence framework (Redecker, 2017) and other national competence frameworks. Although artificial intelligence (AI) is a cross-cutting theme that intersects with the other areas, it is examined separately to get a more nuanced understanding given its emerging and evolving role in education.

The seven digital competence areas are:

1. the use of digital technologies to enhance teaching and learning;
2. selecting, creating and managing digital content;
3. the use of digital technologies for communication, collaboration and professional development;
4. the use of digital technologies to enhance inclusion, personalisation and learners' active engagement;
5. enabling learners to use digital technologies responsibly;
6. the use of digital technologies to assess student learning;
7. the safe and ethical use of AI.

Figure 5.2: Digital competence areas covered in ITE frameworks, ISCED 24, 2024/2025



Source: Eurydice.

230 Lithuania, Order of the Minister of Education and Science on the approval of the description of the requirements for digital literacy programmes for teachers and support specialists, 29 March 2007.

231 Romania, Order of the Minister of Education No 4150 of 2022 approving the digital competence framework of education staff.

232 Romania, Order of the Ministry of Education No 7.386 of 2024 approving the profile and professional standards of teachers in pre-university education, by career stages and by education levels.

ITE guidelines in the French Community of Belgium and regulations in Slovakia only include a general provision referring to pre-service teachers' ability to integrate digital technologies into their teaching practice. The remaining 21 education systems explicitly address one or more of these seven key competence areas. Notably, all of them cover the use of digital technologies to enhance teaching and learning, and nearly all cover the areas selecting, creating and managing digital content and the use of digital technologies for communication, collaboration and professional development.

The use of digital technologies to enhance inclusion, personalised learning and learners' active engagement is included in the ITE frameworks of 16 education systems, while 15 systems cover the responsible use of digital technologies by learners, and 14 systems address the use of digital technologies to assess student learning. In contrast, only seven countries include the safe and ethical use of AI (Czechia, Germany, Spain, France, Latvia, Romania and Norway).

ITE regulations cover all the seven areas in Czechia, France and Romania; all but the safe and ethical use of AI in Estonia, Ireland, Italy, Lithuania and Hungary; and all but students' assessment in Norway. The recommended teacher competence frameworks cover the seven areas in Germany, Spain and Latvia, and all areas except the safe and ethical use of AI in Austria.

5.1.2. Teachers learning digital competences in initial teacher education

The prominence given to the use of digital technologies to enhance teaching and learning – compared with other competence areas – in digital competence frameworks for ITE is reflected in teachers' reports on their learning experiences during their initial education captured in the ICILS survey. It is important to note that the ICILS question refers to the time when the surveyed teachers completed their initial education, not to the reference year.

Figure 5.3 shows the percentage of teachers reporting that their ITE included:

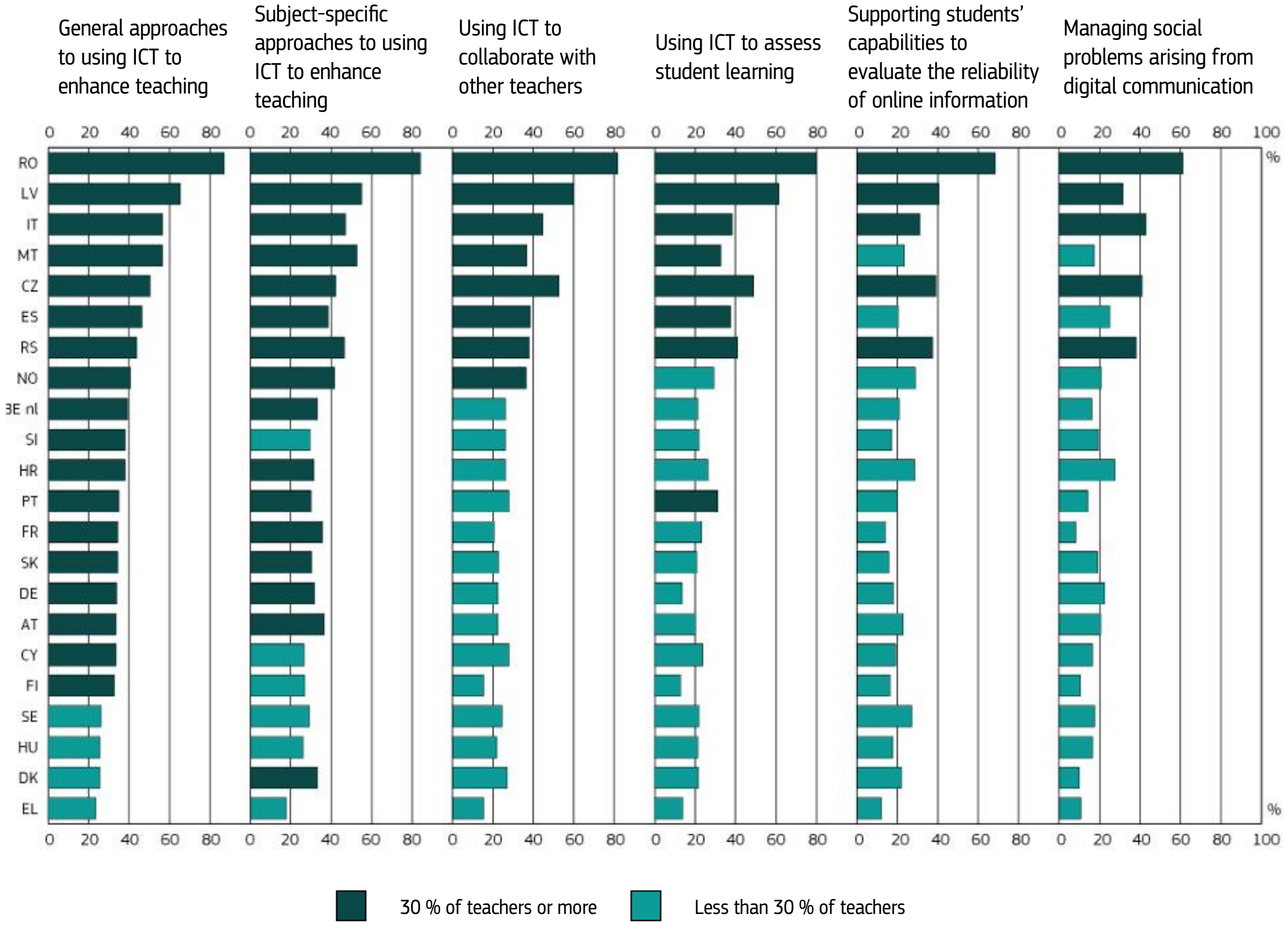
1. general approaches to using ICT to enhance teaching;
2. subject-specific approaches to using ICT to enhance teaching;
3. using ICT to collaborate with other teachers;
4. using ICT to assess student learning;
5. supporting students' capabilities to evaluate the reliability of internet-based information sources;
6. managing social problems experienced by students arising from digital communication, such as cyberbullying.

The most frequently reported areas are general and subject-specific approaches to using ICT to enhance teaching. The use of ICT for collaboration with other teachers and for assessing students' learning are reported by lower percentages of teachers, while the largest gap is observed in supporting students' critical evaluation of online information and managing social problems arising from digital communication.

At least half of the participating teachers reported having learnt general approaches to using digital technologies to enhance teaching during their ITE in Romania, Latvia, Italy, Malta and Czechia; and subject-specific approaches in Romania, Latvia and Malta. The proportion was 30 % or more in all but four countries (Sweden, Hungary, Denmark and Greece) for general approaches, and in all but six (Slovenia, Cyprus, Finland, Sweden, Hungary and Greece) for specific-subject digital learning.

In contrast, at least 30 % of teachers learnt how to use ICT for collaboration with other teachers or to assess student learning in only eight countries; and to support students in evaluating online information or manage social problems arising from digital communication in only five countries. For the latter competence area, the percentage does not reach 20 % in more than half of the countries.

Figure 5.3: Teachers who learnt different aspects of ICT during their ITE (%), ISCED 24, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

This figure is based on Q8 of the ICILS teacher questionnaire ('Did your [initial teacher education] include the following aspects of using ICT?'). Percentage of teachers who answered 'yes'. Education systems are ranked in descending order based on the percentage of teachers who reported that their ITE included general approaches to using ICT to enhance teaching and learning.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.

Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.

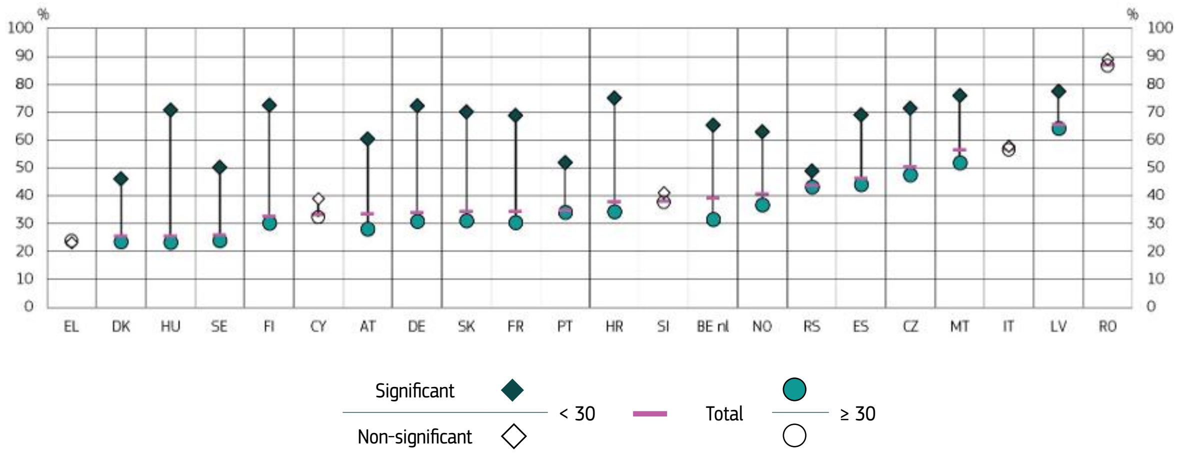
Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

Figure 5.4 shows the percentage of teachers who learnt general approaches to using ICT to enhance teaching during their ITE, by age group. In most countries, teachers under 30 reported having learnt these approaches in significantly higher proportions than those aged 30 and over. The difference is more than 30 percentage points (pp) in Austria, Slovakia, France and the Flemish Community of Belgium, and more than 40 pp in Hungary, Finland, Germany and Croatia.

Despite percentages below 30 % for teachers of all ages, the percentage of teachers under 30 who learnt these approaches exceeds 45 % in Denmark, 50 % in Sweden and 70 % in Hungary. Similarly, the percentage of under-30 teachers exceeds 60 % in Austria and France, and 70 % in Finland, Germany, Slovakia and Croatia, compared with overall percentages (for teachers of all ages) below 40 %.

This evidence suggests a growing tendency for ITE programmes to cover digital competences. The TALIS 2024 survey reveals that recent graduates are more likely than their peers to report that their formal education enhanced their ability to use digital resources and tools for teaching (see box).

Figure 5.4: Teachers who learnt general approaches to using ICT to enhance teaching during their ITE by age (%), ISCED 24, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

This figure is based on Q8 of the ICILS teacher questionnaire ('Did your [initial teacher education] include the following aspects of using ICT?'). Percentage of teachers below 30 years old or teachers 30 and older who answered 'yes'. Age groups are computed based on T_AGE. Education systems appear in ascending order regarding the percentage of teachers who reported that their ITE included general approaches to using ICT to enhance teaching and learning. The percentage differences and standard errors are available in the Statistical tables.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.
Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.
Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

Recent graduates' sense of preparedness for using digital resources and tools for teaching, TALIS 2024

In 22 EU countries, on average, 59 % of lower-secondary teachers who entered the profession within the five years prior to the survey report that their ITE made them feel 'a lot' or 'quite a bit' prepared to use digital resources and tools for teaching. The percentage goes down to 41 % on average for teachers in service for more than five years.

The percentage of new teachers reporting a positive impact is higher than the percentage of more experienced teachers in the 22 EU countries, with the difference being more than 30 pp in Belgium, Denmark, Hungary, Portugal and Finland. More than two thirds of new teachers reported a positive impact of ITE on improving their ability to use digital technologies for teaching in Lithuania, Hungary, Cyprus, Romania, Latvia, Poland, Spain and Portugal. These findings suggest that the growing integration of digital skills within ITE contributes to preparing teachers for using digital technologies for teaching.

Percentage of teachers who report that their formal education and training make them feel prepared 'quite a bit' or 'a lot' to use digital resources and tools for teaching

Years in service	LT	HU	CY	RO	LV	PL	ES	PT	BE nl	BG	SK	EU-22	BE	DK	HR	MT	FI	IT
≤ 5	76.8	76.5	76.4	74.4	67.2	67.2	66.2	66.0	65.2	63.4	59.4	58.9	58.1	58.0	56.6	56.5	52.5	51.6
> 5	73.5	32.5	46.9	70.2	59.9	59.7	52.2	21.1	33.3	36.9	35.5	41.2	25.8	24.5	29.0	36.2	17.7	52.6
Years in service	**EE**	**FR**	**SI**	**BE fr**	**CZ**	**AT**	**SE**		**NL (*)**		**IS**	**ME**	**MK**	**RS**	**TR**		**NO (**)**	
≤ 5	51.6	49.7	48.1	47.4	43.5	42.6	33.0		54.1		46.9	64.6	71.1	74.0	77.7		31.5	
> 5	33.8	20.1	18.8	14.5	15.6	27.9	15.5		27.7		20.6	50.4	54.2	55.0	66.2		11.3	

(*) The Netherlands is not included in the weighted average EU-22.

(**) Estimates should be interpreted with caution due to higher risk of non-response bias.

Source: Based on Table 4.5, TALIS 2024.

5.1.3. Relationship between learning digital competences in initial teacher education and participation in continuing professional development

This subsection examines the relationship between the share of teachers learning digital competences during their ITE and teacher participation in CPD in four areas:

1. the use of productivity applications;
2. integrating ICT into teaching;
3. supporting students' capabilities to evaluate the reliability of online information;
4. managing social problems experienced by students arising from digital communication.

Figure 5.5 shows a positive relationship between both variables in the four areas. As the proportion of teachers who report receiving training on these areas during their ITE increases, so does the proportion of teachers participating in related professional development activities.

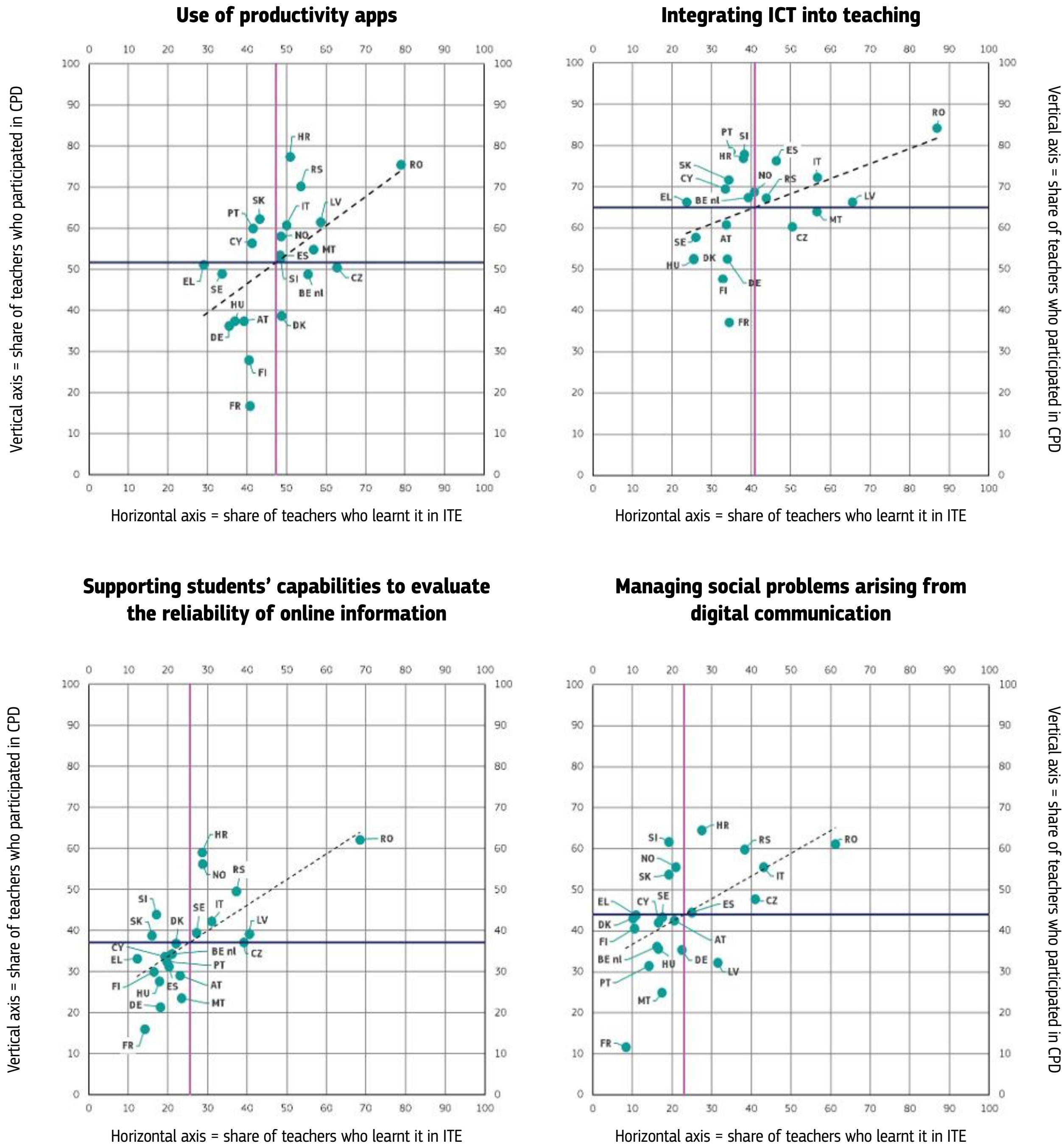
The positive relationship between learning in ITE and participating in CPD is stronger for the area of supporting students' capabilities to evaluate the reliability of online information (r = 0.66), followed by managing social problems arising from digital communication (r = 0.55), the use of productivity applications (r = 0.52) and integrating ICT into teaching (r = 0.48) ([233]).

The intersecting lines in the graph represent the average values. As illustrated by the red vertical lines, teachers tend to report more often learning about the use of productivity applications and how to integrate digital technologies into teaching during their ITE than about the other two areas: supporting students' capabilities to evaluate the reliability of online information and managing social problems arising from digital communication. The participation in related CPD activities (blue horizontal lines) is also higher for the former two areas and notably lower for the latter.

For each competence area, the bottom left quadrant includes the education systems where both the percentage of teachers receiving training during their ITE and participating in related CPD activities are relatively low. This is typically the case for Germany, France, Hungary, Austria and Finland. Conversely, the top right quadrant features the countries with the largest percentages, usually including Croatia, Italy, Romania and Serbia. The top left quadrants show countries where CPD participation rates are high despite a relatively low percentage of teachers reporting the inclusion of these competence areas in their ITE.

233 The Spearman coefficients show that, as the rank of the share of teachers learning ICT in ITE increases, the rank of the share of teachers participating in CPD in the last two years also tends to increase. Spearman and Pearson coefficients are similar, suggesting that the relationship between the two variables is robust and not sensitive to the choice of correlation coefficient or outliers.

Figure 5.5: Relationship between teachers learning different aspects of ICT during their ITE and participating in CPD, ISCED 24, 2023



	Use of productivity apps	Integrating ICT into teaching	Supporting students' capabilities to evaluate the reliability of online information	Managing social problems arising from digital communication
Pearson coefficient	0.53	0.48	0.66	0.55
Spearman coefficient	0.57	0.48	0.60	0.59

Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

X axes are based on ICILS teacher questionnaire Q8 ('Did your [initial teacher education] include the following aspects of using ICT?'). Percentage of teachers who answered 'yes'.
Y axes are based on ICILS teacher questionnaire Q9 ('How often did you participate in professional learning activities dealing with the following content areas in the past two years?'). Percentage of teachers who participated once or more.
The blue and red intersecting lines represent the average of the percentage values.
The Pearson coefficient measures the strength and direction of the linear relationship between the inclusion of the competence area in ITE and participation in CPD. The Spearman coefficient measures the strength and direction of the relationship between the two ranked variables.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.
Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.
Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

5.2. Continuing professional development

Despite the increasing trend to include digital competences in ITE, key competence areas still receive insufficient attention. Moreover, teachers who did their ITE in the past may not have had the opportunity to develop their digital skills during their studies. CPD is essential to develop the skills and confidence that teachers need to effectively integrate digital technologies into their teaching practices and to stay up to date with the latest technologies, pedagogies and best practices. The 2023 Council Recommendation on the key enabling factors for successful digital education and training underlines the need to encourage in-service teachers to develop and upgrade their digital skills and competences.

