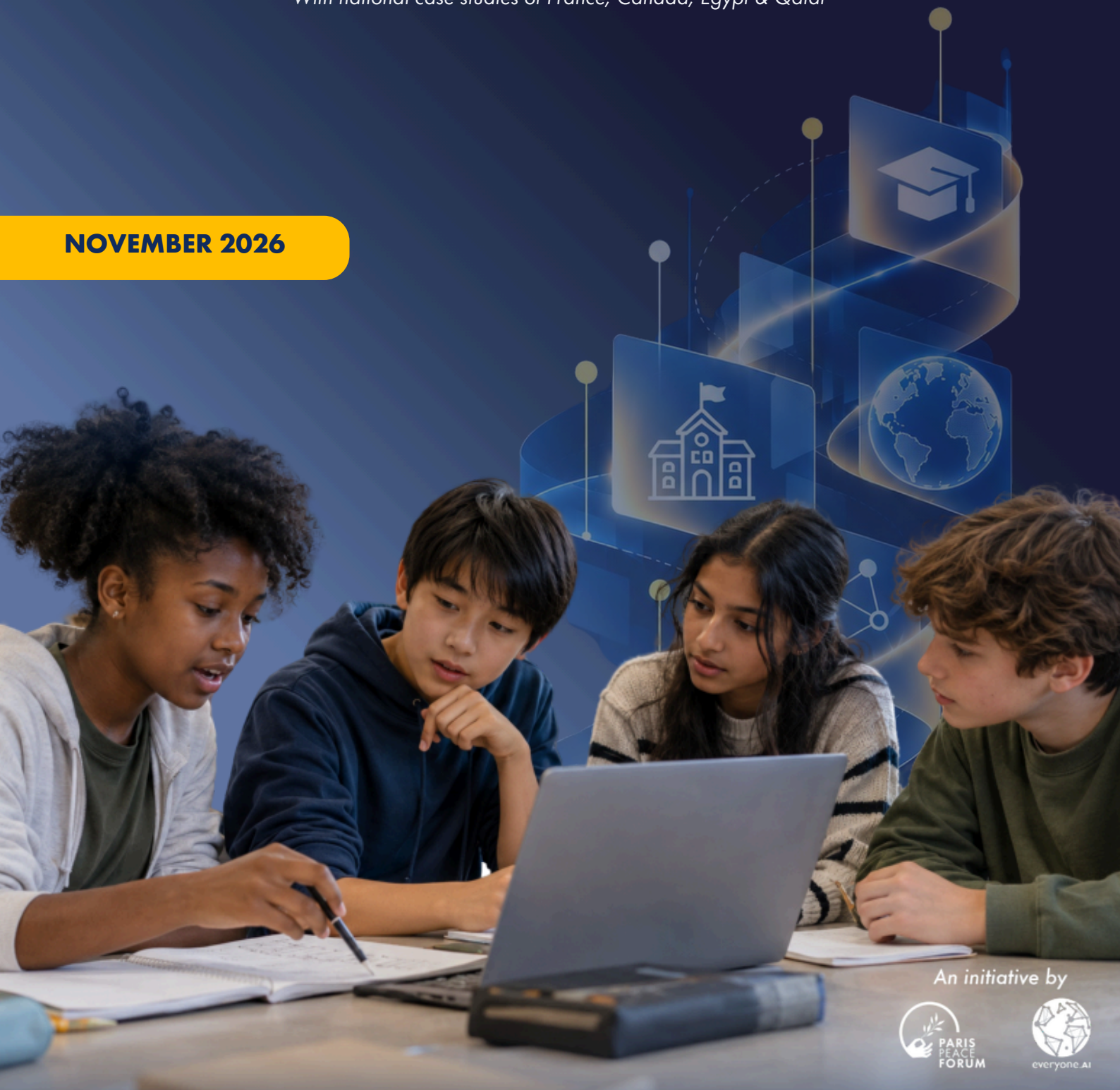
iRAISE
International Research-driven Alliance for AI Serving Every child

Human-centered AI Literacy in Schools:

Evidence-based Multi-stakeholder Recommendations for Primary & Secondary (K-12) Education

With national case studies of France, Canada, Egypt & Qatar

NOVEMBER 2026



An initiative by

PARIS PEACE FORUM

everyone.AI

> *For the mind does not require filling like a bottle, but rather, like wood, it only requires kindling to create in it an impulse to think independently and an ardent desire for the truth.*
>
> **— Plutarch, *On Listening to Lectures* (*Moralia*)**