This section first explores how teacher digital competences are integrated into CPD frameworks across European countries. It subsequently analyses teachers' participation in CPD across competence areas. Finally, it investigates teachers' perceptions of their professional development gaps and the relationship between participation and needs.

5.2.1. Digital competence frameworks for continuing professional development

Digital competence frameworks for CPD refer to the requirements and recommendations established by education authorities regarding the digital competences that in-service teachers should have or otherwise develop. They can be laid out in regulations establishing mandatory requirements or guidelines setting out recommendations. This section examines the digital competence frameworks for CPD applicable to all lower-secondary teachers in the 2024/2025 reference year. Competence frameworks that only apply to certain specialisations are excluded.

Figure 5.6 shows the 23 education systems that report digital competence frameworks for CPD. While digital competences for entry-level teachers are often defined in regulations, digital competences for in-service teachers tend to be laid out in guiding documents or recommendations. This is the case in all but two countries. In Romania [234] and North Macedonia [235], digital competences are included in the mandatory teacher competences frameworks, which inform teachers' professional development, are evaluated in annual appraisals and influence promotion.

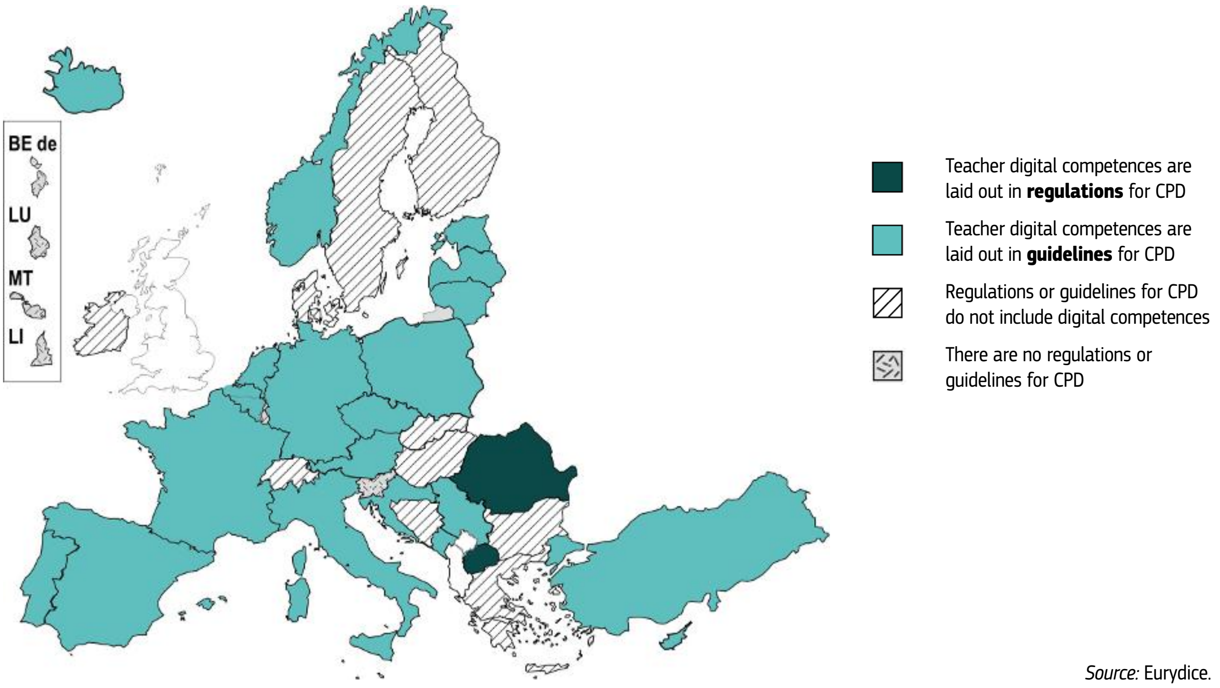
The other 21 education systems have issued recommendations on the digital competences that in-service teachers should have or otherwise develop. Digital competence is one of the areas in the general teacher competence frameworks required for entry-level teachers and recommended for teacher professional development in Czechia, France, the Netherlands and Iceland (see Section 5.1.1). It is also the case in Türkiye, where teacher digital professional development is further laid out in specific guidelines [236].

234 Romania, Order of the Ministry of Education No 7.386 of 2024 approving the profile and professional standards of teachers in pre-university education, by career stages and by education levels.

235 North Macedonia, Basic teacher professional competences. The use of digital tools for interactive and personalised teaching is also a training priority in the 2025 Professional development training programme for teachers.

236 Türkiye, Digital teacher qualifications – digital ecosystem for teacher training, funded under the 2021–2027 EU Instrument for Pre-Accession Assistance.

Figure 5.6: Digital competence frameworks for CPD, ISCED 24, 2024/2025



Source: Eurydice.

In Lithuania, the teacher digital competence framework sets out requirements for entering the profession and is recommended for teacher professional development. In Germany, Spain, Latvia and Austria, there is a teacher digital competence framework recommended for pre- and in-service teachers (see Section 5.1.1). Croatia ([237]) and Poland ([238]) have recently adopted a teacher digital competence framework for in-service teachers in line with DigCompEdu. In the French and Flemish Communities of Belgium, Denmark, Ireland, Italy, Hungary, Portugal and Montenegro, education authorities have adopted plans or established priorities for teacher professional development programmes aiming to enhance teachers' digital competence (see country examples).

Finally, regulations or guidelines for teacher CPD do not specify digital competences in 10 systems, while in the German-speaking Community of Belgium, Luxembourg, Malta, Slovenia and Liechtenstein, there are no regulations or guidelines for CPD. Nevertheless, these systems may still provide CPD opportunities on digital competences.

Digital competence frameworks for teachers' professional development

In the **French Community of Belgium**, 1 of the 19 focuses of the teacher professional development plan covers professional and pedagogical skills, competence to support the development of students' digital skills and AI ([239]).

In the **Flemish Community of Belgium**, the *Digisprong* Action plan includes the enhancement of the digital competence of teachers and ICT coordinators through tailored ICT training and ICT bootcamps, with the aim of improving digital didactic skills and the use of ICT in the educational process – including digital learning environments that incorporate emerging technologies such as AI or learning analytics (action 3.1) and targeted support for starting teachers (action 3.2) ([240]).

In **Italy**, the enhancement of teacher digital competence is one of the strategic objectives in the 'Three-year guidelines for the training of school staff 2023-2025', established by the School of Higher Education Training (SAFI) to implement the M4C1R2.2 School of Higher Education reform of the EU-funded national recovery and resilience plan, NextGenerationEU ([241]).

In **Austria**, digi.komp offers teachers guidance on eight digital competence areas: (1) digital and computer literacy; (2) digital life, teaching and learning; (3) designing, modifying

237 Croatia, Strategic framework for the digital transformation of schools and school systems in the Republic of Croatia (2030). and DigCompEdu: Croatian Academic and Research Network (CARNET).

238 Poland, Resolution No 98 of the Council of Ministers of 12 September 2024, regarding the adoption of the public policy titled 'Digital transformation of education policy'.

239 French Community of Belgium, 2024 Decree setting the priorities for the professional development of teachers and other education staff.

240 Flemish Community of Belgium, *Digisprong*: from proximity to advancement ICT plan for quality digital education for the relaunch of the 'Flemish resilience' plan.

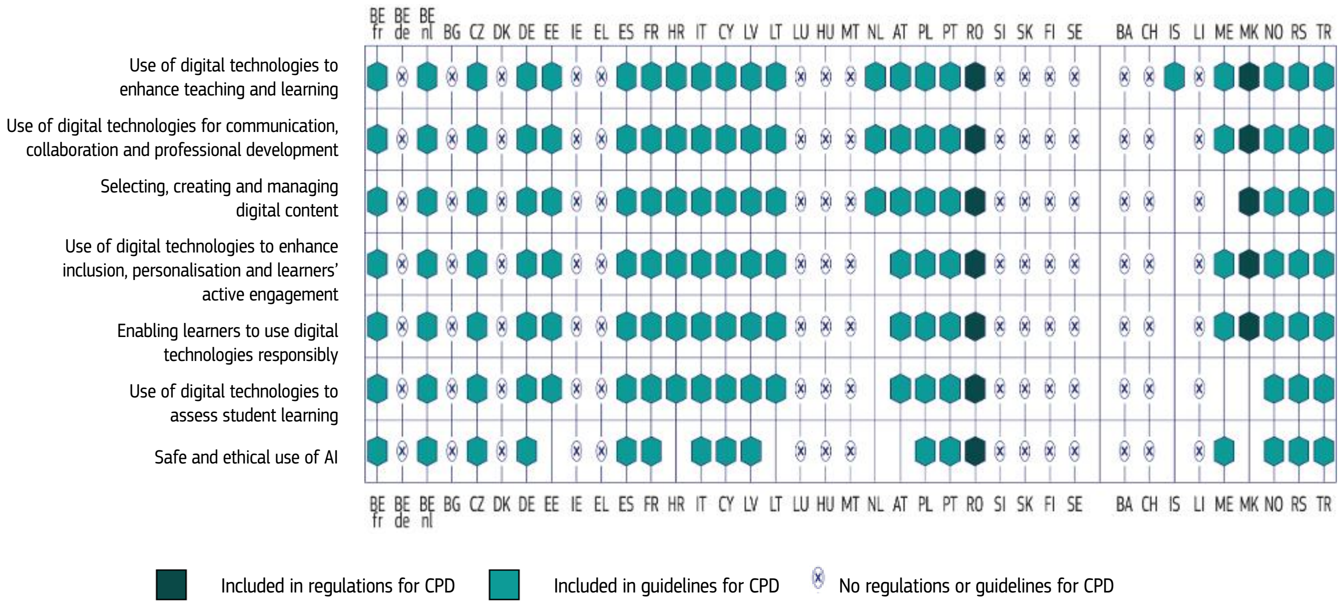
241 Italy, Three-year guidelines for the training of school staff 2023-2025 and Integrated digital teaching and training on the digital transition of school staff.

and publishing teaching materials, and rights of use and copyrights; (4) planning and evaluating teaching and learning with digital media and learning environments; (5) field-specific use of digital media, software and digital content; (6) promoting the digital skills of learners; (7) efficient and responsible digital classroom and school management, and communication and collaboration; and (8) CPD on and through digital technologies [242].

In **Montenegro**, the Strategy for the digitalisation of the education *system* 2022–2027 lays out the objective to improve teachers' digital competences; the strategy has been operationalised in concrete CPD activities that teachers must gradually complete [243].

In terms of content, digital competence frameworks for CPD are usually more specific and tend to cover more areas than ITE frameworks. As Figure 5.7 shows, the use of digital technologies to enhance teaching and learning is included in the frameworks of the 23 education systems. Nearly all of them also cover the use of digital technologies for communication, collaboration and professional development and to enhance inclusion and personalisation; the selection, creation and management of digital content; and promoting learners' responsible use of digital technologies. The use of digital technologies to assess student learning is explicitly mentioned in the CPD frameworks of 18 systems, and the safe and ethical use of AI is mentioned in 15 systems (twice as many as in the case of ITE frameworks).

Figure 5.7: Digital competence areas covered in CPD frameworks, ISCED 24, 2024/2025



Source: Eurydice.

5.2.2. Teachers participating in continuing professional development on digital competences

According to ICILS data, teachers engage in learning activities to enhance their digital competences while in service in larger percentages than during their ITE.

Figure 5.8 shows the percentages of teachers who engaged in CPD in the two years prior to the ICILS survey to improve their digital skills in the following areas:

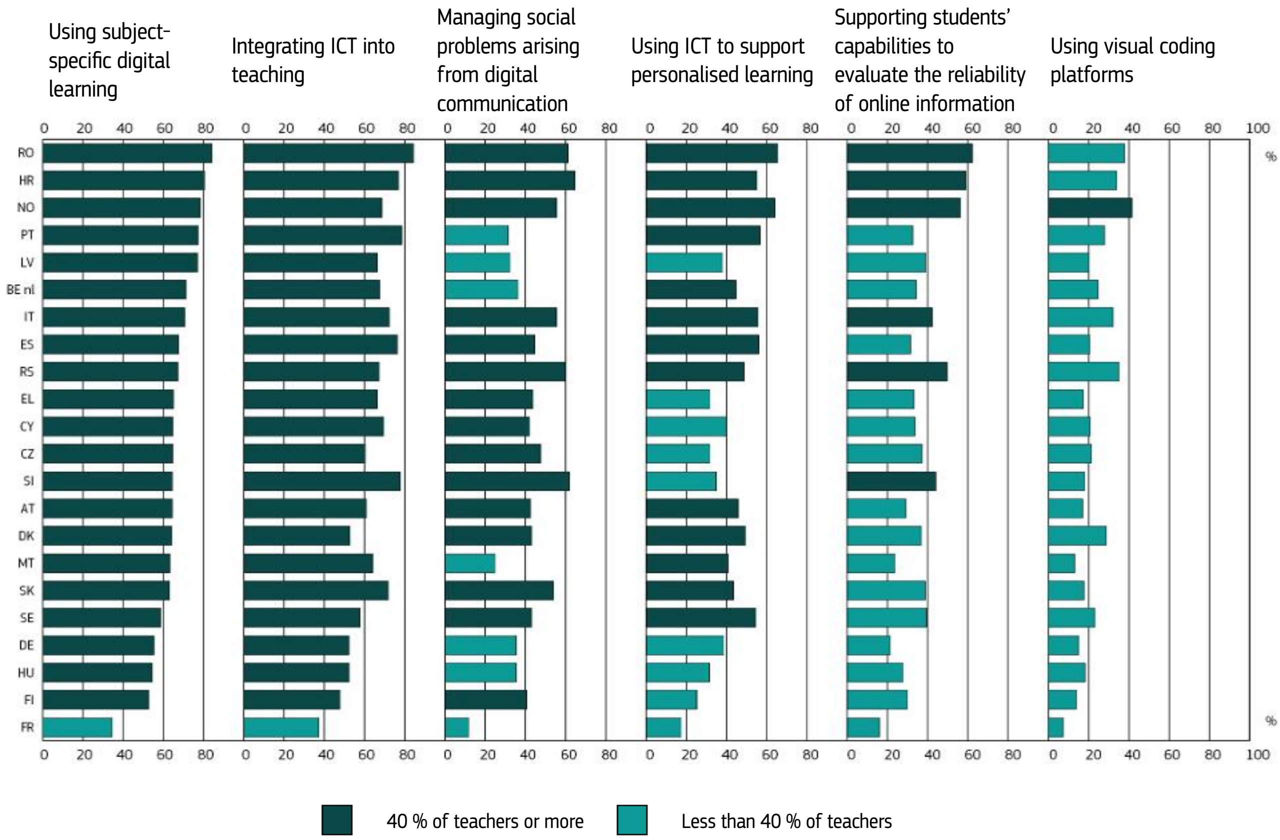
1. using subject-specific digital learning;
2. integrating ICT into teaching;
3. managing social problems experienced by students arising from digital communication, such as cyberbullying;
4. using ICT to support personalised learning;
5. supporting students' capabilities to evaluate the reliability of internet-based information sources;
6. using visual coding platforms.

242 Austria, the digi.komp competence model.

243 Montenegro, Strategy for the digitalisation of the education system 2022-2027.

The selection of the areas aligns with those identified in the analysis for ITE when possible (see Section 5.1.3). However, the ICILS survey question on CPD does not address students' assessment and collaborative practices but does cover the use of ICT to support personalised learning and visual coding platforms. The latter can be considered a proxy for advanced digital skills. Generally, participation rates in CPD tend to exceed the share of teachers who report learning digital skills as part of their ITE (see Figure 5.3). Similarly to ITE, the emphasis in CPD is on subject-specific and general approaches to teaching over the other competence areas.

Figure 5.8: Teachers participating in digital competence CPD in the past two years (%), ISCED 24, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

This figure is based on Q9 of the ICILS teacher questionnaire ('How often did you participate in professional learning activities dealing with the following content areas in the past two years?'), Sum of percentages of teachers who participated once and more than once. Education systems are ranked in descending order based on the percentage of teachers who reported having participated once or more in CPD training on using subject-specific digital learning.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.

Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.

Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

Subject-specific and general approaches to using digital technologies to enhance teaching are the most common areas for CPD. Teachers also frequently participate in learning activities on managing social problems arising from digital communication and on the use of ICT to personalise learning. Supporting students' critical evaluation of online sources and using visual coding platforms are less commonly reported.

In nearly all countries, at least 40 % of teachers participated in CPD activities on general and subject-specific approaches to using ICT to enhance teaching and learning. At least 40 % of teachers received training on managing issues arising from digital communication in 15 education systems, and on using ICT to support personalised learning in 13 systems.

By contrast, 40 % or more of teachers engaged in professional development on supporting students in evaluating the reliability of internet-based information sources in only six countries (Romania, Croatia, Norway, Italy, Serbia and Slovenia), and on the use of visual coding platforms only in Norway. For the use of visual coding platforms, the percentage of teachers is below 20 % in nine systems.

TALIS findings indicate that while teachers frequently engage in CPD on digital tools and resources, participation in AI-focused training remains limited (see box).

Content of professional learning activities for lower-secondary teachers, TALIS 2024

Teachers were asked in TALIS about the topics covered in their professional learning activities in the 12 months prior to the survey. The most frequently reported area is the use of digital resources and tools, with 74.1 % of teachers participating in related CPD activities. Digital resources and tools in the table below refers to teachers who reported having participated in learning activities on pedagogical skills for incorporating digital resources and tools into teaching (66.6 %) or technical skills for the use of digital resources and tools (63.9 %) combined. However, less than one in three teachers participated in activities to learn how to use AI for teaching.

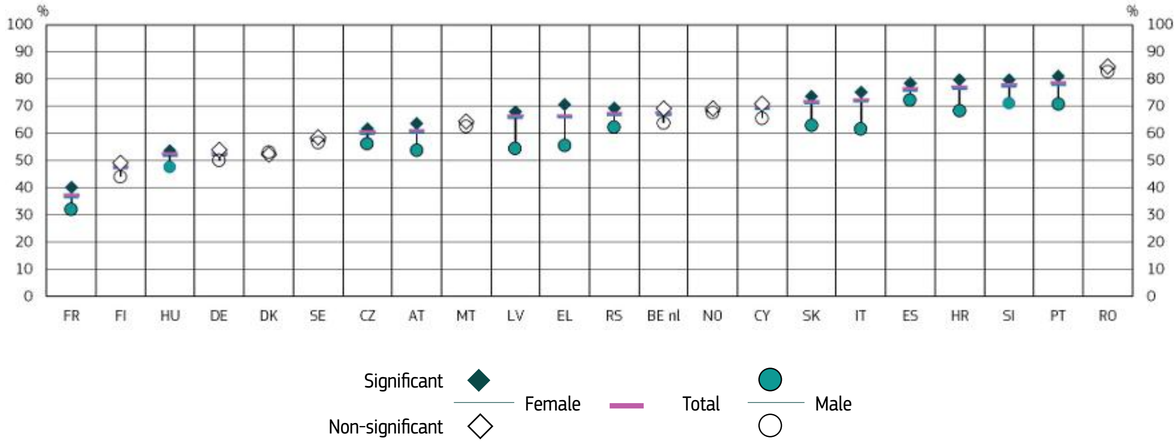
Percentage of teachers who reported that the following topics were included in their professional learning activities in the 12 months prior to the survey, average across 22 EU countries (%)

Digital resources and tools	74.1
Knowledge and understanding of my subject field(s)	71.7
Pedagogical skills for incorporating digital resources and tools into teaching	66.6
The pedagogy of the subject matter(s) I teach	66.1
Technical skills for the use of digital resources and tools	63.9
Student assessment practices	62.9
Knowledge of the curriculum	61.5
Teaching students with special education needs	55.5
Classroom management for student behaviour	51.1
Approaches to individualised learning	49.7
Methods for supporting students' social and emotional learning	47.3
Analysis and use of student assessments	45.3
Teacher–parent/guardian cooperation	42.4
Other	29.9
Using AI for teaching and learning	29.7
Teaching in a multicultural or multilingual setting	28.2
School management and administration	18.0

Source: Based on Table 4.22, TALIS 2024.

Figure 5.9 shows the difference between female teachers' and male teachers' participation in professional development activities for the area integrating digital technologies into teaching. Notably, female teachers tend to engage in CPD more than their male peers. This is the case in all the countries except in Denmark, where participation is similar between sexes. The difference in CPD participation rates between female teachers and male teachers is more than 10 pp in Latvia, Greece, Slovakia, Italy, Croatia and Portugal.

Figure 5.9: Teachers participating in CPD on integrating digital technologies into teaching in the past two years, by sex (%), ISCED 24, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

This figure is based on Q9A of the ICILS teacher questionnaire ('How often did you participate in professional learning activities dealing with the following content areas in the past two years?'). Sum of percentages of female teachers and male teachers who participated once and more than once. Education systems appear in ascending order regarding the percentage of teachers who participated once or more in CPD training on integrating digital technologies into teaching. The percentage differences and standard errors are available in the Statistical tables.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.

Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.

Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

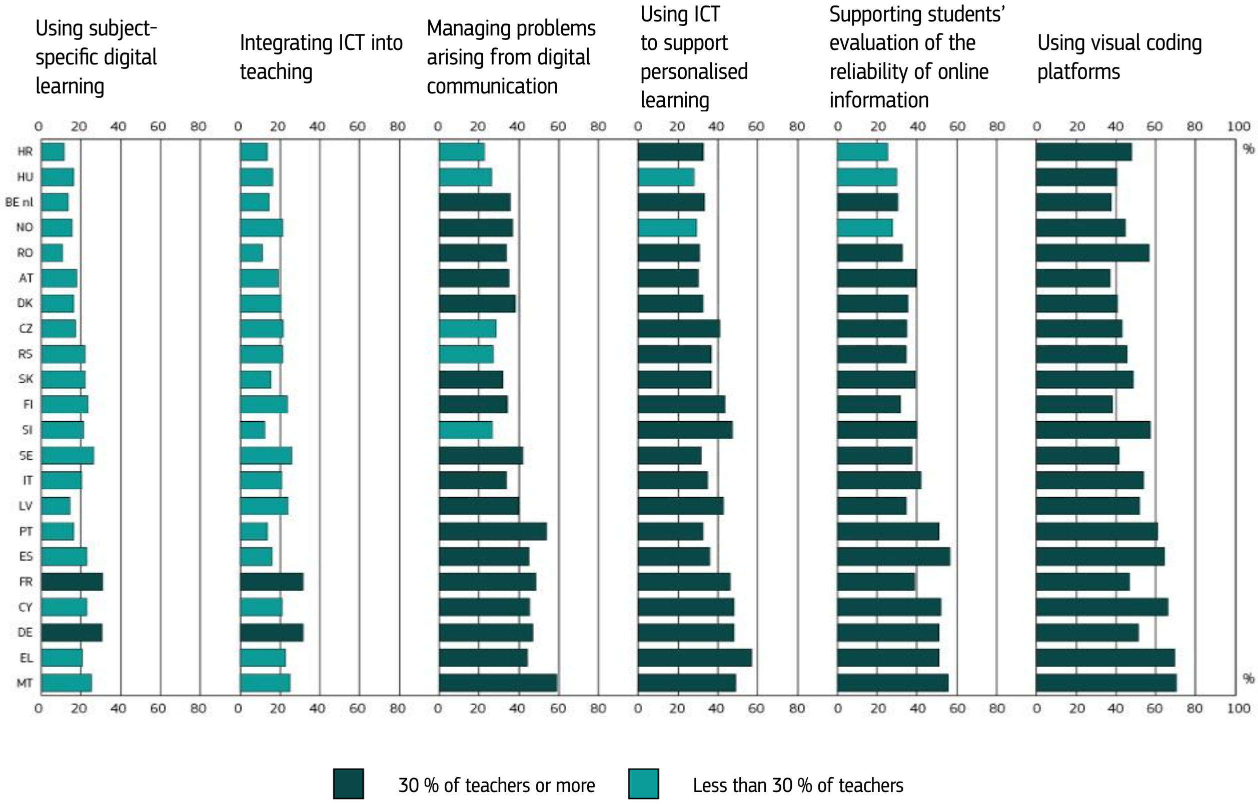
5.2.3. Teachers' self-perceived professional development gaps

This subsection analyses teachers' self-perceived professional development gaps, understood as the discrepancy between the professional development needs identified by teachers themselves and their actual participation in CPD. Based on teachers' responses to the ICILS survey, it investigates the digital competence areas where teachers recognise a need for improvement but are not participating in relevant CPD. With teachers acknowledging the importance of these competences, non-participation may be due to other factors such as insufficient opportunities, competing priorities or time constraints. In the second part, the analysis delves deeper into how teachers' perception on their professional needs is associated with their participation in CPD activities.

Figure 5.10 shows the percentage of teachers who did not participate in CPD activities despite reporting a need for improvement in the six key competence areas examined in the previous section. The self-perceived professional development gap is relatively small in the use of subject-specific digital learning and integrating ICT into teaching but quite significant in the other four competence areas.

The percentage of teachers who acknowledge their need to do more professional learning on subject-specific approaches or integrating digital technologies into teaching but did not participate in relevant CPD activities does not generally exceed 20 %. Only in Germany and France is it around 30 %.

Figure 5.10: Teachers needing to develop their digital competences but not participating in CPD (%), ISCED 24, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

This figure is based on Q9A of the ICILS teacher questionnaire ('How often did you participate in professional learning activities dealing with the following content areas in the past two years?') and Q9B ('Do you need to do more professional learning activities dealing with the following content areas in the future?'). Percentage of teachers who reported the need for more professional learning in these areas but did not engage in CPD in the two years before the survey. Education systems are ranked in descending order based on the average values for the six areas.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % of the overall sampling participation rate. The data for these countries should be interpreted with caution.

Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.

Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

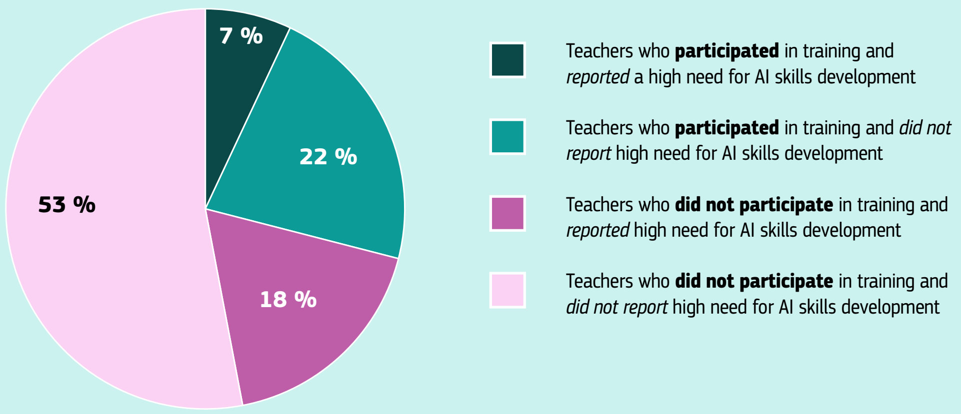
By contrast, in the area of managing social problems arising from digital communication, the percentage of teachers perceiving a professional development gap is 30 % or higher in 17 education systems, and above 50 % in Portugal and Malta. Regarding the use of digital technologies to support personalised learning, at least 30 % percentage of teachers report the need for further professional development but did not engage in relevant CPD activities in 20 education systems, with more than 50 % for Greece. In the area of supporting students' capabilities to evaluate the reliability of internet-based information sources, at least 30 % of teachers report a professional development gap in 19 systems. In Portugal, Spain, Cyprus, Germany, Greece and Malta, the percentage is above 50 %.

The largest professional development gap is observed in the use of visual coding platforms. In this area, the percentage of teachers declaring a need for improvement but not engaging in professional development exceeds 30 % in all countries – and is usually above 40 %. In Portugal, Spain, Cyprus, Greece and Malta, the self-perceived professional development gap concerns more than 60 % of teachers. TALIS data show a similarly large gap in the use of AI for teaching and learning (see box).

Professional learning needs and participation in training on the use of artificial intelligence, TALIS 2024

According to TALIS 2024, an average of only 29 % of lower-secondary teachers in 22 EU countries engaged in CPD activities on the use of AI for teaching and learning in the 12 months prior to the survey. In fact, 75 % of the teachers did not perceive a high need for developing these skills – and 53 % did not participate in related CPD. Only 25 % of teachers declared a high need for developing skills for using AI for teaching and learning, but only 7 % also participated in related CPD.

Professional learning needs and participation regarding the use of AI for teaching and learning, average across 22 EU countries (%)



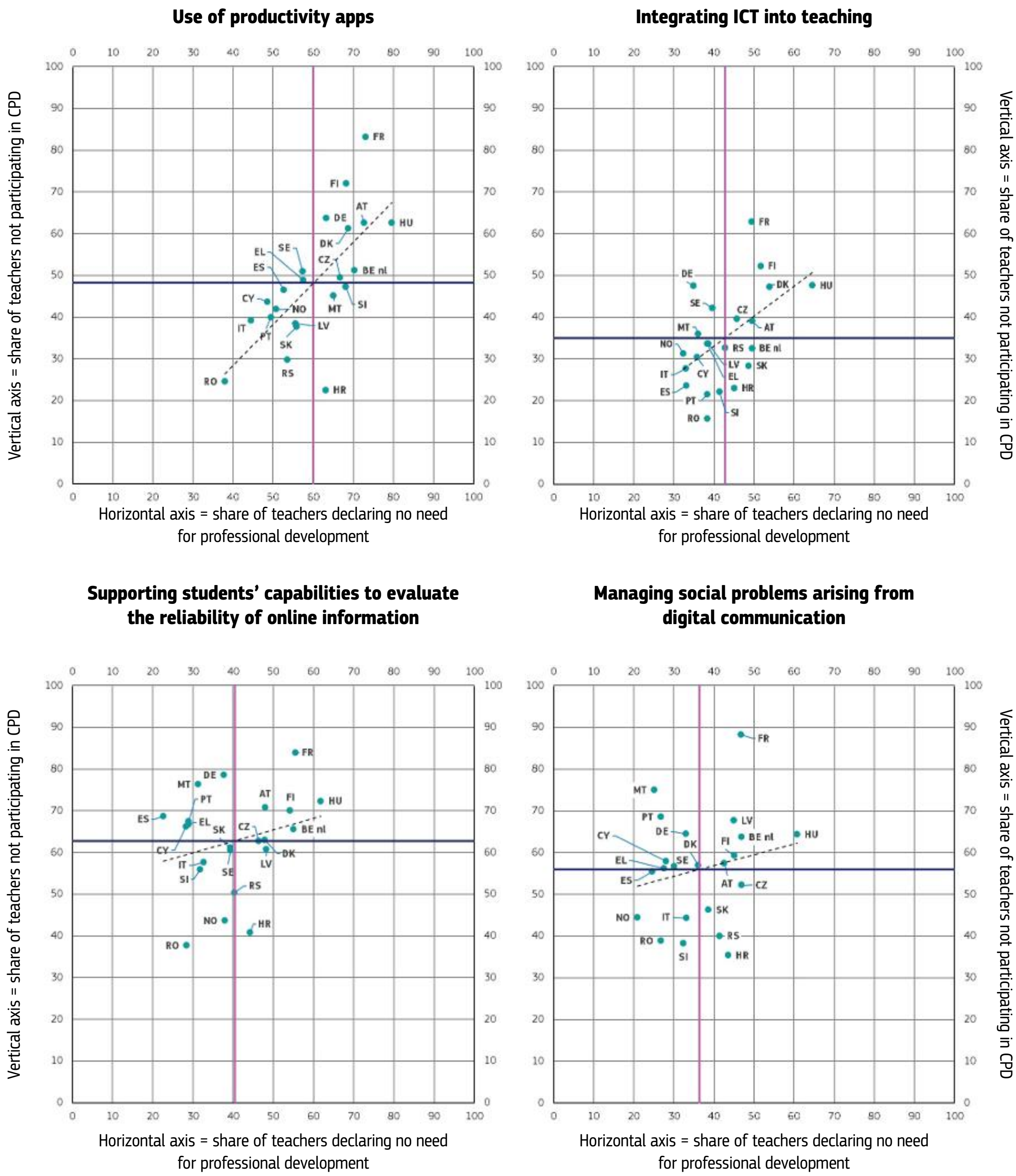
Source: based on Table 4.30, TALIS 2024.

Figure 5.11 illustrates the relationship between the percentage of teachers not needing further professional development (*x* axis) and those who did not engage in related CPD activities over the previous two years (*y* axis). Notably, as the proportion of teachers not needing additional learning increases, so does the percentage of teachers not participating in related CPD activities. The strongest relationship is observed in the use of productivity applications (r = 0.70) and integrating digital technologies into teaching (r = 0.51), while it is notably weaker in the other two areas (r = 0.25 for supporting students' capabilities to evaluate the reliability of online information and r = 0.20 for managing social problems arising from digital communication) ([244]).

This suggests that the perception that no additional professional development is needed explains the non-participation of teachers in related CPD activities to a greater extent in areas such as the use of productivity applications and integrating ICT into teaching than in the other two areas, where teachers may not participate despite finding it necessary for their work.

244 The Spearman and Pearson coefficients are similar, suggesting that the relationship between the two variables is not sensitive to the choice of correlation coefficient or outliers.

Figure 5.11: Relationship between not needing CPD and not participating in CPD, ISCED 24, 2023



	Use of productivity apps	Integrating ICT into teaching	Supporting students' capabilities to evaluate the reliability of online information	Managing social problems arising from digital communication
Pearson coefficient	0.70	0.51	0.25	0.20
Spearman coefficient	0.76	0.50	0.19	0.18

Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

X axes are based on ICILS teacher questionnaire Q9B ('Do you need to do more professional learning activities dealing with the following content areas in the future?'). Percentage of teachers who answered, 'I don't need to do more professional learning related to this content'.
Y axes are based on ICILS teacher questionnaire Q9A ('How often did you participate in professional learning activities dealing with the following content areas in the past two years?'). Percentage of teachers who did not participate.
The blue and red intersecting lines represent the averages of the percentage values.
The Pearson coefficient measures the strength and direction of the linear relationship between not having the need for professional development and not participating in CPD. The Spearman coefficient measures the strength and direction of the relationship between the two ranked variables.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.
Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.
Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

The intersecting lines represent the average values. As illustrated by the red vertical lines, teachers tend to report not needing further professional development on the use of productivity applications more than on the other three competence areas, where teachers are more likely to report the need to improve their competences. For integrating ICT into teaching, the non-participation rate (blue horizontal line) is low; that is, the participation rate is high. However, participation is notably lower for the areas of supporting students' capabilities to evaluate the reliability of online information and managing social problems arising from digital communication; this confirms the larger professional development gap in these areas.

The bottom left quadrant in each scatter plot shows the education systems with lower percentages of teachers not needing and not engaging in CPD (i.e. where needs and participation rates are higher), while the top right quadrant shows the systems with larger percentages of teachers not needing and not engaging in CPD (i.e. where needs and participation rates are lower). The top left quadrant features countries that combine low percentages of teachers not needing further professional development with relatively high non-participation rates (i.e. teachers perceive they need to develop their digital competences but do not engage in relevant training). This is the case in Germany, Greece, Spain, Malta, Portugal and Cyprus for supporting students' in evaluating the reliability of online information; and Germany, Malta and Portugal for managing social problems arising from digital communication. The bottom right quadrant depicts the inverse pattern (i.e. countries with high CPD participation rates despite a low perceived need for further professional development). Croatia appears in this group for all areas.

5.3. Measures to support teachers

To enhance teachers' and trainers' digital competences, the 2023 Council Recommendation underlined the need to provide and recognise flexible, accessible and innovative formats for digital upskilling, such as online training, short courses leading to microcredentials, national and international staff exchanges and peer learning. It also acknowledged how teacher participation in collaborative projects, networks and communities of practice and research can contribute to developing their digital skills and competences.

This section first examines initiatives of this kind that support teachers in developing their digital competences. It subsequently investigates the development of guidelines to support teachers on emerging issues related to the use of digital technologies, including tackling misinformation and social problems arising from digital communication. Finally, it explores measures to foster digital leadership in schools.

5.3.1. Initiatives to promote the development of teacher digital competences

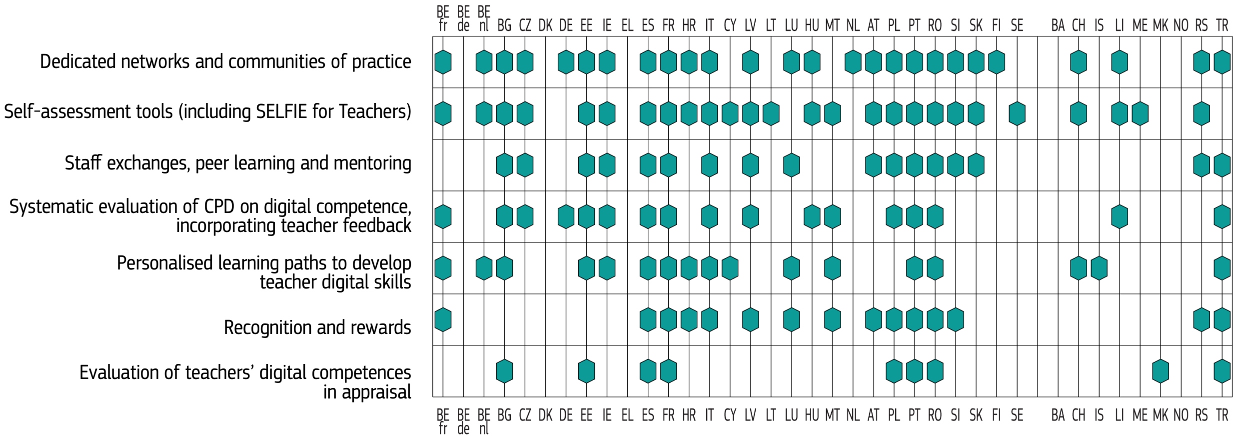
This subsection explores the initiatives implemented by governments across Europe to motivate, support and enable teachers to acquire knowledge, develop their skills and increase their confidence to effectively integrate digital technologies into their teaching practices. It specifically examines:

1. the creation of dedicated networks and communities of practice on digital education for teachers;
2. the promotion of staff exchanges, peer learning and mentoring in the field of digital education;

3. the development of personalised learning paths to enhance teachers' digital competences;
4. the introduction of recognition systems, such as badges or certificates, to acknowledge teachers' digital competences, and the provision of rewards, stipends or other incentives to encourage their continuing development;
5. the evaluation of teachers' digital competences as part of their appraisals to track progress and ensure further professional development when needed;
6. the use of self-assessment tools to enable teachers to monitor their progress and identify areas for improvement;
7. the systematic evaluation of CPD plans and schemes to ensure that training programmes are effective, relevant and responsive to teachers' needs and the latest developments in digital education.

Figure 5.12 shows that all but five education systems have at least one of these measures in place, with Spain, France, Portugal and Romania reporting all, and Bulgaria, Estonia, Italy, Poland and Türkiye reporting nearly all.

Figure 5.12: Measures to promote the continuing development of teacher digital competences, ISCED 24, 2024/2025



Source: Eurydice.

More than two thirds of the education systems have established and support specialised networks and communities of practice for teachers and the use of self-assessment tools.

The dedicated networks and communities of practice provide opportunities for teachers to share best practices, exchange ideas and knowledge, receive feedback, collaborate with other teachers, engage in projects and access learning resources, training, expertise and support (see country examples).

Dedicated networks and communities of practice for digital education

The Digisprong Knowledge Centre in the **Flemish Community of Belgium** is a platform that fosters learning networks for educators to exchange insights and experiences on specific digital themes.

DIGI plovárna in **Czechia** is a place for sharing ideas among teachers, a space for developing digital competences and a source of inspiration for teaching computer science in basic and upper-secondary schools. Teachers present their experiences and practical examples to each other in collaboration with the event moderator. The programme of the 'DIGI pool' focuses on individual educational areas / subjects (and their pedagogies) and their interconnection with digital competences.

The Expertisepunt Digitale Geletterdheid in the **Netherlands** is a digital expertise centre connecting, inspiring and informing schoolteachers who would like to develop their digital literacy and apply digital technologies to teaching and learning.

The eEducation initiative in **Austria** aims to bring digital and computer science skills into all classrooms, with a network of innovative schools and activities to support teachers.

Regarding self-assessment tools, a few European countries have developed their own online tools to enable teachers to self-assess their progress in developing digital competences and tailor their learning paths accordingly. Examples include Pix in the French Community of Belgium, Digisnap in the

Flemish Community of Belgium, Profil Učitel21 in Czechia, Pix+ Édu in France, TET-SAT in Cyprus and digi.check in Austria. A more widespread approach across Europe is the adoption of Self-reflection on Effective Learning by Fostering the Use of Innovative Educational Technologies (SELFIE) for Teachers, a free online tool offered by the European Commission in 24 languages. This tool enables teachers to assess and receive feedback on their using digital technologies in their teaching practice. The use of SELFIE for Teachers has been officially adopted in 23 educations systems [245]. In Liechtenstein, school heads are responsible for ensuring the use of SELFIE among teachers, which is also used in school internal evaluations.