Table of Contents

iRAISE Presentation 5

Authors 5
Editors 5
Reviewers 6
Acknowledgements 6

Executive Summary 7

Key Findings 8
Implications and Investment Priorities 9
Recommendations at a Glance 11
References Executive Summary 12

Introduction 13

Scope and Perspectives 15
Methods 16
Report Structure 16

I. Digital Literacy and Why It Matters 17

1.1. Digital Literacy: An Evolving Concept 17
1.2. Why Digital Literacy Matters for Children 18
1.3. The Role of Schools in Digital Literacy Education 19
1.4. AI Literacy: A New Entrant in the DL Space 21
1.5. Measuring Digital and AI Literacy 25

II. Foundations of Effective Digital Literacy Programmes 27

2.1. Resources 27
2.2. Content Design 31
2.3. Pedagogical Strategies 33

III. Case studies: France, Canada, Egypt, and Qatar 35

3.1. Comparative Snapshot 35
3.2. Four governance models 36
3.3. Cross-country lessons 38

IV. Remaining Challenges, Pitfalls to Avoid and Recommendations 41

4.1. Investing in teachers, their training, and in dedicated time for digital and AI literacy 41
4.2. Supporting children's wellbeing through healthy digital habits and protected time offline 42
4.3. Strengthening measurement and longitudinal research on DL/AI Literacy 45
4.4. The Last Mile: Families, Communities and NGOs 48
4.5. System-Wide Interoperability and Infrastructure Investment 49
4.6. Flagship project: A Universal Learning & AI Literacy Toolkit 50

V. Limitations 53

Conclusion: Human-centred AI Literacy in Schools 53

References 55

Appendix A. France: Centralised, sovereign, and protection-oriented 67

A.1. Demographic and connectivity context 67
A.2. Governance structure 67
A.3. Curriculum 68
A.4. Remaining challenges 68
A.5. Priority NGO partners 69
A.6. Outcome in a snapshot 70

Appendix B. Canada: Decentralised, innovative, but fragmented 70

B.1. Demographic and connectivity context 70
B.2. Governance structure 71
B.3. Curriculum 72
B.4. Remaining challenges 72
B.5. Priority NGO partners 73
B.6. Outcome in a snapshot 73

Appendix C. Egypt: Rapid scale under demographic pressure 74

C.1. Demographic and connectivity context 74
C.2. Governance structure 75
C.3. Curriculum 75
C.4. Remaining challenges 75
C.5. Priority NGO partners 76
C.6. Outcome in a snapshot 76

Appendix D. Qatar: High-resource, centrally coordinated, and confronting the wellbeing frontier 77

D.1. Demographic and connectivity context 77
D.2. Governance structure 77
D.3. Curriculum 78
D.4. Remaining challenges 79
D.5. Priority NGO partners 79
D.6. Outcome in a snapshot 80

Appendix E. Survey on national approaches to digital literacy for youth safety and wellbeing 81

iRAISE PRESENTATION

iRAISE

An initiative by

iRAISE is an international multi-stakeholder coalition launched in February 2025 at the AI Action Summit and co-led by **everyone.AI** and the **Paris Peace Forum**.
The alliance brings together **Governments** (Bulgaria, Chile, Costa Rica, Denmark, France, Iceland, Luxembourg, Mexico, Norway, Senegal, Togo, Uruguay), **Major company leaders** (OpenAI, Google, Microsoft, Anthropic, Hugging Face), more than 50 **NGOs including Youth Voices** (for example, Children & Screens), and **Researchers** from leading universities (including Harvard, Stanford, Berkeley, and CNRS), with the support of **international organizations** such as UNESCO, UNICRI.
The Coalition's goal is to ensure that AI is designed and governed with children's best interests at its core. By working across disciplines, it accelerates safe, equitable, and child-centered innovation.
The findings, interpretations, and conclusions expressed in this report are solely those of the authors.

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EXECUTIVE SUMMARY

The 2025 Programme for International Student Assessment (PISA) results recorded the lowest average performance ever observed across OECD countries in science, reading, and mathematics, extending a decline in reading that began well before Generative Artificial Intelligence ("GenAI", or "AI") reached classrooms. Governments are responding in different ways with some scaling instructional technologies, while others are moving to restrict access. Sweden, Finland, Denmark and France have restricted phones during school hours for non-instructional use and Sweden has returned to printed textbooks. GenAI is now part of this divide. In 2026, Norway, New York City and Los Angeles restricted students' direct use of GenAI; while since 2025, Estonia and India have expanded AI tools or curricula. This 'deploy or restrict' framing leaves open the questions this report addresses. Which uses and designs of GenAI support children's learning, development and wellbeing, under what conditions and for which educational purposes? And what should governments, schools, and partners put in place while evidence on age-appropriate use is still being built?

Answering these questions requires consideration of the fundamental nature and purpose of school. In line with philosopher Gert Biesta's view of schooling (2009, 2020), we distinguish three purposes that schools pursue simultaneously: (i) qualification (knowledge, skills and dispositions); (ii) socialisation (entry into a society's shared history, values and rules, and life alongside peers from other backgrounds); and (iii) subjectification (becoming a subject who reasons independently and takes moral responsibility for their actions, rather than an object that executes instructions). While AI tools may support aspects of qualification, the growing availability of information outside school makes schools' roles in socialisation and subjectification even more important.

Early evidence on AI and learning is now emerging. The relationship is complex, depending on how AI is designed for educational settings, how and for what purpose it is used, and how students are equipped to use it (OECD, 2026b). Nonetheless, PISA's first data on 15-year-olds' GenAI use suggest that it may not favour learning. Students who do not use AI chatbots for schoolwork generally outperform those who do, and gains from thoughtful use are modest and vary with demographic factors (e.g., socio-economic status, immigrant status, and gender). The most favourable results were observed among students who reported regularly using AI to support their learning while also having opportunities to develop AI literacy at school, though even this group scored only slightly higher than non-users. These findings do not establish whether AI use improves learning, highlighting the need for stronger evidence as deployment expands.

Whichever path governments take, 'deploy or restrict', the underlying task would be the same: preparing children to learn, socialise, and take part in civic life in environments that digital technology increasingly shapes. AI may create real opportunities for personalised learning, creativity and inclusion, but may also present substantial risks, including cognitive offloading, emotional dependence, image-based abuse such as sexualised deepfakes, misinformation and new forms of inequality. Schools have faced this challenge before with digital literacy (DL): the composite competence that enables individuals to access, evaluate, create, and share information safely, responsibly, and critically in digital environments. As society went digital, many education systems incorporated digital literacy into their curricula. Yet, only about half of countries worldwide have defined the digital skills they expect learners to acquire (UNESCO, 2023b). AI literacy, the set of competences needed to understand, use, and evaluate AI critically, is the newest layer of that task.

Research has historically examined digital and AI literacy separately. As the forthcoming PISA 2029 assessment of Media and AI Literacy (MAIL) will do, this report brings them together, building on the foundations of decades of media and information literacy (MIL). Experience with digital literacy therefore shows what helps new literacy programmes succeed in schools and what makes them fail.

This report is produced by iRAISE, a multi-stakeholder alliance for beneficial AI for children co-led by everyone.AI and the Paris Peace Forum. Its scope focuses on school-based digital and AI literacy in primary and secondary education (K-12), because schools remain a universally accessible and accountable institution in young people's lives. Adult and lifelong digital literacy are addressed in the report only where they shape children's environments. Our focus on literacy does not shift responsibility for AI harms onto children, families or teachers. Companies must design and deploy AI that respects

children's rights, and governments must set and enforce rules that hold them accountable (UN Committee on the Rights of the Child, 2021). Yet even the safest tools can impact how children learn, how teachers teach, and what schools assess. Safety by design limits the harm AI products can cause, while AI literacy, the focus of this report, equips children, teachers and families to understand, question and use AI to support learning, development and democratic life.

With AI already widely used in schools and homes, we take a human-centred and pragmatic approach to help decision-makers act while longitudinal evidence on its learning impacts develops. We believe that AI should support and not replace the relational, ethical, and motivational roles of teachers, caregivers, and peers.

Drawing on a structured review of global evidence and consultations with government officials, NGOs, and experts in France, Canada, Egypt and Qatar, the report is written for governments, schools, regulators and funders, and sets out the conditions under which EdTech and AI providers can contribute positively to AI literacy (Table 1 and Box 12).

KEY FINDINGS

The findings move from the human relationships at the heart of learning to the systems that sustain them:

1. **Human relationships remain an irreplaceable condition for learning and teaching in the AI era.** Learning is socio-affective as well as cognitive: middle-school students who perceive their teachers as caring, report both stronger mastery goals and emotional engagement in the subject (Adler & Virat, 2022). Students' enjoyment is also linked to how much they perceive their teacher to enjoy the subject (Frenzel et al., 2009, 2018). Meanwhile, teachers also draw meaning from these relationships: US educators say their strongest sense of meaning at work comes from their interactions with students (Brenan, 2026). Teachers and caregivers therefore need to remain active anchors of accountability, trust, and feedback. As GenAI can now answer students' questions directly, schools must still teach core content but increasingly also how to learn (Houdé & Borst, 2018). AI systems should therefore be designed as supports for human pedagogy, not replacements for it.