SELFIE helper and pedagogical innovation assistant

The SELFIE helper and pedagogical innovation assistant (Sherpa) project is a two-year Erasmus+, key action 3 programme, which aims to enhance the systematic use of the SELFIE tool across Europe. Sherpa will support schools in building their knowledge around the SELFIE tool and understanding its results in terms of their strategy and practices for integrating digital technologies into their school environment. The objective is to develop a SELFIE helper (a chatbot system to help schools use the SELFIE platform, providing them with real-time help to resolve specific issues) and a SELFIE pedagogical toolkit (a comprehensive package that aims to help schools understand the results of SELFIE and use them to develop specific innovative strategies and actions that address the more effective use of digital technologies in teaching and learning).

Participants in the project include the International Hellenic University, the Faculty of Information Technology at the University of Jyväskylä in Finland, the Cyprus Pedagogical Institute, the Centre for Educational Technology at Tallinn University in Estonia and the Institute for Educational Technology of the National Research Council of Italy.

Less than half of these education systems provide for opportunities for staff exchanges, peer learning and mentoring, the systematic evaluation of CPD plans and schemes to take into account teachers' needs, personalised learning paths, recognition systems and rewards.

Mentorship schemes specific to digital education, where experienced teachers or project leaders provide on-the-job support and guidance to teachers individually, are offered as part of the progetiiger programme in Estonia, the field training workshops in Italy [246] and the National Institute for Teacher Training (IFEN) peer-to-peer programme in Luxembourg. In Slovakia, the 'digital transformation of education and schools' programme provides for individualised coaching for school heads and mentoring for teachers in dedicated clubs and from the digital coordinators. Job-shadowing and peer observation programmes in several autonomous communities in Spain include the use and integration of digital technologies into teaching [247]. Similarly, the teacher mobility programme in Türkiye offers teachers the opportunity to go to work in a different school in the context of several digital projects. In general, mentoring, peer observations in the classroom or job exchanges are not widespread across European countries, which more frequently offer teachers the opportunity for peer learning and exchanges in the context of dedicated workshops and learning communities.

Teachers' feedback is an integral part of the evaluation of CPD programmes offered or funded by education authorities and is systematically used for improving them in systems such as the French Community of Belgium, Bulgaria, Estonia, Spain, France, Italy, Latvia, Hungary, Poland, Romania, Liechtenstein and Türkiye. Teachers are typically asked to evaluate the content of the programmes, the teaching methodology, the trainers and the progress achieved in the development of their competences. In the French Community of Belgium, teachers' self-assessments of their digital competences in the context of the project 'form@tion 2022–2025' have also been used to identify their needs and develop training and resources accordingly. In Czechia, the National Pedagogical Institute (Digikoalice) produces reports evaluating how schools teach digital competences, which include the evaluation of the development of teachers' digital competences through CPD activities, as well as their opinions and attitudes. In Ireland, the evaluation of CPD programmes systematically considers the feedback collected from teachers, but it may also include a post-impact evaluation of teachers' progress and change of practice. In Malta, the digital professional development sessions provided by Directorate for Digital Literacy and Transversal Skills are designed according to the feedback received from teachers and schools, their impact on teaching practice, recent developments in digital technology and pedagogy, and policy priorities. In Portugal, the Ministry of Education, Science and Innovation, in cooperation with the training centres of the schools' association (CFAE) has designed a CPD offer (as stipulated in the Digital transition action plan) based on the previous evaluation of teachers' digital competences (following DigCompEdu).

245 In North Macedonia, the use of SELFIE for Teachers has been piloted in vocational secondary education.

246 Italy, Ministerial Decree No 66 on the training of school staff for the digital transition .

247 Examples include Observa_Acción in Galicia, ObservaRioja in La Rioja, Programa Visita in Cantabria and Mira y Actúa in Aragon.

Personalised learning paths are tailored approaches to the development of digital skills that take into account teachers' prior knowledge, skills and experiences, and allow them to define their own learning paths and pursue them at their own pace. They are competence-based, adaptive and flexible (in terms of content, time and means), often leading to formal recognition through certificates or badges. In France, the Magistère platform offers online courses and training programmes that enable teachers to create personalised learning paths for developing their digital competences, with associated badges recognising the completion of these programmes. In Croatia, the e-Schools program provides workshops, webinars, e-courses and hosts EduBlica, which consists of about 300 digital items for microlearning. Similarly, teachers can create their own learning paths to acquire and certify digital competences through the form@tion 2022–2025 project in the French Community of Belgium, the Scuola Futura platform in Italy and the Teacher Information Network in Türkiye. In Spain, teachers can get accreditation for their digital competences and obtain points that are valuable for competing for transfers. In Slovenia, teachers who can certify the innovative use of modern technologies in an educational learning process and their dissemination in conferences or dedicated communities of practice can get points for their career progression. Teachers who engage in CPD on digital competence can also obtain credits for career progression in Romania and Serbia.

The evaluation of teachers' digital competence in regular appraisals is only reported in nine countries (Bulgaria, Estonia, Spain, France, Poland, Portugal, Romania, North Macedonia and Türkiye).

5.3.2. Guidelines for supporting teachers on emerging issues related to the use of digital technologies

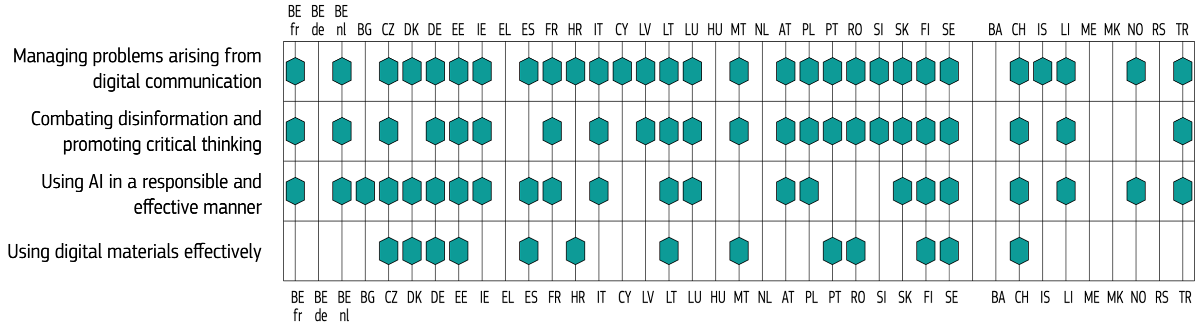
As highlighted in previous sections, the focus of ITE and CPD tends to be on general or subject-specific approaches to integrating digital technologies into teaching, with less attention given to other essential areas such as teaching students to critically evaluate the reliability of online information, managing social problems arising from digital communication (e.g. cyberbullying) and using AI effectively and safely. Additionally, digital wellbeing in the teaching and learning process is increasingly becoming a prominent topic in political and policy debates. As underlined by the 2023 Council Recommendation, it is necessary to design supportive digital teaching and learning approaches and environments, taking into account the risks associated with the overuse and misuse of digital technologies. The European Commission has recently updated the guidelines for teachers and educators on tackling disinformation and promoting digital literacy through education and training (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2026a) and on the ethical use of AI and data in education and training (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2026c). It has also released new guidelines on making informed choices on digital education content (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2025b).

This subsection aims to explore whether education authorities across Europe have developed and disseminated guidelines to support teachers in addressing the following issues:

1. managing problems arising from digital communication, including cyberbullying, screen addiction and other related problems;
2. combating disinformation and promoting critical thinking;
3. using AI in a responsible and effective manner;
4. optimising the use of digital materials, including striking a balance between digital and non-digital resources, and selecting and evaluating digital resources.

Figure 5.13 shows that 30 education systems have developed guidelines for at least one of these key issues. Notably, Czechia, Estonia, Lithuania, Finland, Sweden and Switzerland have guidelines for all four areas. In Germany, guidelines cover the different issues depending on the *Länder*.

Figure 5.13: Guidelines on emerging issues associated with the use of digital technologies, ISCED 24, 2024/2025



Source: Eurydice.

Country-specific notes

Greece, Malta and **Romania**: Education authorities are expecting to release guidelines for teachers on the use of AI in 2026.
Iceland: The AI action plan for 2025–2027 provides for the development of standards and guidelines for teachers on the use of AI in education, with particular attention to ethical and privacy issues.

Around three quarters of the education systems have developed guidelines to support teachers in managing problems arising from digital communication. These guidelines generally cover how to prevent and deal with cyberbullying, which is understood as the use of digital technologies, such as social media, text messages or online forums, to harass, intimidate or humiliate another person. They may also address the safe and ethical of using social media more broadly, including issues such as online harassment, the sharing of harmful content, hate speech and discrimination (e.g. based on gender, age or race), screen addiction, data privacy and security.

Guidelines for teachers on how to combat disinformation and promote students' critical thinking are available in 23 education systems. They are often provided in the context of broader projects, as is the case in Czechia (AIDIG project), Estonia (Targalt Internetis), Ireland (Webwise.ie), France (Éduscol – education aux médias et à l'information), Austria (Safer Internet Centre and Zentrum Polis), Poland (Ogólnopolska Sieć Edukacyjna), Portugal (SeguraNet programme) and Slovenia (Dezinformacije). In the Flemish Community of Belgium, the Knowledge Centre for Digital and Media Literacy (Mediawijs) offers 'Mediacoach' training, lesson plans, fact-checking tools, video materials and guidelines addressing topics related to disinformation and fake news. The French Community of Belgium ([248]) and Switzerland ([249]) have developed dedicated websites on combating disinformation.

Guidelines for teachers on the responsible and effective use of AI are reported in 22 education systems. They can refer to guidelines on the use of AI in schools (Czechia ([250]), Ireland ([251]), Italy ([252]), Slovakia ([253]) and Norway ([254]), or in education (Bulgaria ([255]), Denmark ([256]), Estonia ([257]), Spain ([258]), France ([259]), Poland ([260]) and Switzerland ([261])).

248 French Community of Belgium, Higher Council for Media Education (CSEM).
249 Switzerland, IQESonline – Fake news.
250 Czechia, Guidance on AI in schools.
251 Ireland, Guidance on AI in schools.
252 Italy, Guidelines on the use of AI in schools.
253 Slovakia, Recommendations for the use of artificial intelligence in primary and secondary schools.
254 Norway, Guidelines on AI in schools.
255 Bulgaria, Guidelines on the use of AI in the education system.
256 Denmark, Recommendations on the use of generative AI in primary education, by the Board of Education and Quality.
257 Estonia, AI guidelines, by the Ministry of Education and Research.
258 Spain, Guidelines on the use of AI in education.
259 France, Framework for the use of AI in education.
260 Poland, AI as megatrend shaping education: How to prepare for opportunities and socio-economic challenges related to Artificial Intelligence?. See also https://fundacja.orange.pl/nasze-programy/lekcja-ai and https://zpe.gov.pl.
261 Switzerland, AI in education.

The French Community of Belgium ([262]), the Flemish Community of Belgium ([263]), Lithuania ([264]), Finland ([265]), Luxembourg ([266]), Austria ([267]), Sweden ([268]) and Türkiye ([269]) have developed specific guidelines for teachers ([270]). These guidelines typically cover issues such as understanding the logic of AI applications, critical evaluation of AI-generated content, data protection and copyright issues, the use of AI to enhance lesson planning, differentiated instruction, student assessment and feedback, and how to support students to use AI in a responsible manner.

One third of the education systems have developed guidelines on the effective use of digital materials. In Estonia, the ÕPIRAAM framework for planning and conducting effective, balanced and inclusive instruction includes specific recommendations for the meaningful use of digital tools, emphasising the balance between digital and non-digital resources and the importance of critically selecting and evaluating digital materials to enhance learning outcomes. The Swedish government has now shifted its focus from digital learning materials to greater emphasis on analogue resources, recommending the selective use of digital tools only when they offer clear educational value. The Swedish National Agency for Education (Skolverket) is developing guidelines and support materials to help educators select and use learning tools more effectively ([271]). Denmark, Croatia and Malta have also published recommendations to strike a balance between the use of digital and non-digital resources for teaching in schools. Czechia, Germany, Spain, Lithuania, Portugal, Romania, Finland and Switzerland have developed guidelines to support teachers in assessing and selecting digital resources.

5.3.3. Digital leadership and support

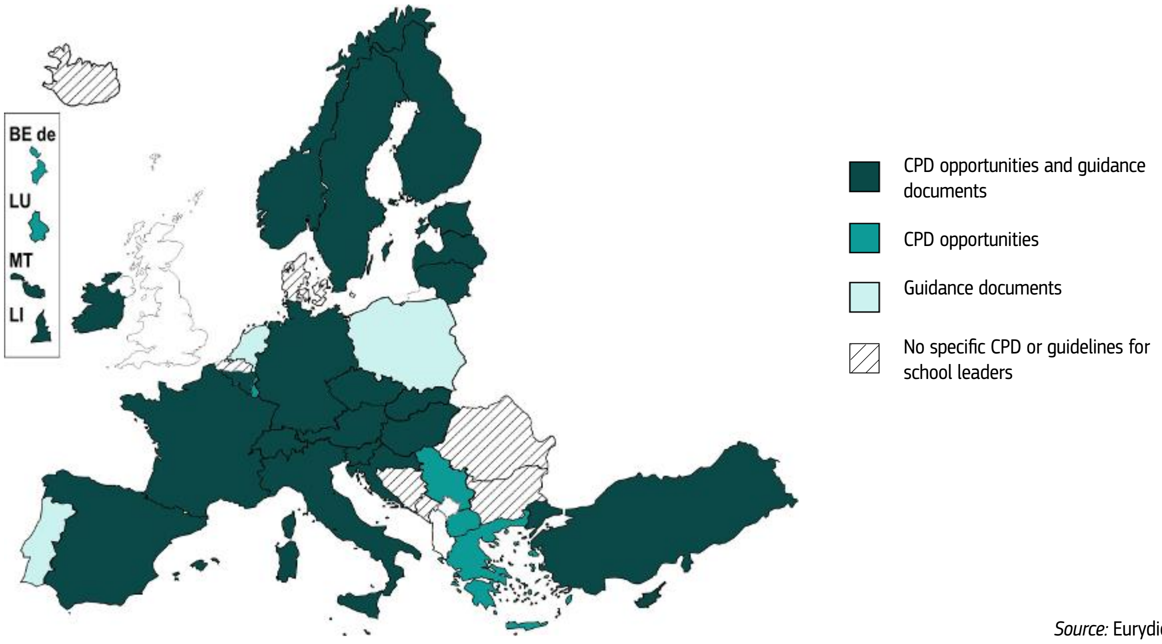
School leaders play a vital role in advancing digital education by providing a clear vision for technology integration, empowering teachers to innovate and experiment with new approaches and fostering a culture of continuous learning and improvement. This subsection examines the support mechanisms established by education authorities to equip school leaders with the necessary tools and expertise to effectively integrate digital technologies into their schools, ensuring their optimal, safe and responsible use to enhance teaching and learning outcomes.

Figure 5.14 shows the education systems that provide specific CPD opportunities for school heads, with a focus on digital leadership, strategic planning and the effective integration of emerging technologies, and guidance documents to support them in developing and implementing school digital plans and strategies.

The majority of education systems (23 in total) provide CPD opportunities and guidance documents for school leaders. The 'Digital educational leadership programme' in Czechia aims to empower school heads to integrate digital technologies, create a vision, address risks and build an inclusive and safe environment ([272]), while the 'Handbook for school heads on ICT management in schools' provides guidance on the school IT administration environment and funding options ([273]). To facilitate the recent introduction of school digital plans in Spain, the autonomous communities are providing school leaders with specific training and guidance documents, while the National Institute for Educational Technologies and Teacher Training (INTEF) has developed a guide to help school heads to develop, implement and evaluate school digital plans ([274]).

262 French Community of Belgium, AI guidelines for teachers.
263 Flemish Community of Belgium, AI guidelines for teachers.
264 Lithuania, How to seize the opportunities of artificial intelligence? Advice for teachers.
265 Finland, AI guide for teachers.
266 Luxembourg, Guidelines, practice and exchange on artificial intelligence.
267 Austria, School package on AI.
268 Sweden, advice on AI, chatbots and similar tools.
269 Türkiye, AI tools for education.
270 This is also the case in some German *Länder* and in Liechtenstein.
271 Sweden, Guide on the selection and use of learning tools in teaching.
272 Czechia, Digital educational leadership programme.
273 Czechia, Guide on ICT school governance for school heads.
274 Spain, School digital plan.

Figure 5.14: CPD and guidance documents on the integration of digital technologies for school leaders, ISCED 24, 2024/2025



Source: Eurydice.

In Estonia, facilitating school digital innovation and learning in technology-rich environments is among the centrally supported CPD activities for school leaders under the HANO initiative, while the 'Digital Mirror' (Digipeegel) offers guidance and resources to lead and manage digital innovation in schools. In Slovenia, the National Education Institute offers guidance documents for schools to develop their digital strategies, while the Raising Digital Competence portal offers training opportunities for school leaders to develop their digital competences.

While the German-speaking Community of Belgium, Greece, Luxembourg, North Macedonia and Serbia provide CPD opportunities for digital leadership, strategic planning and the effective integration of digital technologies, Malta, Poland and Portugal have developed guidance documents.

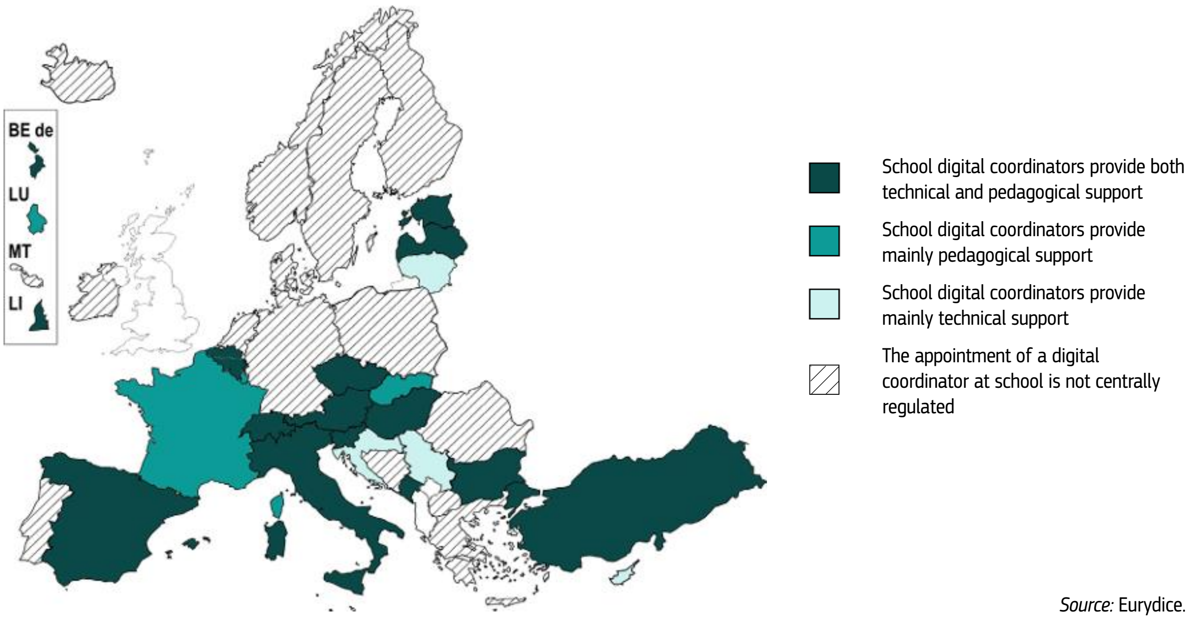
Training and guidance are essential for empowering school leaders to drive digital transformation and foster innovative education at their schools. However, the individualised, daily support provided by digital coordinators can make a significant impact on the successful implementation and sustainability of digital initiatives. By having a dedicated digital coordinator, schools can benefit from personalised guidance, technical support and enhanced collaboration, ultimately leading to increased confidence and competence in using digital technologies.

Figure 5.15 illustrates the education systems that provide for the appointment of digital coordinators in schools, 23 systems in total. In the other 15 systems, there is not such a provision at the central level, but there may still be digital coordinators at schools. The digital coordinator may be responsible for the technical support, for pedagogical aspects (e.g. advising on digital pedagogy, choosing digital tools or resources) or for both.

Most commonly, school digital coordinators provide technical assistance and pedagogical support for teachers. This is the case in 16 education systems. Their responsibilities may include providing technical support and troubleshooting, ensuring network security and data protection, managing software and hardware updates, advising school leaders on the design and implementation of the school digital strategy, supporting teachers in developing digital literacy and pedagogical skills, and collaborating with teachers to develop digital resources and materials.

In Croatia, Cyprus, Lithuania and Serbia, the role of digital coordinators is mainly technical, while, in France, Luxembourg and Slovakia, they are mainly responsible for the pedagogical support.

Figure 5.15: Main role of school digital coordinators, ISCED 24, 2024/2025



Source: Eurydice.

Country-specific notes

Greece: Schools may appoint someone to support teachers and students in the use of the computer labs.
Spain: The specific role of the digital coordinators is defined by the autonomous communities.
Switzerland: Digital coordinators can provide both pedagogical and technical support or just one depending on the school. In some schools, there are two coordinators for each type of responsibility.

5.4. The use of digital technologies in teaching

The creation of a supportive environment that encourages teachers to develop their digital competences and apply their knowledge and skills in their teaching practice requires the provision of a quality access to digital technology, technical support and troubleshooting services, and a robust and reliable digital infrastructure (including learning management systems, online platforms and digital tools). However, it is also crucial that teachers have the necessary time and resources to explore, experiment and integrate digital tools and methods into their teaching practice and, moreover, that they believe it is worthy and necessary.

Research has widely demonstrated the close relationship between the integration of technologies in the classroom and teachers' beliefs in its potential benefits (Ertmer, 2005; Cheng and Xie, 2018; Petko, Prasse and Cantieni, 2018). Teachers who believe digital technologies can make a substantial difference in learning tend to be more resilient in the face of obstacles and exhibit greater agency in navigating challenges (Vongkulluksn, Xie and Bowman, 2018; Kimmons and Hall, 2016). Teachers who hold positive beliefs about the impact of using digital technologies on student engagement, motivation and learning outcomes are more likely to integrate them into their teaching practices (Ottenbreit-Leftwich *et al.*, 2010; Galanek and Gierdowski, 2019). TALIS confirms that, the more positive beliefs teachers have about the benefits of using digital content, the more likely they are to use it in whole-class and individualised instruction (OECD, 2025c).

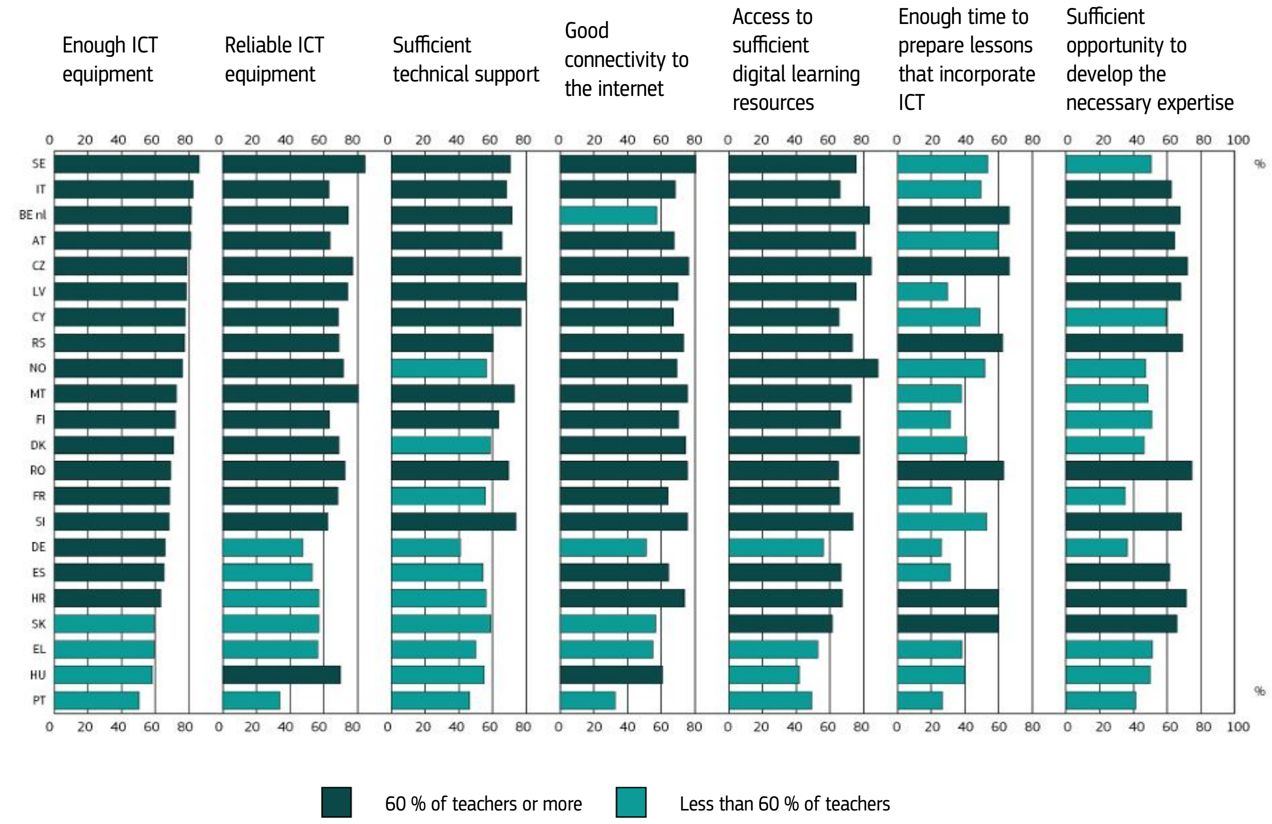
This section focuses on these two dimensions, which may influence the successful integration of digital technologies into teaching. The several elements characteristic of a supportive environment for technological integration, is investigated in the first subsection, while the second subsection investigates its impact on the use of digital technologies for teaching. The last subsection focuses on teachers' views of the challenges and benefits of digital technologies in education.

5.4.1. Teacher access to supportive conditions

This subsection examines teachers' access to certain supporting conditions for integrating digital technologies into teaching, according to their responses to the ICILS survey. Figure 5.16 shows the percentage of lower-secondary teachers who report that:

- their school has enough ICT equipment (e.g. computers and peripheral devices);
- the ICT equipment works when they need to use it;
- there is sufficient technical support to maintain the ICT equipment;
- the school has good connectivity (e.g. fast speed and stable connection) to the internet;
- the school has access to sufficient digital learning resources (e.g. learning software or apps);
- there is enough time to prepare lessons that incorporate ICT;
- there is sufficient opportunity to develop the expertise necessary to prepare lessons that incorporate ICT.

Figure 5.16: Teachers reporting access to certain supportive conditions for integrating digital technologies into teaching (%), ISCED 24, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

This figure is based on Q13 of the ICILS teacher questionnaire ('To what extent do you agree or disagree with the following statements about the use of ICT in teaching at your school?'). Percentage of teachers who agreed and strongly agreed. Education systems are ranked in descending order based on the percentage of teachers who reported that their school has enough ICT equipment.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.

Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.

Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

Teachers usually have enough computers and other peripheral devices, and often have stable, fast internet connection at school. However, this equipment may not always work, and the school may lack the technical support necessary to maintain it. Similarly, although teachers tend to have access to the necessary digital learning resources, they may not have enough time to prepare lessons or develop the required expertise. The most supportive environment can be found in Czechia, Serbia and Romania, where 60 % or more of the teachers report access to all seven areas.

In all but four countries (Slovakia, Greece, Hungary and Portugal), 60 % or more of teachers report that their schools have enough ICT equipment. However, they may experience problems when using it or regarding its maintenance. More than 40 % of teachers report experiencing problems when using school ICT equipment in six countries (Germany, Spain, Croatia, Slovakia, Greece and Portugal) and not having the necessary technical support to maintain the equipment in 10 (Norway, Denmark, France, Germany, Spain, Croatia, Slovakia, Greece, Hungary and Portugal). In five education systems (Flemish Community of Belgium, Germany, Slovakia, Greece and Portugal), more than 40 % of teachers report problems in access to stable, fast speed connectivity to internet at school.

Similarly, 60 % or more of teachers report that their schools have access to sufficient digital learning resources in all but four countries (Germany, Greece, Hungary and Portugal). However, teachers often lack the time to prepare lessons that incorporate ICT or sufficient opportunity to develop the necessary expertise. Of the seven supportive conditions, having enough time is reported by the lowest percentage of teachers in nearly all the countries. More than 40 % of teachers report not having enough time to prepare lessons incorporating digital technologies in 16 education systems, and more than 40 % report not having the opportunity to develop the necessary expertise in 11 systems. The lack of time to prepare lessons concerns the majority of teachers in more than half of the systems, and more than two thirds in Latvia, Finland, France, Germany, Spain and Portugal.

5.4.2. Relationship between supportive conditions and use of digital technologies for teaching

This subsection explores how these supportive conditions can influence the integration of digital technologies into teaching practices. Figure 5.17 shows the relationship between the percentage of teachers using digital technologies for teaching every day (*y* axis) and the percentage of teachers who (*x* axis):

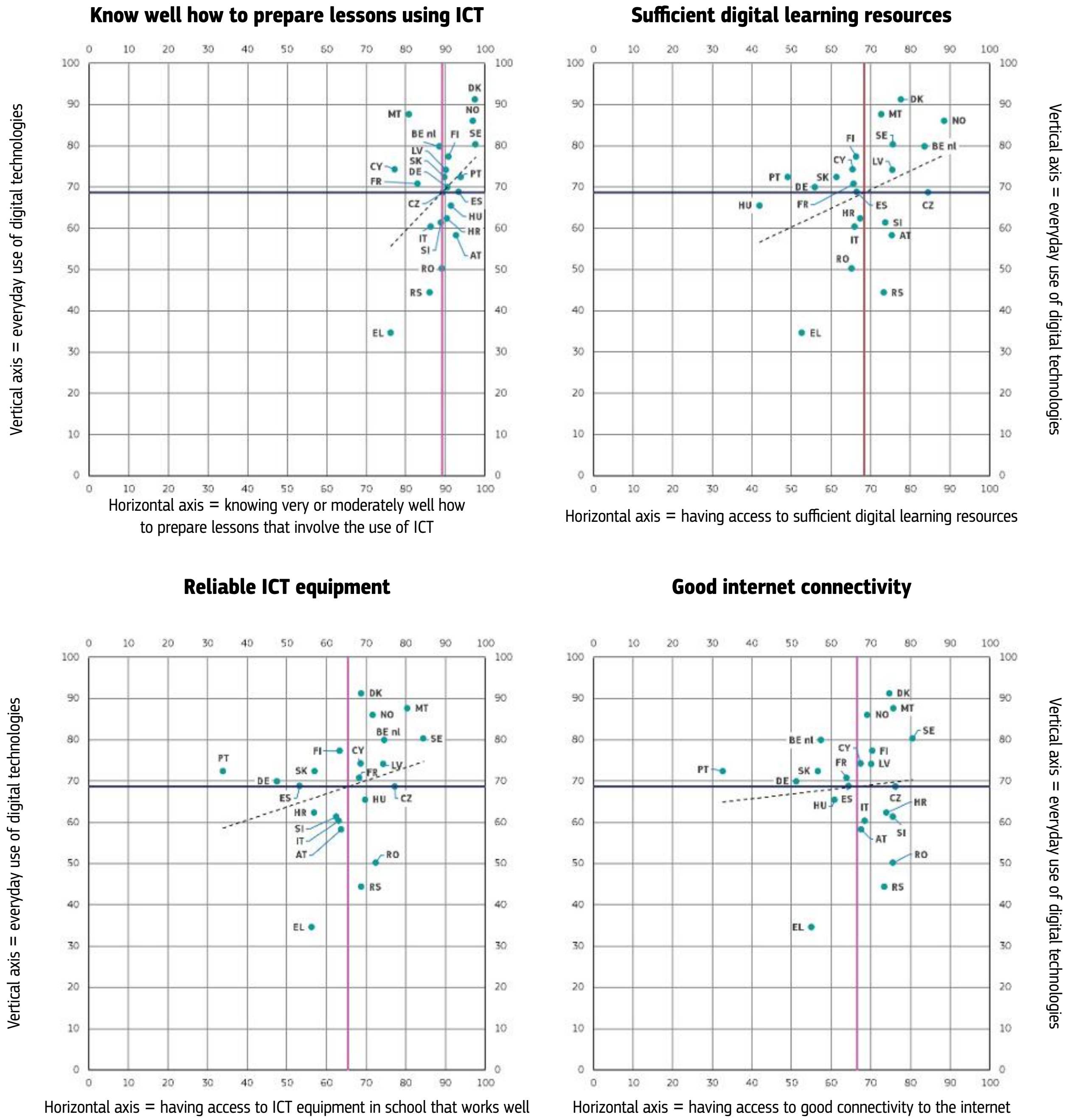
- know well how to prepare lessons using ICT;
- have access to sufficient digital learning resources;
- have access to reliable ICT equipment;
- have good connectivity (e.g. fast speed and stable connection) to the internet.

The figure shows a positive relationship between the first three variables and the regular use of digital technologies for teaching. As the proportion of teachers who know how to prepare lessons incorporating digital technologies and have access to sufficient digital learning resources and reliable ICT equipment increases, so does the percentage of teachers using digital technologies for teaching every day. The positive relationship is stronger for teachers' self-confidence in preparing lessons using ICT (r = 0.42) and the availability of digital learning resources (r = 0.38), and weaker for access to reliable ICT equipment (r = 0.26) ([275]). Good connectivity to the internet may be a prerequisite but have a limited role in explaining increases in the everyday use of digital technologies by teachers.

The intersecting lines represent the average values. As illustrated by the red vertical lines, teachers report knowing how to prepare lessons with digital technologies in larger percentages than having access to learning resources, ICT equipment and internet connectivity. The bottom left quadrants show the education systems with low percentages for each of these factors combined with low percentages of teachers using digital technologies in their lessons every day. Greece usually features in this group. The top right quadrants show the education systems with the highest percentages, usually including the Scandinavian countries.

275 The Spearman and Pearson coefficients are similar, suggesting that the relationship is not sensitive to the choice of correlation coefficient or outliers.

Figure 5.17: Relationship between supportive conditions and the daily use of digital technologies for teaching, ISCED 24, 2023



	My school has access to sufficient digital learning resources	I can prepare lessons that involve ICT well	ICT equipment in my school works whenever I need to use it	My school has good connectivity to the internet
Pearson coefficient	0.38	0.42	0.26	0.09
Spearman coefficient	0.38	0.34	0.38	0.12

Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

X axes are based on ICILS teacher questionnaire Q7 ('How well can you do these tasks using ICT? Prepare lessons that involve the use of ICT'), percentage of teachers who replied, 'I can do this very well' and 'I can do this moderately well', and ICILS teacher questionnaire Q13 ('To what extent do you agree or disagree with the following statements about the use of ICT in teaching at your school?'), percentage of teachers who agreed and strongly agreed with 'My school has access to sufficient digital learning resources', 'ICT equipment in my school works whenever I need to use it' and 'My school has good connectivity to the internet'.
Y axes are based on ICILS teacher questionnaire Q6 ('How often do you use ICT at school for teaching?'). Percentage of teachers who replied, 'once every day' and 'more than once every day'.
The blue and red intersecting lines represent the average of the percentage values.
The Pearson coefficient measures the strength and direction of the linear relationship between teachers' proficiency and access to adequate equipment, connectivity and resources, on the one hand, and the daily use of digital technologies in their teaching, on the other. The Spearman coefficient measures the strength and direction of the relationship between the two ranked variables.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.
Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.
Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

5.4.3. Teachers' views of the challenges and benefits of digital technologies in education

This subsection examines the concerns and perceptions of teachers regarding the integration of digital technologies in education as revealed through their responses to the ICILS survey. First, it investigates the potential drawbacks and challenges that teachers associate with the use of digital technologies into teaching and learning, and, second, it examines the benefits and advantages that teachers believe digital technologies can bring to the educational process.

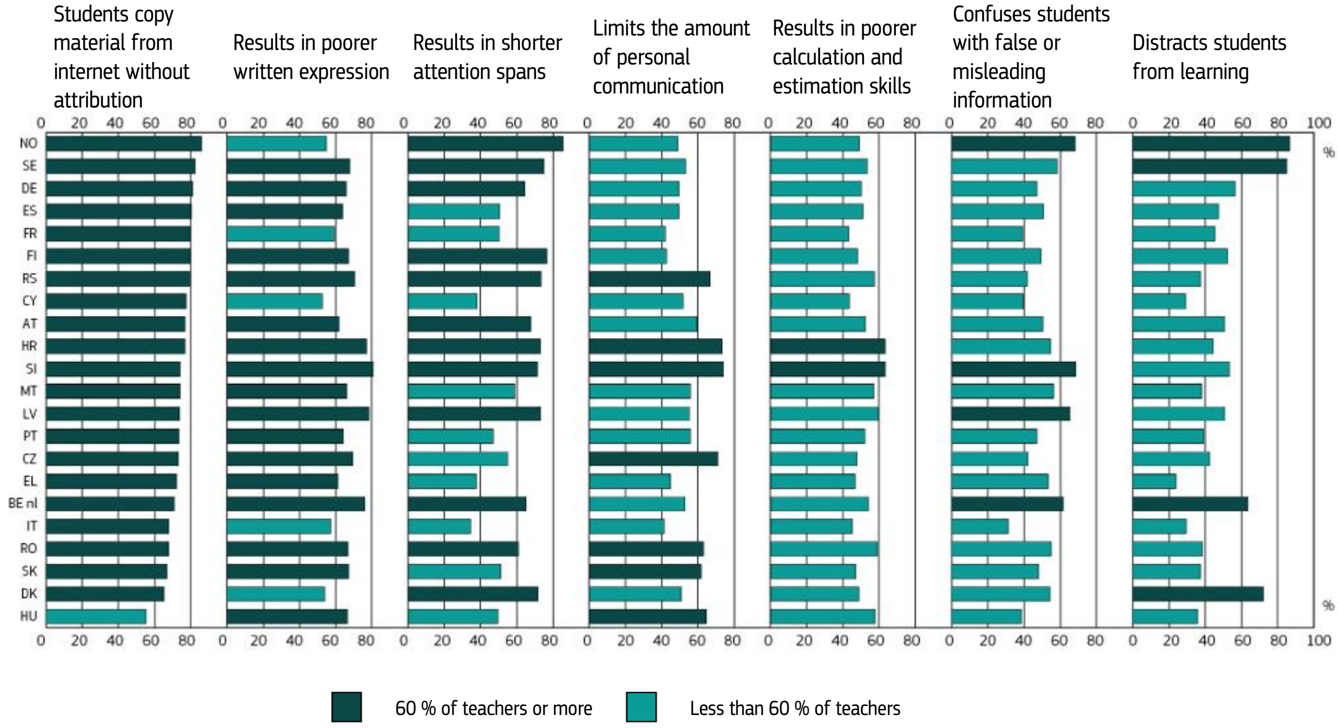
Figure 5.18 shows that the predominant concern among teachers is the risk of students plagiarising online content, specifically copying material from internet sources without properly citing or attributing it. With the exception of Hungary, the percentage of teachers sharing this concern exceeds 60 % in all education systems, reaching 80 % or more in Norway, Sweden, Germany, Spain, France and Finland.

In all but five education systems, 60 % or more of teachers believe that the integration of digital technologies in teaching and learning leads to a decline in students' written expression skills. In more than half of the systems, 60 % or more of teachers think that digital technologies contribute to shortening students' attention spans.

Albeit less prominently, teachers are also concerned about the potential negative effects of digital technologies on students' interpersonal communication and calculation skills, and about the risks of disinformation. Most teachers in more than half of the education systems share these concerns. Distraction from learning is the challenge less commonly reported.

On average, teachers tend to be more concerned about these risks and drawbacks in Norway, Sweden, Serbia, Croatia, Slovenia, Latvia and the Flemish Community of Belgium.

Figure 5.18: Teachers' views of the drawbacks of using digital technologies in teaching and learning (%), ISCED 24, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

This figure is based on Q14 of the ICILS teacher questionnaire ('To what extent do you agree or disagree with the following statements about using ICT in teaching and learning at your school?'). Percentage of teachers who agreed and strongly agreed. Education systems are ranked in descending order based on the percentage of teachers who believe that using digital technologies in teaching and learning results in students copying information from the internet without attribution.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.

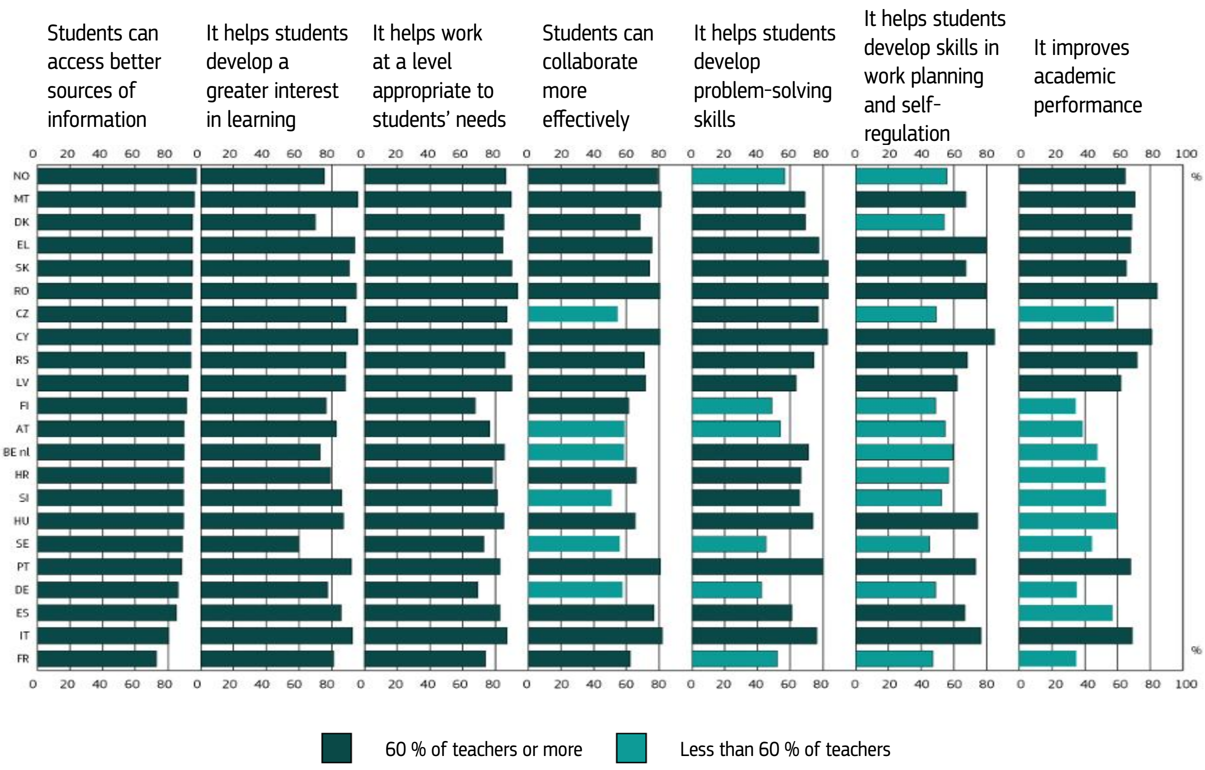
Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.

Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

Figure 5.19 shows teachers' beliefs on the merits of using digital technologies for teaching and learning. Generally, the percentages of teachers in agreement with these benefits exceed the percentages of teachers concerned by potential risks and drawbacks.

Teachers generally agree that the use of digital technologies in education enables students to access better sources of information, increases their interest in learning and helps them work at the level of their individualised needs. More than 60 % of teachers in all education systems acknowledge these benefits, with particularly high levels of recognition in Norway, Malta, Denmark, Greece, Slovakia, Romania, Czechia and Cyprus.

Figure 5.19: Teachers' views of the benefits of using digital technologies in teaching and learning (%), ISCED 24, 2023



Source: Eurydice, based on IEA, ICILS 2023 database.

Explanatory notes

This figure is based on Q14 of ICILS teacher questionnaire ('To what extent do you agree or disagree with the following statements about using ICT in teaching and learning at your school?'). Percentage of teachers who agreed and strongly agreed. Education systems are ranked in descending order based on the percentage of teachers who believe that using digital technologies in teaching and learning enables students to access better sources of information.

Country-specific notes

Belgium (BE nl), Denmark, Germany, France, Cyprus, Malta, Austria and **Sweden**: These countries did not meet the guidelines for the sampling participation rate but achieved at least 50 % for the overall sampling participation rate. The data for these countries should be interpreted with caution.
Luxembourg, Netherlands, and **Bosnia and Herzegovina**: These countries did not meet the guidelines for the sampling participation rate for reporting. Data for these countries are available in the Statistical tables.
Slovakia: Not following sampling procedures for teacher listing might have introduced bias into the data.

In more than two thirds of the education systems, 60 % of teachers or more believe that the use of digital technologies in teaching and learning enhances student collaboration and students' problem-solving skills, and, in half of the systems, at least 60 % of teachers recognise its positive impact on students' organisational skills and academic performance.

These findings are corroborated by TALIS, where more than 60 % of teachers in 22 EU countries recognise the benefits of using digital resources and tools for students' planning skills, performance and collaboration, and more than 80 % perceive a positive impact on their interest in learning. Regarding the concerns, 76 % of teachers are worried about the risks of students submitting internet content as their own work, and around 63 % of the teachers perceive a negative effect on face-to-face communication and students' wellbeing. Teachers tend to be more sceptical about the potential benefits of using AI in education. On average, less than half of the teachers believe that AI can assist with tasks such as lesson preparation, adapting learning materials, supporting personalised learning and automating administrative tasks, while around two thirds believe that AI enables students to pass off others' work as their own and makes inaccurate or inappropriate recommendations (see box).

Teachers' beliefs regarding the benefits and challenges of using digital resources and tools, TALIS 2024

Percentage of teachers who 'agree' or 'strongly agree' that the use of digital resources and tools:

Has the following benefits	Students develop greater interest in learning	Students collaborate on tasks efficiently	Students develop skills to plan and monitor their own work	Students improve their academic performance
Average across 22 EU countries (%)	82.2	69.3	69.1	61.6
Has the following challenges	**Their use results in students submitting internet content as their own work**	**Their use limits the amount of face-to-face communication among students**	**Their frequent use negatively impacts students' wellbeing**	**Their use distracts students from learning**
Average across 22 EU countries (%)	76.0	63.0	62.6	48.5

Source: Based on Table 1.47 and Table 1.48, TALIS 2024.

Teachers' views of the benefits and challenges of using AI in education, TALIS 2024

Percentage of teachers who 'agree' or 'strongly agree' that the use of AI:

Has the following benefits	Supports students with specific needs	Enables teachers to adapt learning material to different students' abilities	Helps teachers write or improve lesson plans	Helps teachers automate administrative tasks	Assists teachers in supporting students individually
Average across 22 EU countries (%)	46.4	43.0	43.0	39.6	31.7
Has the following challenges	**Enables students to misrepresent others' work as their own**	**Makes recommendations that may not be appropriate or correct**	**Jeopardises the privacy and security of student data**	**Amplifies biases that reinforce students' misconceptions**	**Suggests unsuitable pedagogical approaches**
Average across 22 EU countries (%)	71.7	63.9	43.6	39.8	22.5

Source: Based on Table 1.61 and Table 1.62, TALIS 2024.

5.5. Conclusions

The successful integration of digital technologies into teaching practices relies on teachers' competences and attitudes; their access to adequate digital infrastructure, connectivity and content; and the available support and time to develop their skills and prepare their lessons.

Nearly two thirds of the education systems outline digital competences for entry-level teachers, usually in ITE regulations or mandatory frameworks. The use of digital technologies to enhance teaching and learning and for communication, collaboration and professional development, and the selection, creation and management of digital content, are the areas most often covered. Enabling students to use digital technologies responsibly and the use of digital technologies for assessment are less frequently covered, while only a few education systems cover the safe and ethical use of AI.

Similar findings emerge from ICILS. Teachers report learning in ITE about the use of digital technologies for assessment, supporting students' capability to evaluate the reliability of online information and managing social problems associated with digital communication in lower percentages than they report learning about the use of digital technologies for general and subject-specific approaches to enhance teaching. In general, the percentages of teachers reporting digital learning experiences during their ITE are relatively low (compared with their participation in CPD), but are higher among younger teachers, which suggests a growing tendency for teacher education programmes to cover digital competences.

Nearly two thirds of the education systems outline digital competences for in-service teachers and their professional development, usually in guidelines and reference frameworks. Although not mandatory, digital competence frameworks for CPD are generally more comprehensive than frameworks for ITE, usually covering most key areas – with the use of AI also being the area least frequently reported.

According to TALIS, teachers engage in CPD related to digital tools and resources more frequently than in other professional areas. However, participation in AI-focused training remains relatively low. Across digital competence areas, the ICILS survey results shows high levels of CPD engagement in using subject-specific digital learning and integrating ICT into teaching, but more limited engagement in managing social problems associated with digital communication, supporting students' critical evaluation of online information and, especially, in using visual coding platforms. It is in these three digital competence areas that teachers report larger self-perceived development gaps. Teachers could have other reasons for not participating in related CPD despite finding it necessary, such as time constraints, competitive priorities or inadequate options.

Nevertheless, around three quarters of the education systems have developed guidelines to support teachers on managing problems arising from digital communication, and close to two thirds of the systems have issued guidelines on combating disinformation and on using AI in a responsible and ethical manner. One third of the systems also offer guidance to teachers on the effective use of digital materials, covering the evaluation and selection of digital resources and striking a balance between digital and analogue resources.

In more than two thirds of the education systems, teachers can develop their digital competences and improve the integration of digital technologies into their teaching practices through dedicated networks and communities of practice. A similar number of systems offer self-assessment tools (usually SELFIE for Teachers) to enable teachers to monitor their progress and identify areas for improvement. Individualised, on-the-job training opportunities, such as peer learning or mentoring, personalised learning paths and recognition systems are less widespread. Teacher appraisal covers digital competences in only nine countries.

Fostering digital school leadership also serves to support teachers in the development of their digital competences and the use of digital technologies for teaching. There is widespread provision of CPD opportunities and guidance documents targeting school leaders on issues such as digital leadership, strategic planning and the effective integration of digital technologies. Moreover, almost two thirds of the education systems regulate the appointment of school digital coordinators, who can provide technical assistance and pedagogical support to teachers.

According to ICILS, teachers usually have enough computers and other peripheral devices, and often have stable, fast internet connection at school. However, this equipment may not always work, and schools may lack the technical support necessary to maintain it. Teachers also tend to report access to sufficient digital learning resources but insufficient time to prepare their lessons or develop the necessary skills. Moreover, the strongest predictor of the daily use of digital technologies for teaching is teachers' self-confidence in preparing lessons incorporating digital technologies.

Beyond adequate digital infrastructure, sufficient quality digital content and the availability of time for skills development and lesson preparation, the use of digital technologies in the education process also depends on teachers' perception of their associated risks and benefits. According to ICILS, teachers widely recognise the benefits of digital technologies in education, particularly in terms of improved access to information sources, increased student motivation and personalising learning opportunities. However, they also express significant concerns about students copying material without proper attribution and the decline of students' writing skills and communication abilities. TALIS also highlights teachers' concerns over the impact of digital technologies on student wellbeing and scepticism about the educational value of AI.

By strengthening digital competences in ITE, providing high-quality CPD, reducing barriers to teacher participation, and ensuring access to reliable equipment, resources and support, education systems can empower teachers to integrate digital technologies into their practice confidently and effectively, maximising their educational potential while minimising the associated risks.

Glossary

I. General terms

Adaptive learning systems: artificial intelligence (AI)-driven systems that personalise education by adjusting to the specific needs of individual learners. These systems modify content, pace or delivery methods to enhance each learner's experience (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2026c).

Artificial intelligence (AI) system: a machine-based system designed to operate with varying levels of autonomy, which may exhibit adaptiveness after deployment, and which, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations or decisions that can influence physical or virtual environments ([276]).

Assistive technology: 'any equipment, product, or software used to help people with disabilities improve their capacities and overcome the constraints caused by their impairments' (Saabi, Chlioui and Radgui, 2025).

Communication and collaboration: the competence to interact, communicate and collaborate through digital technologies while being aware of cultural and generational diversity, to participate in society through public and private digital services and participatory citizenship, and to manage one's digital presence, identity and reputation (Vuorikari, Kluzer and Punie, 2022, p. 7.).

Connectivity: the ability of a computer, programme, device or system to connect with one or more others. There are different connection types that use different technologies, such as fibre, 5G and satellite. Each technology offers a different level of speed or bandwidth (e.g. the speed with which data are transferred between a device and the internet) (European Commission, 2023).

Continuing professional development (CPD): ongoing education and training that enables teachers to enhance, expand and upgrade their knowledge, skills and attitudes, ultimately supporting their professional growth and effectiveness in the classroom. CPD can take various forms, including formal and informal activities, such as courses, seminars, workshops, degree programmes, peer observations, self-reflections and other professional learning experiences. These activities may focus on subject-specific content, pedagogical practices or a combination of both, and can lead to additional certifications or qualifications.

Cross-curricular (teaching/learning) area: an area (or theme or topic) that is explicitly defined as a cross-cutting teaching/learning principle. Under this approach, rather than (or in addition to) being explicitly mentioned as part of particular subjects, educational content and objectives are understood to be transversal and therefore taught across all subjects and curriculum activities. Cross-curricular areas are often defined in the general part of curricula. However, they may also be established in other top-level steering documents.

Curriculum: any official steering document issued by top-level authorities containing programmes of study or any of the following: learning content, learning objectives, attainment targets, guidelines on pupil assessment or syllabi. Specific legal decrees in some countries can also be taken into account. More than one type of steering document containing provisions relating to digital education may be in force at any one time in a country and these may impose different levels of obligation on schools to comply. They may, for example, contain advice, recommendations or regulations. However, whatever the level of obligation, they all establish the basic framework in which schools develop their own teaching to meet their pupils' needs.

276 Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (Artificial Intelligence Act) (OJ L, 2024/1689, 12.7.2024, ELI: http://data.europa.eu/eli/reg/2024/1689/oj).

Cybersecurity: all the measures adopted to defend information systems from external unauthorised access and user actions that compromise the confidentiality, integrity and availability of both information and systems.

Data protection: the processes and mechanisms designed to protect individual privacy rights regarding the collection, storing, handling, processing and dissemination of data ([277]).

Digital competence: involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital wellbeing and competences related to cybersecurity), intellectual-property-related questions, problem-solving and critical thinking ([278]).

Digital content creation: the competence to create and edit digital content, to improve and integrate information and content into an existing body of knowledge while understanding how copyright and licences are to be applied, and to know how to give understandable instructions for a computer system (Vuorikari, Kluzer and Punie, 2022, p. 7).

Digital ecosystem: a well-integrated environment where digital infrastructure, tools, content and pedagogical practices come together to enhance teaching and learning. It includes reliable connectivity, secure platforms, high-quality digital resources and professional development opportunities for educators. The ecosystem also ensures accessibility, inclusion and collaboration among schools and stakeholders, including industry, to foster innovation and digital competence among students.

Digital education: aims to empower students with the digital competences necessary to thrive in an increasingly digital world, while also leveraging technology to improve educational outcomes, increase accessibility and foster innovative learning environments. It encompasses two interconnected dimensions: (1) the development of digital literacy and skills in students, enabling them to effectively navigate, create and interact with digital technologies; and (2) the pedagogical use of digital technologies to support and enhance teaching, learning and assessment.

Digital education content (and digital learning resources): learning, teaching and assessment materials aimed at addressing pedagogical objectives and made available in digital formats through digital tools and platforms. Such content may be developed by educational publishers, EdTech companies, cultural and scientific organisations, ministries of education, or teachers and learners. In this report, the term digital learning resources is used interchangeably with digital education content (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2025b).

Digital infrastructure: the structures (physical or virtual) that enable technological development and access to ICT. It includes hardware, software, digital equipment and the connectivity required to support them, such as broadband networks, high-speed internet and cloud-based systems.

Digital learning platform: a web space or portal for educational content and resources, offering educators and learners access to various digital tools and digital education content, such as digital textbooks, videos, documents and more. These platforms often host content in a user-friendly way so that it can be accessed easily, in one place, by schools (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2025b).

Digital literacy: the ability to access, analyse and communicate information effectively using digital technologies. It is also referred to as computer and information literacy (CIL), measured by the International Computer and Information Literacy Study (ICILS). The EU agreed to set a target to improve digital literacy ([279]). This target for digital skills aims to reduce the share of low-achieving eighth graders to less than 15 % by 2030. Low achievers in digital literacy are students scoring below 492 points on the ICILS scale, which corresponds to proficiency levels below level 2 (European Commission: Directorate-General for Education, Youth, Sport and Culture, 2024).

Digital school plan / strategy: a strategic framework designed to guide the effective integration of digital technologies in teaching, learning and school management. It outlines the school's digital priorities, key initiatives to enhance digital competence, the resources allocated for digital transformation, and

277 Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1, ELI: http://data.europa.eu/eli/reg/2016/679/oj).

278 Council Recommendation of 22 May 2018 on key competences for lifelong learning (OJ C 189, 4.6.2018, https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.C_.2018.189.01.0001.01.ENG), p. 9.

279 Council Recommendation of 23 November 2023 on improving the provision of digital skills and competences in education and training (OJ C, C/2024/1030, 23.1.2024, ELI: http://data.europa.eu/eli/C/2024/1030/oj).

the intended outcomes related to digital learning and infrastructure. This plan serves as a roadmap for fostering a digitally inclusive and innovative learning environment aligned with educational goals.

Digital technology: electronic tools, systems, devices and resources that generate, store and process data in digital form, and enable the creation, communication and exchange of digital information. This includes, but is not limited to, computers, laptops, tablets, smartphones, software applications, digital platforms and networks, and the internet and other digital communication systems (UNESCO Institute for Statistics, 2018).

Earmarked funding: financial resources specifically allocated by top-level authorities for targeted purposes.

Educational technology (EdTech): the industry that combines education and technological advances (and the scientific field), which involves interdisciplinary knowledge informing the use of digital tools and devices, processes and procedures, and resources and strategies to improve learning experiences in a variety of learning settings (Huang, Spector and Yang, 2019).

Emerging technologies: new and innovative technologies, such as artificial intelligence (AI), virtual reality (VR) and blockchain, that have the potential to transform teaching and learning, and are characterised by their rapid development, high uncertainty and potential for significant impact on educational outcomes.

External school evaluation: school evaluation conducted by evaluators who report to a local, regional or top-level education authority and who are not directly involved in the activities of the school being evaluated. Such an evaluation covers a broad range of school activities, including teaching and learning and/or all aspects of the management of the school.

Generative AI (GenAI): an artificial intelligence (AI) technology that automatically generates content in response to prompts written in natural language conversational interfaces. Rather than simply curating existing web pages, by drawing on existing content, GenAI actually produces new content. The content can appear in formats that comprise texts written in natural language, images (including photographs, digital paintings and cartoons), videos, music and software code. While GenAI can produce new content, it cannot generate new ideas or solutions to real-world challenges, as it does not understand real-world objects or social relations that underpin language (Miao and Holmes, 2023).

Information and data literacy: the competence to articulate information needs; to locate and retrieve digital data, information and content; to judge the relevance of the source and its content; and to store, manage and organise digital data, information and content (Vuorikari, Kluzer and Punie, 2022, p. 7).

Initial teacher education (ITE): the pre-service training programme aiming to equip prospective teachers with the essential knowledge, skills and professional competences required to excel in their future role. ITE programmes combine academic studies in subject-specific areas with professional training in pedagogy, teaching methods and educational practices, and foster the development of critical attitudes and values necessary for effective teaching. These programmes often include practical experiences, such as in-school placements, to provide aspiring teachers with hands-on experience and a smooth transition into the profession. ITE is typically provided by accredited universities, teacher education institutions or other recognised providers.

Intelligent tutoring system: a software system running on a computer that mimics human tutoring, for example by providing immediate feedback or customised instructions to a student without the need for human intervention (Vuorikari, Punie and Cabrera Giraldez, 2020).

Internal school evaluation: evaluation undertaken by persons or groups of persons who are directly involved with the school (e.g. the school head or its teaching and administrative staff and students). Teaching and/or management tasks may be evaluated.

International Standard Classification of Education (ISCED): the reference international classification for organising education programmes and related qualifications by levels and fields. It was developed to facilitate the comparison of education statistics and indicators across countries based on uniform and internationally agreed definitions. The coverage of ISCED extends to all organised and sustained learning opportunities for children, young people and adults, including those with special educational needs, irrespective of the institutions or organisations providing these opportunities or the form in which they are delivered.

The current classification – ISCED 2011 (UNESCO Institute for Statistics, 2012) – has nine levels, which start at ISCED 0 (early childhood education) and extend to ISCED 8 (doctoral or an equivalent level).

This report covers one ISCED level, **ISCED 2**. The key characteristics of the levels in question are as follows. Programmes at ISCED 2 level, or in lower secondary education, typically build on the fundamental teaching and learning processes that begin at ISCED 1. Usually, the educational aim is to lay the foundation for lifelong learning and personal development, preparing students for further educational opportunities. Programmes at this level are usually organised around a more subject-oriented curriculum, introducing theoretical concepts across a broad range of subjects.

Some education systems may offer vocational education programmes at ISCED 2 to provide individuals with skills relevant to employment.

ISCED 2 begins after 4 to 7 years of ISCED 1 education. Students enter ISCED 2 typically between the ages of 10 and 13 (age 12 being the most common). Lower secondary education typically lasts until ages 14 to 16.

Interoperability: the ability of different digital systems, platforms and applications to connect and share data with each other seamlessly. In a school context, a high level of interoperability means that a new digital resource or tool can easily 'talk to' the school's existing systems, such as its learning management system or student information system, without requiring complex customised integration. The Interoperable Europe Act establishes a framework for cooperation to support this goal across the EU ([280]).

Learning management system: a web-based software platform made for delivering, tracking and managing online and blended learning. Its main features allow for handling all aspects of the learning process beyond content delivery (e.g. course management, learners' enrolment, online activity tracking).

National/standardised tests: tests carried out under the responsibility of the top-level education authority. The procedures for the administration and marking of these tests, and the setting of content and the interpretation and use of results, are decided at the top level. All students take the tests under similar conditions, and tests are marked in a consistent way. National standardised tests are separate from but often deployed in addition to the national examinations leading to certificates taken at the end of an ISCED level. Tests designed at the school level on the basis of a centrally designed framework of reference are not considered to be national standardised tests. International surveys such as the Programme for International Student Assessment (PISA) are not considered, although the results may be used for national purposes.

Open educational resources: learning, teaching and research materials in any format or medium that either reside in the public domain or are subject to copyright but have been released under an open licence, thereby permitting free-of-charge access, reuse, repurposing, adaptation and redistribution by others (UNESCO, 2022).

Problem-solving: the competence to identify needs and problems, to resolve conceptual problems and problem situations in digital environments, to use digital tools to innovate processes and products, and to keep up to date with the digital evolution (Vuorikari, Kluzer and Punie, 2022, p. 7).

Quality assurance: the systematic review of educational provision to maintain and improve its quality, equity and efficiency. This process includes both external evaluations and internal mechanisms such as school self-evaluations. In the context of digital education, quality assurance focuses primarily on areas such as information technology infrastructure, the quality of digital content, the responsible use of digital technologies, professional development for teachers and the effectiveness of digital learning strategies. The main objectives are to verify compliance with established standards, enhance accountability and provide recommendations for continuous improvement.

Safety: the competence to protect devices, content, personal data and privacy in digital environments; to protect physical and psychological health, and to be aware of digital technologies for social wellbeing and social inclusion; and to be aware of the environmental impact of digital technologies and their use (Vuorikari, Kluzer and Punie, 2022, p. 7).

Self-assessment tools: a tool or process that enables teachers and/or students to reflect on their skills and teaching practices, identify areas for improvement and develop strategies for enhancing student learning.

Socioeconomic background: a combined economic and sociological measure of an individual's or family's economic and social position relative to others, based on income, level of education and occupation.

Special educational needs: a range of needs, including physical and mental disabilities, and cognitive and educational impairments.

Specific bodies/agencies: organisations with a legal status external to the top-level education authority but supported financially by it. The specific body/agency would be responsible for providing support

280 Regulation (EU) 2024/903 of the European Parliament and of the Council of 13 March 2024 laying down measures for a high level of public sector interoperability across the Union (Interoperable Europe Act) (OJ L, 2024/903, 22 March 2024, ELI: http://data.europa.eu/eli/reg/2024/903/oj).

in the area of digital education to schools. Such responsibility can be the only mission of the body/agency, or part of a broader mission that covers other aspects linked to education or the digital strategy. If its mandate is broader, the mission must make explicit reference to the responsibility (or responsibilities) of the body/agency in the field of digital education and examples of concrete actions must be provided to consider it within the scope of this report.

Teacher appraisal: the evaluation of individual teachers with a view to formulating a judgement about their work and performance. It can be formative evaluation and/or summative evaluation and usually results in verbal or written feedback that is intended to guide and help them to improve their teaching. It can lead to individual professional development plans, promotion, salary progression and other formal and/or informal outcomes.

Teacher competence framework: a comprehensive and systematic structure that outlines the essential knowledge, skills and attitudes that teachers should possess to effectively perform their professional roles and responsibilities. The framework may be set down in any type of official document issued by a top-level education authority (e.g. regulations, national plans, stand-alone texts focusing on teacher competences or teacher standards).

Top-level authority: the highest level of authority with responsibility for education in a given country, usually located at the national (state) level. However, in Belgium, Germany, Spain and Switzerland, the *Communautés*, *Länder,* *Comunidades Autónomas* and cantons, respectively, are either wholly responsible or share responsibility with the state level for all or most areas relating to education. Therefore, these administrations are considered the top-level authorities for the areas where they hold responsibility, while, for those areas for which they share the responsibility with the national/state-level authorities, both are considered to be top-level authorities.

Top-level policy frameworks: official policy documents adopted by top-level authorities setting out objectives, principles or requirements in a specific policy area. Such policy frameworks may take the form of strategies, action plans, programmes, recommendations or technical guidelines.

Virtual reality (VR) / augmented reality (AR): VR involves the use of a computer to visually simulate an artificial environment within which a user can interact with objects and be fully immersed. AR refers to the real-time digital overlay of information over physical elements. A user's real, visible environment is the predominant element, with extra information intended to augment the actual environment a user sees on an ad hoc basis, rather than fully replacing it (European Commission, 2020a).

II. Statistical terms

Correlation coefficient: an index that quantifies the linear relationship between a pair of variables. The coefficient takes values between – 1 and 1, with the sign indicating the direction of the relationship and the numerical magnitude indicating its strength. Values of – 1 or 1 indicate that the sample values fall on a straight line. A value of zero indicates a lack of any linear relationship between the two variables. The Spearman rank correlation coefficient is a coefficient that takes into account the ranks of the variables and not their observed values (Everitt and Skrondal, 2010).

Significance level: the probability of wrongly rejecting the null hypothesis (the hypothesis that there is no difference or no association) when it is true. For example, a significance level of 0.05 indicates a 5 % risk of concluding that a relationship exists when in reality there is no relationship.

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Annexes

Annex 1: Large-scale initiatives supporting artificial intelligence use in schools, ISCED 24, 2024/2025

This annex provides information supporting Section 1.2 and Figure 1.15 in Chapter 1. Please refer to the analysis provided in Section 1.2 for further information ([281]).

Education system	Title and source of the large-scale project/initiative	Main focus area
BE fr	No large-scale project/initiative covering ISCED 24	
BE de	No large-scale project/initiative covering ISCED 24	
BE nl	No large-scale project/initiative covering ISCED 24	
BG	No large-scale project/initiative covering ISCED 24	
CZ	AIDIG project; EduLab @ Sféra	Initiatives supporting the integration of AI into education through teacher training, methodological guidance, educational resources, research activities and collaboration between educators, researchers and technology experts.
DK	*SkoleGPT*	Free, open-source, GDPR-secure GenAI assistant for teachers in primary and lower-secondary education.
DE	No large-scale project/initiative covering ISCED 24	
EE	No large-scale project/initiative covering ISCED 24	
IE	Oide AI Hub	Professional learning and capacity-building resources supporting the responsible use of AI in teaching and school practice.
EL	Skills labs modules on AI	AI-related learning scenarios and teacher training embedded in nationwide skills labs as part of science, technology, engineering, arts and mathematics development and digital competence development.
ES	Código Escuela 4.0; Lab-IA (Castilla y León)	Initiatives supporting the introduction of AI in schools through AI-related learning resources, pilot activities and teacher support. The national Código Escuela 4.0 (School Code 4.0) welcome kit includes AI components, while the regional Lab-IA pilots the use of AI tools in schools.
FR	No large-scale project/initiative covering ISCED 24	
HR	BrAIn –Application of artificial intelligence-based digital technologies in education project	National project funded by the European Social Fund Plus (ESF+) supporting the responsible integration of AI into education through AI curriculum development, teacher professional development, guidance and AI-supported learning tools.
IT	Two-year AI experimentation (15 schools)	Ministry-supervised pilot deploying AI-powered learning assistants in lower-secondary education. Includes teacher support and evaluation by Italy's National Institute for the Evaluation of the Education and Training System ([282]) to inform potential national roll-out.
CY	No large-scale project/initiative covering ISCED 24	

281 Up to two initiatives per system are shown when reported by the country and relevant to lower-secondary education (ISCED 24).
282 National Institute for the Evaluation of the Educational System of Education and Training (INVALSI).

Education system	Title and source of the large-scale project/initiative	Main focus area
LV	AI4Math - Artificial intelligence (AI) support for an accelerated approach to mathematics learning	A national project exploring the use of AI to support accelerated mathematics learning through adaptive digital tools and pedagogical support for teachers.
LT	No large-scale project/initiative covering ISCED 24	
LU	KI Léierbud Teachino	Pilot image generation platform for pedagogy and pilot AI-assisted planning/differentiation tool; linked to forthcoming national AI strategy.
HU	No large-scale project/initiative covering ISCED 24	
MT	FAIE - Fair AI Education (pilot)	AI-powered adaptive learning system that personalises learning activities and assessment according to students' progress and learning needs.
NL	NOLAI – National Education Lab AI	The national AI education lab for primary, secondary and special education, supporting the development, research and implementation of responsible AI applications in education through collaboration between schools, researchers and industry.
AT	100-school AI pilot	Scientifically monitored pilot programme deployed across school types; decision on next phase pending results
PL	Lesson: AI	2025–2027 nationwide teacher training on AI
PT	No large-scale project/initiative covering ISCED 24	
RO		
SI	GEN-UI – Digital Transformation of Teaching and Learning through AI	A national initiative supporting the integration of GenAI into education through the development of guidance materials, learning scenarios and professional support for teachers on the responsible use of AI in teaching and learning.
SK	No large-scale project/initiative covering ISCED 24	
FI	Generation AI	National research policy programme developing AI-supported pedagogical solutions and teacher capacity. Includes pilot implementation in schools, evaluation of learning impact and guidance for system-level deployment.
SE	No large-scale project/initiative covering ISCED 24	
BA		
CH		
IS		
LI		
ME		
MK		
NO		
RS		
TR	Dynamic course	A national initiative supporting the integration of digital technologies into teaching and learning through technology-enhanced learning scenarios and teacher training on the use of digital tools, including interactive whiteboards, web-based tools and artificial intelligence.

Annex 2: Dedicated bodies/agencies supporting digital education at school, 2024/2025

This annex lists the bodies or agencies reported by education systems as having formal responsibilities for the coordination, implementation or support of digital education policies at the school level. It provides information for Section 3.2 and Figure 3.6 in Chapter 3. Please refer to the analysis provided in Section 3.2.1 for further information.

Education system	Dedicated bodies/agencies supporting digital education in schools
BE fr	Service Général du Numérique Éducatif (General Directorate for Digital Education)
BE de	Fachberatung Medien (Autonome Hochschule in Ostbelgien) (Media Education Advisory Service)
BE nl	Kenniscentrum Digisprong (Digisprong Knowledge Centre)
BG	No body/agency reported
CZ	Digikoalice (National Pedagogical Institute)
DK	Center for Undervisningsmidler (CFU) (Centre for Teaching Resources)
DE	Kommission "Bildung in der digitalen Welt" (Commission 'Education in the Digital World' (DigiKom) – Standing Conference of the Ministers of Education and Cultural Affairs (KMK)) (283)
EE	Inseneeria- ja digihariduse keskus (Centre for Engineering and Digital Education Centre within the Estonian Education and Youth Board (HARNO))
IE	Oide Technology in Education
EL	Ινστιτούτο Εκπαιδευτικής Πολιτικής (ΙΕΠ) (Institute of Educational Policy (IEP)) Ινστιτούτο Τεχνολογίας Υπολογιστών και Εκδόσεων «ΔΙΟΦΑΝΤΟΣ» (Computer Technology Institute and Press Diophantus (CTI))
ES	Instituto Nacional de Tecnologías Educativas y de Formación del Profesorado (INTEF) (National Institute for Educational Technologies and Teacher Training)
FR	Direction du numérique pour l'éducation (DNE) (Directorate for Digital Education)
HR	Hrvatska akademska i istraživačka mreža (Croatian Academic and Research Network (CARNET)
IT	Istituto per le Tecnologie Didattiche (CNR-ITD) (Institute for Educational Technology) Istituto Nazionale di Documentazione, Innovazione e Ricerca Educativa *(*INDIRE*)* (National Institute for Documentation, Innovation and Educational Research)
CY	Μονάδα Τεχνολογιών Πληροφορίας και Επικοινωνίας (ICT Unit of the Ministry of Education, Sport and Youth) Παιδαγωγικό Ινστιτούτο Κύπρου (Cyprus Pedagogical Institute)
LV	Valsts izglītības attīstības aģentūra (VIAA) (State Education Development Agency)
LT	Nacionalinė švietimo agentūra (NŠA) (National Agency for Education)
LU	Centre de gestion informatique de l'Éducation (CGIE) (Centre for Educational IT Management) Institut de formation de l'Éducation nationale (IFEN) (National Institute for Teacher Training)
HU	Klebelsberg Központ (Klebelsberg Centre) Oktatási Hivatal (Educational Authority)
MT	Directorate for Digital Literacy and Transversal Skills (DLTS)
NL	Kennisnet
AT	Kompetenzzentrum eEducation (eEducation Competence Centre) Virtuelle Pädagogische Hochschule (VPH) (Virtual College of Teacher Education)
PL	Ośrodek Rozwoju Edukacji (ORE) (Centre for Education Development) Naukowa i Akademicka Sieć Komputerowa – Państwowy Instytut Badawczy (National Research Institute NASK)

283 In Germany, the Commission 'Education in the Digital World' (DigiKom) operates within the Standing Conference of the Ministers of Education and Cultural Affairs (KMK). It serves as an internal coordination and monitoring body rather than an external agency providing direct support to schools.

Education system	Dedicated bodies/agencies supporting digital education in schools
PT	Equipa de Recursos e Tecnologias Educativas (ERTE), Directorate-General for Education Ministry of Education, Science and Innovation (MECI)
RO	No body/agency reported
SI	Zavod Republike Slovenije za šolstvo (National Education Institute Slovenia) Akademska in raziskovalna mreža Slovenije (Academic and Research Network of Slovenia)
SK	Národné centrum pre digitálnu transformáciu vzdelávania (NCDTV) (National Centre for Digital Transformation of Education)
FI	Opetushallitus (Finnish National Agency for Education)
SE	Skolverket (Swedish National Agency for Education)
BA	No body/agency reported
CH	Educa (Switzerland's National competence Centre for Digital Education)
IS	No body/agency reported
LI	Zentrum für Schulmedien (Centre for School Media)
ME	No body/agency reported
MK	No body/agency reported
NO	Utdanningsdirektoratet (Norwegian Directorate for Education and Training)
RS	Сектор за дигитализацију у просвети (Department for Digitalisation in Education and Science of the Ministry of Education) Завод за вредновање квалитета образовања и васпитања (Centre for Educational Technology of the Institute for the Evaluation of Education Quality)
TR	Yenilik ve Eğitim Teknolojileri Genel Müdürlüğü (YEĞİTEK) (Directorate General for Innovation and Educational Technologies)

Annex 3: Curriculum approaches to teaching digital competence, ISCED 24, 2024/2025

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
BE fr	Ongoing implementation of curriculum reform	The new common core curriculum, which includes requirements for digital competence, has been gradually implemented. The provisions for general lower-secondary education will apply starting from the 2026/2027 academic year. Digital competence, based on five competence areas from DigComp 2.2, is included within the framework for 'Manual, technical, technological and digital training'. The new curriculum promotes an interdisciplinary integration of digital competence.	Manual, technical, technological and digital training / Référentiel de formation manuelle, technique, technologique et numérique (FMTTN) http://www.enseignement.be/public/docs/r-f-rentiel-de-formation-manuelle-technique-technologique-et-num-rique-fmttn-.pdf
BE de	Ongoing implementation of the updated educational framework	Information and media literacy as a cross-curricular competence area is incorporated into the updated educational frameworks, applicable to all levels of education starting from the 2028/2029 academic year.	Framework-oriented guide to the development of information and media literacy among primary and secondary school pupils in the German-speaking Community of Belgium / Rahmenplanorientierter Leitfaden zur Entwicklung von Informations- und Medienkompetenz bei Primar- und Sekundarschülern in der Deutschsprachigen Gemeinschaft Belgiens https://ostbelgienbildung.be/PortalData/21/Resources/downloads/schule_ausbildung/schulische_ausbildung/130916-LEITFADEN_IMK_-_Gesamtdokument.pdf
BE nl	Cross-curricular theme	Digital competence and media literacy encompass familiarity with, engagement in and the critical and responsible use of digital technologies for learning, working and participating in social life. By the end of the first stage of secondary education, all pupils are required to meet the final attainment targets for basic literacy. To ensure this, a carefully defined minimum level of basic literacy has been established, which incorporates digital competence as a supportive element for all key competences.	Secondary Education Code / Codex Secundair Onderwijs https://codex.vlaanderen.be/Zoeken/Document.aspx?DID=1020342&param=inhoud&AID=1136153

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
BG	Cross-curricular theme	Digital and media literacy should be integrated into teaching in all academic subjects.	'Objective 2.1: Training oriented towards the formation and development of key competences and skills for life and work in the 21st century', in: Strategic framework for the development of education, training and learning in the Republic of Bulgaria (2021–2030) / Стратегическа рамка за развитие на образованието, обучението и ученето в република България (2021–2030) https://www.navet.government.bg/bg/media/strategicheska-ramka_obrobuuchene_110321-1.pdf
	Compulsory separate subject(s)	Computer modelling and information technology / Компютърно моделиране и информационни технологии.	Several official documents describe the curriculum and educational strategy aimed at developing the digital literacy of students in Bulgaria.
CZ	Cross-curricular theme	Digital competence is one of the key competences of basic education.	Framework educational programme for basic education / Rámcový vzdělávací program pro základní vzdělávání https://edu.gov.cz/dokumenty/rvp-ramcove-vzdelavaci-programy/rvp-zv-ramcovy-vzdelavaci-program-pro-zakladni-vzdelavani/
	Compulsory separate subject(s)	Informatics / Informatika	Framework educational programme for basic education / Rámcový vzdělávací program pro základní vzdělávání RVP ZV - Rámcový vzdělávací program pro základní vzdělávání - Edu.cz
DK	Cross-curricular theme	IT and media as a cross-cutting theme.	IT and Media / It og medier https://www.emu.dk/grundskole/dansk/it-og-medier
DE	Cross-curricular theme	Integrating digital competences across all subjects.	'Education in the digital world / Bildung in der digitalen Welt' https://www.kmk.org/themen/bildung-in-der-digitalen-welt/strategie-bildung-in-der-digitalen-welt.html

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
	Compulsory separate subject(s)	Basic curriculum for media education / Basiscurriculum Medienbildung (Berlin). Media competence framework / Medienkompetenzrahmen (North Rhine-Westphalia). Media education and digitalisation in schools / Medienbildung und Digitalisierung in der Schule (Saxony). Media education and computer science / Medienbildung und Informatik (Thuringia). Computer science and media education / Informatik und Medienbildung (Mecklenburg-Vorpommern).	Strategy of the Standing Conference of the Ministers of Education and Culture - 'Education in the digital world' / Strategie der Kultusministerkonferenz -‚Bildung in der digitalen Welt' https://www.kmk.org/fileadmin/Dateien/veroeffentlichungen_beschluesse/2016/2016_12_08-Bildung-in-der-digitalen-Welt.pdf
EE	Cross-curricular theme	Digital competence is one of eight key competences that appear in all subject curricula.	National Curriculum for Basic Schools https://www.riigiteataja.ee/en/eli/ee/529042024002/consolide/current
	Optional separate subject(s)	Informatics / Informaatika	Optional Subject 'Informatics' https://www.riigiteataja.ee/tolkelisa/5290/4202/4002/10.pdf#
IE	Cross-curricular theme	All subjects at the Junior Cycle level contain the eight key skills including digital skills (e.g. using digital technology to develop numeracy skills and understanding).	'Junior Cycle – Curriculum' https://curriculumonline.ie/junior-cycle
	Optional separate subject(s)	Digital media literacy Coding	'Junior Cycle – Curriculum' https://curriculumonline.ie/junior-cycle

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
EL	Cross-curricular theme	The new curricula for most of the school subjects include the development of digital competences in the expected learning outcomes. In particular, it clearly states that students should use new technologies appropriately in their daily teaching practice, taking advantage of the benefits of e-learning and available digital tools.	The Philosophy of the New Curricula / Η Φιλοσοφία των Νέων Προγραμμάτων σπουδών https://www.iep.edu.gr/i-filosofia-ton-neon-programmaton-spoudon/
	Compulsory separate subject(s)	Informatics / Πληροφορική	https://ebooks.edu.gr/ebooks/
ES	Cross-curricular theme	Digital competence must be addressed in all subjects.	Royal Decree 217/2022, of March 29, establishing the organisation and minimum teaching requirements of compulsory secondary education / Real Decreto 217/2022, de 29 de marzo, por el que se establece la ordenación y las enseñanzas mínimas de la Educación Secundaria Obligatoria https://www.boe.es/buscar/pdf/2022/BOE-A-2022-4975-consolidado.pdf
	Compulsory separate subject(s)	Technology and digitalisation / Tecnología y Digitalización	Royal Decree 217/2022, of March 29, establishing the organisation and minimum teaching requirements of compulsory secondary education / Real Decreto 217/2022, de 29 de marzo, por el que se establece la ordenación y las enseñanzas mínimas de la Educación Secundaria Obligatoria https://www.boe.es/buscar/pdf/2022/BOE-A-2022-4975-consolidado.pdf

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
ES	Optional separate subject(s)	Digital education / Educación Digital Basic digitalisation / Digitalización Básica Digital development / Desarrollo Digital	Digital education (autonomous community of Galicia). Decree 156/2022, of 15 September, by which the order is established and the curriculum of mandatory secondary education in the Autonomous Community of Galicia / DECRETO 156/2022, de 15 de septiembre, por el que se establecen la ordenación y el currículo de la educación secundaria obligatoria en la Comunidad Autónoma de Galicia https://www.xunta.gal/dog/Publicados/2022/20220926/AnuncioG0655-190922-0002_es.pdf Basic digitalisation (autonomous community of Extremadura) Decree 110/2022, of 22 August, for establishing the order and the curriculum of Obligatory Secondary Education for the Community Autonomous Region of Extremadura / Decreto 110/2022, de 22 de agosto, por el que se establecen la ordenación y el currículo de la Educación Secundaria Obligatoria para la Comunidad Autónoma de Extremadura https://doe.juntaex.es/pdfs/doe/2022/1640o/22040165.pdf Digital development (autonomous community of Castilla-La Mancha) Decree 82/2022, of 12 July, for establishing the order and curriculum of Obligatory Secondary Education in the autonomous community of Castilla-La Mancha / Decreto 82/2022, de 12 de julio, por el que se establece la ordenación y el currículo de Educación Secundaria Obligatoria en la comunidad autónoma de Castilla-La Mancha https://docm.jccm.es/docm/descargarArchivo.do?ruta=2022/07/14/pdf/2022_6659.pdf&tipo=rutaDocm
FR	Cross-curricular theme	Digital competence is integrated into the common core of knowledge, skills and culture.	Common core of knowledge, skills and culture / Le socle commun de connaissances, de compétences et de culture: Décret n° 2015-372 du 31 mars 2015 https://www.legifrance.gouv.fr/loda/id/JORFTEXT000030426718 Digital competence framework / Le cadre de référence des compétences numériques https://eduscol.education.fr/738/cadre-de-reference-des-competences-numeriques

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
HR	Cross-curricular theme	The four domains of this cross-curricular theme are interconnected and build on each other to ensure the systematic development of general digital literacy for children and young people. The four domains are: (a) the functional and responsible use of ICT; (b) communication and collaboration in the digital environment; (c) research and critical evaluation in the digital environment; (d) creativity and innovation in the digital environment.	Decision on adoption of the curriculum for the cross-curricular topics of the use of information and communication technology for elementary and secondary schools in the Republic of Croatia / Odluka o donošenju kurikuluma za međupredmetnu temu Uporaba informacijske i komunikacijske tehnologije za osnovne i srednje škole u Republici Hrvatskoj https://narodne-novine.nn.hr/clanci/sluzbeni/2019_01_7_150.html
	Compulsory separate subject(s)	Informatics / Informatika	Decision on the adoption of the curriculum for the subject of computer science for elementary and high schools in the Republic of Croatia / Odluku o donošenju kurikuluma za nastavni predmet informatike za osnovne škole i gimnazije u republici hrvatskoj (ISCED 24 grades 5 and 6) https://narodne-novine.nn.hr/clanci/sluzbeni/2018_03_22_436.html
	Optional separate subject(s)	Informatics / Informatika	Decision on the adoption of the curriculum for the subject of computer science for elementary and high schools in the Republic of Croatia / Odluku o donošenju kurikuluma za nastavni predmet informatike za osnovne škole i gimnazije u republici hrvatskoj (ISCED 24 grades 7 and 8) https://narodne-novine.nn.hr/clanci/sluzbeni/2018_03_22_436.html
IT	Cross-curricular theme	Digital competence is one of four key competences.	National guidelines for the curriculum of nursery school and the first cycle of education / Indicazioni nazionali per il curricolo della scuola dell'infanzia e del primo ciclo d'istruzione https://www.mim.gov.it/documents/20182/8952594/Indicazioni+nazionali+2025.pdf/593dfc49-bcdc-ffbb-747a-5c368b4bac01?version=1.0&t=1749622399405 National Guidelines and New Scenarios / Indicazioni Nazionali e nuovi scenari https://www.mim.gov.it/documents/20182/0/Indicazioni+nazionali+e+nuovi+scenari

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
CY	Compulsory separate subject(s)	Computing (computer science / ICT) / Πληροφορική	Secondary General Education Informatics / Πληροφορική Μέσης Γενικής Εκπαίδευσης https://plirom.schools.ac.cy/el/
LV	Cross-curricular theme	Digital literacy is one of the cross-cutting skills: 'the pupil uses digital technologies responsibly and efficiently for the acquisition of knowledge, the creation of new content, the sharing of the content and for the communication, critically and constructively assesses the role of technologies and media in the society.' It is also included in basic skills as part of the field 'technologies'.	Regulations regarding the state basic education standard and model basic education programmes / Noteikumi par valsts pamatizglītības standartu un pamatizglītības programmu paraugiem https://likumi.lv/ta/en/en/id/303768-regulations-regarding-the-state-basic-education-standard-and-model-basic-education-programmes
	Compulsory separate subject(s)	Computer systems / Datorika	Regulations regarding the state basic education standard and model basic education programmes / Noteikumi par valsts pamatizglītības standartu un pamatizglītības programmu paraugiem https://likumi.lv/ta/en/en/id/303768-regulations-regarding-the-state-basic-education-standard-and-model-basic-education-programmes
LT	Cross-curricular theme	The general education curriculum includes digital competence as a cross-curricular competence.	National curricula for pre-primary, and secondary education / Informatikos bendroji programs i skyrius bendrosios nuostatos https://www.e-tar.lt/rs/aesupplement /1a76405023 9511edb4cae1b158f98ea5/PtvgOnKxAG/c6ffc002d58d11f08918e1adc7c5b1ec/
	Compulsory separate subject(s)	Informatics / Informatika	National curricula for pre-primary, primary and secondary education, Annex 21, 'Informatics curriculum' / Informatikos bendroji programs i skyrius bendrosios nuostatos https://www.e-tar.lt/rs/aesupplement /1a76405023 9511edb4cae1b158f98ea5/PtvgOnKxAG/c6ffc002d58d11f08918e1adc7c5b1ec/

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
LU	Cross-curricular theme	The development of competences in artificial intelligence and data literacy, on the one hand, and the progressive introduction of AI use by pupils on the other, should be conceived together and built upon a prior foundation of general digital competences. Both areas are embedded in a gradual and spiral progression, in which key concepts are regularly revisited and consolidated, with an age- and context-appropriate level of complexity, autonomy and responsibility.	KI-kompass – Strategic framework for artificial intelligence in schools, https://ki-kompass.lu/wp-content/uploads/2026/02/EN_CadreStrategique_KI-_-v5.pdf
	Compulsory separate subject(s)	Digital sciences / Digital sciences	https://script.lu/fr/activites/projets-conclus/cours-digital-sciences
	Optional separate subject(s)	Informatics / Informatique	https://script.lu/fr/activites/innovation/cours-digital-scienceshttps:/edumedia.lu/wp-content/uploads/2024/12/Medienkompass_EN_web.pdf
HU	Cross-curricular theme		National Core Curriculum / Nemzeti Alaptanterv https://net.jogtar.hu/jogszabaly?docid=a1200110.kor
	Compulsory separate subject(s)	Digital culture / Digitális kultúra	https://magyarkozlony.hu/ dokumentumok/3288b6548a740b9c8daf918a399a0bed1985db0f/megtekintes
MT	Cross-curricular theme	Strategic pillar 1 of the digital education strategy for 2024–2030, nurturing digital global citizens, states that educators should work 'to develop foundational digital skills and computational thinking starting from early education, integrating ICT across all subjects by 2025'.	Digital Education Strategy https://education.gov.mt/wp-content/uploads/2025/03/NS_DDLTS-25_Eng-NOBLEED.pdf
	Compulsory separate subject(s)	ICT C3	'C3 – Information communication technologie' https://c3.skola.edu.mt/
	Optional separate subject(s)	Computing	

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
NL	Curriculum reform	Although schools have full autonomy to organise digital education, there are ongoing discussions on integrating digital literacy as one of the basic skills into the school curriculum. The Foundation for Curriculum Development drew up core objectives for digital literacy and examination programmes for schools, which have been tested at various schools. The core objectives are expected to be finalised in 2025 and then laid down in law.	https://www.rijksoverheid.nl/onderwerpen/digitalisering-onderwijs/digitale-geletterdheid-op-school
AT	Cross-curricular theme	Media literacy is anchored as a teaching principle and cross-curricular subject for all types of schools and grades.	Policy Decree on Media Education / Grundsatzerlass Medienbildung Rundschreiben Nr. 12/2022 ; 2022-0.318.453 ; Grundsatzerlass Medienbildung, Aktualisierung, Information der Schulen or Rundschreiben Nr. 2022–12 – Rundschreibendatenbank des BMBWF
	Compulsory separate subject(s)	Digital literacy / Digitale Grundbildung	Curriculum of the Subject Digital Basic Education Regulation of the Federal Minister for Education, Science and Research amending the Regulation on Curricula for Secondary Schools and the Regulation on Curricula for General Secondary Schools / Verordnung des Bundesministers für Bildung, Wissenschaft und Forschung, mit der die Verordnung über die Lehrpläne der Mittelschulen sowie die Verordnung über die Lehrpläne der allgemeinbildenden höheren Schulen geändert werden https://www.ris.bka.gv.at/Dokumente/BgblAuth/BGBLA_2022_II_267/BGBLA_2022_II_267.html
PL	Compulsory separate subject(s)	Informatics / Informatyka	Core curriculum for general education in primary school https://podstawaprogramowa.pl/Szkola-podstawowa-IV-VIII-1/Informatyka Core curriculum for general education in four-year general secondary school and five-year technical secondary school https://podstawaprogramowa.pl/Liceum-technikum/Informatyka

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
PT	Compulsory separate subject(s)	Information and communications technology (ICT) / Tecnologias de Informação e Comunicação (TIC)	Curriculum – Essential learnings – Information and communications technologies / Aprendizagens Essenciais Tecnologias da Informação e Comunicação 7th grade / 7.º ano https://www.dge.mec.pt/ sites/default/files/Curriculo/Aprendizagens_ Essenciais/3_ciclo/tic_3c_7a_ff.pdf 8th grade / 8.º ano https://www.dge.mec.pt/sites/default/files/Curriculo/Aprendizagens_Essenciais/3_ciclo/tic_3c_8a_ff.pdf 9th grade / 9.º ano https://www.dge.mec.pt/sites/default/files/Curriculo/Aprendizagens_Essenciais/3_ciclo/tic_3c_9a_ff.pdf
RO	Cross-curricular theme	Digital competence is one of the eight key competences and is cross-cutting in nature. The key competences are seen as benchmarks of the national curriculum, determine the learning profile of the graduate and have associated descriptors for primary, lower-secondary and upper-secondary education levels.	Pre-university Education Law (Law No 198/2023), Art. 12(3) and Art. 91 The Graduate Learning Profile, approved by Ministerial Order No 6731/2023 / Profilului de formare al absolventului, Ordin No 6731/2023 https://legislatie.just.ro/Public/DetaliiDocument/277019
	Compulsory separate subject(s)	Informatics and ICT / Informatica si TIC	Computer Science and ICT curriculum (middle school) / Programa scolara Informatica si TIC (gimnaziu)
SI	Cross-curricular theme	Digital competence is one of eight key competences that appear in all subject curricula.	Curricula for Basic School Subjects / Program osnovnošolskega izobraževanja Digitalizirani učni načrti https://dun.zrss.si/#/
	Optional separate subject(s)	Computer science / Računalništvo (this includes text editing, computer networks and multimedia).	Computer science /Računalništvo https://www.gov.si/assets/ministrstva/MIZS/Dokumenti/Osnovna-sola/Ucni-nacrti/izbirni/3-letni-lahko-krajsi/Racunalnistvo_izbirni.pdf
SK	Cross-curricular theme	Media education	State Educational Programme for Lower-secondary Education – 2nd stage of elementary school / Štátny vzdelávací program nižšie stredné vzdelávanie – 2. stupeň základnej školy https://www.statpedu.sk/files/articles/dokumenty/inovovany-statny-vzdelavaci-program/svp_nsv_6_2_2015.pdf

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
	Compulsory separate subject(s)	Informatics / Informatika	Informatics / Informatika https://www.minedu.sk/data/att/2d2/22091.7fd543.pdf
FI	Cross-curricular theme	ICT is a cross-cutting competence.	National Core Curriculum for Basic Education https://eperusteet.opintopolku.fi/#/en/perusopetus/419550/25/tiedot
SE	Cross-curricular theme	Digital competence is part of the 'mission of the school' and is integrated into different syllabuses from the first grade onwards.	Curriculum for compulsory school, preschool class and school-age Educare https://www.skolverket.se/getFile?file=13128
BA	Compulsory separate subject(s)	Basics of informatics / Osnove informatik	Basics of Informatics https://osbukinje.skolatk.edu.ba/file/informatikaos-6-9/90
CH	Cross-curricular theme	1. The module 'media and informatics' distinguishes between the areas of media and informatics (separate subject) and the skills required to use ICT, which are referred to as application skills. The application skills are taught in an integrated manner within the subject areas. 2. Digital education consists of three interdependent areas: media, informatics and applications. All subject areas offer opportunities to mobilise and develop the use of digital tools. 3. Technology and media is part of the cross-cutting competences.	1. Lehrplan 21 https://v-fe.lehrplan.ch/index.php?code=b|10|0&la=yes 2. Plan d'études romand https://portail.ciip.ch/per/domains/8 3. Piano di studi https://pianodistudio.edu.ti.ch/formazione-generale-e-trasversale/tecnologie-e-media/
	Separate subject(s)	1. Media and informatics; 2. Digital education; 3. Technology and media. (These subjects are from three regional curricula).	1. Lehrplan 21 https://v-fe.lehrplan.ch/index.php?code=b|10|0&la=yes 2. Plan d'études romand https://portail.ciip.ch/per/domains/8 3. Piano di studi https://pianodistudio.edu.ti.ch/formazione-generale-e-trasversale/tecnologie-e-media/
IS	Compulsory separate subject(s)	Information and technology education / Upplýsinga og tæknimennt	Information and Technology Education / Upplýsinga- og tæknimennt https://www.adalnamskra.is/grunnskoli/kafli-26-upplysinga-og-taeknimennt-2024

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
LI	Cross-curricular theme	Digital and media competences are cross-curricular themes.	Digital and Media Competences – Education strategy 2025+ / Bildungsstrategie 2025 Fürstentum Liechtenstein – Strategische Ziele und Handlungsfelder https://www.bildungsstrategie.li/de/bildungsstrategie/strategische-ziele-handlungsfelder/tblid/387/default.asp
	Compulsory separate subject(s)	Media and Informatics / Medien und Informatik	https://fl.lehrplan.ch/index.php?code=b|10|0&la=yes
ME	Cross-curricular theme	Digital competence is defined as a key competence to be developed through a cross-curricular approach.	The decision of the National Council for Education of 15 June 2020 on the digital competence framework / Okvir digitalna kompetencia 2020 https://www.gov.me/dokumenta/a739dabd-8506-4b33-9276-bd9eeecc8752
	Compulsory separate subject(s)	Informatics with technology / Informatika sa tehnikom	Informatics with technology / Informatika sa tehnikom https://www.gov.me/dokumenta/52d97435–91de-4c83-8a83-0613cc0062b8
	Optional separate subject(s)	Creating graphics and image and photography processing / Izrada grafike i obrada slike i fotografije Introduction to programming / Uvod u programiranje	
MK	Cross-curricular theme	Digital literacy should be included in most of the mandatory and some of the elective subjects.	Concept note on primary education / Концепција за основно образование https://portal.mdt.gov.mk/post-body-files/usvoena-koncepcija-za-osnovno-obrazovanie-file-LjIV.pdf
	Compulsory separate subject(s)	Technical education and informatics / Tehnicko obrazovanie I informatika (grade 6) Informatics / Informatika (grade 7)	Technical education and informatics / Tehnicko obrazovanie I informatika https://www.bro.gov.mk/wp-content/uploads/2023/03/Tehnicko-obrazovanie-i-informatika-6-odd.6631.pdf Informatics / Informatika https://www.bro.gov.mk/wp-content/uploads/2019/08/Nastavna_programa-Informatika-VII_odd.pdf
	Optional separate subject(s)	Programming / Programiranje Informatics projects / Proekti od informatikata	

	Curriculum approaches	Subjects / learning areas	Reference document (title and link)
NO	Cross-curricular theme	Digital skills are defined as one of five basic skills.	'Basic skills' https://www.udir.no/lk20/khv01-02/om-faget/grunnleggende-ferdigheter?lang=eng
	Optional separate subject(s)	Programming / Programmering	Curriculum for the Optional Subject Programming (Lower-secondary Education) / Læreplan i valgfaget programmering (PRG01-02) https://www.udir.no/lk20/prg01-02
RS	Cross-curricular theme	Digital competence is identified as 1 of 11 key competences that should be developed through all subjects.	Law on the Education System Foundations, Article 12 / Zakon o osnovama sistema obrazovanja i vaspitanja, član 12 https://www.paragraf.rs/propisi/zakon_o_osnovama_sistema_obrazovanja_i_vaspitanja.html
	Compulsory separate subject(s)	Informatics / Informatika i računarstvo Technics and technology / Tehnika i tehnologija	https://pravno-informacioni-sistem.rs/slglrsViewPdf/a24406e1-a0df-4c0e-8d37-889324374c16?fromLink=true
TR	Cross-curricular theme	Digital literacy is identified as one of the nine literacy skills that should be integrated into the curricula of any subject, wherever is appropriate.	Literacy skills / Okuryazarlik becerileri https://tymm.meb.gov.tr/beceriler/okuryazarlik-becerileri
	Compulsory separate subject(s)	Information technologies and software / Bilişim Teknolojileri ve Yazılım	https://ttkb.meb.gov.tr/meb_iys_dosyalar/2025_02/10103210_ilkogretimkurumlari_hdc_2024_21.pdf 10103210_ilkogretimkurumlari_hdc_2024_21.pdf
	Optional separate subject(s)	Artificial intelligence applications / Yapay zeka uygulamaları Robotic coding / Robotik Kodlama Digital arts / Dijital Sanatlar	https://tymm.meb.gov.tr/

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EC-01-26-040-EN-N

Digital education in Europe: Bridging gaps in access, teaching and learning

Eurydice report

As digital transformation is reshaping all aspects of society, how are European education systems responding? Drawing on data from the Eurydice network and ICILS 2023 survey, this report provides an evidence-based overview of the state of digital education in Europe. It is an essential resource for policymakers working to develop inclusive, innovative, and future-ready education systems.

The first part of the report focuses on the governance of digital infrastructure and access. It examines how education systems regulate connectivity, hardware, software, interoperability, and technical support in schools. It then considers digital equity and inclusion, particularly the disparities in access to digital technology at home and in schools. Policy approaches to the integration of artificial intelligence and other emerging technologies in education are examined. Attention is also given to school-level digital planning and quality assurance, highlighting how digital transformation is organised, supported and evaluated.

The second part of the report focuses on teaching and learning. The chapter on curriculum and assessment examines whether and how digital competences are integrated into national curricula and are evaluated. The final chapter investigates digital competence frameworks for teacher education and training across Europe, highlighting the main gaps in professional development, as well as barriers to and perceptions of the use of digital technologies in teaching.

Qualitative data on policies and measures are collected from the Eurydice Network in 38 education systems, including the 27 EU Member States, Bosnia and Herzegovina, Switzerland, Iceland, Liechtenstein, Montenegro, North Macedonia, Norway, Serbia and Türkiye.

The Eurydice Network's task is to understand and explain how Europe's different education systems are organised and how they work. The network provides descriptions of national education systems, comparative studies devoted to specific topics, indicators and statistics. All Eurydice publications are available free of charge on the Eurydice website or in print upon request. Through its work, Eurydice aims to promote understanding, cooperation, trust and mobility at European and international levels. The network consists of national units located in European countries and is co-ordinated by the European Education and Culture Executive Agency (EACEA).

For more information about Eurydice, see: https://eurydice.eacea.ec.europa.eu/

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