2. **Schooling has a collective civic function that must be protected in the AI-era.** Beyond individual skill development, schools provide shared references that sustain belonging, disagreement, and collective reasoning in communities. Much of this socialisation happens outside the syllabus, in the hidden curriculum of living, interacting, and making friends with peers from different backgrounds, and in a protected space where young people can raise complex, sometimes uncomfortable questions that may have no right answer. If digital pathways become too fragmented, especially through personalised learning, we risk weakening the common cultural and civic ground that social cohesion and democratic dialogue require.

3. **What makes school-based digital literacy programmes effective is well documented, but unevenly implemented.** Evidence points to three pillars: (i) **resources,** comprising teacher training, infrastructure, partnerships, and dedicated time in the timetable; (ii) **content design**, through curricula that are theory-based, inclusive and cross-curricular; and (iii) **pedagogical strategies**, including age-tailored, sustained, and well-assessed interventions. Time is a resource most easily overlooked: curricula, teacher training and materials will have only limited impact unless schools reserve time to teach digital and AI literacy, through dedicated lessons or projects across subjects. Schools must also decide what existing content or activities will be reduced or replaced to make room (Section 2.1.1). Teachers' own digital competence and confidence are consistently positively correlated with how well they foster students' digital skills (Hatlevik, 2017; Lorenz et al., 2019). Yet, many teachers across OECD countries, report lacking the preparation to use AI in their teaching, and what they most commonly report as a learning need is skills for using AI (OECD, 2025b).

4. **Digital and AI literacy frameworks are abundant, but their translation into curricula and classroom instruction lags behind while their effects on students are rarely measured.** Competency frameworks such as DigComp and France's Cadre De Références des Compétences du Numérique (CRCN) describe what students should be able to do; curricula turn them into sequenced learning experiences. There is a gap between recognising MIL in national policy and including it in school curricula. UNESCO's 2025 mapping found that 171 of 194 Member States referenced MIL or related competences in national frameworks, but only 84 (43%) included MIL elements beyond technical digital skills in school curricula (UNESCO, 2025). Few education systems track whether students actually acquire these competences (Section 1.5). Two recent US evaluations found that programmes improved students' knowledge but changes in behaviour were mainly observed among older students (Jones et al., 2024, 2026).

Without explicit AI-literacy components, including critical engagement with AI-mediated content, data rights and algorithmic bias, GenAI may encourage over-reliance rather than learning: by removing the effort and errors through which students learn, it can raise performance during practice while lowering what students can do on their own (Bastani et al., 2025). Implementing and measuring these programmes would benefit from a robust global research effort.

5 **NGOs and universities act as "human infrastructure" for digital and AI Literacy.** They translate national or regional strategies into lived experiences for children, families, and teachers. NGOs and universities play an essential role in reaching marginalised youth, supporting parents and delivering evidence-informed programmes on digital safety, AI awareness and media literacy. Their work is often constrained by project-based funding and limited capacity to evaluate its impact. They provide critical bottom-up information on how DL strategies are received and how they perform (Section 3.3).

6 **Effective digital and AI literacy require inter-ministerial collaboration, with the education ministry as coordinator.** No single ministry alone can govern GenAI as it reaches almost every domain of children's lives and its use cases encompass education, information and communication technology, health, child protection, interior and justice, social affairs, and culture. The most coherent systems in our case studies designate a clear coordinating authority, typically the education ministry (at regional level in federal systems), with standing mechanisms for cooperation, so that curriculum, infrastructure, connectivity, online-safety and data-protection policies are designed together and adapt as quickly as AI capabilities and uses evolve. NGOs and technology providers contribute within this framework (Finding 5; Box 12).

7 **Our four country case studies reveal contrasting governance models, but in all of them, human factors (teacher confidence, parental mediation and community trust) matter as much as policy design.** France combines a strong sovereign framework (a competence framework called CRCN, the Pix certification and a data-protection gateway called GAR) with territorial inequalities and a teacher-training bottleneck; Canada combines NGO programmes with broad reported reach but unmeasured depth, funded through time-limited grants, with fragmented coordination; Egypt has scaled infrastructure rapidly but faces equity gaps, teachers' anxiety about technical failures and parental distrust of digital learning; Qatar has closed the access divide but now faces wellbeing concerns and a shortage of Arabic-language AI content. In all four, infrastructure and content alone have not guaranteed effective outcomes (Chapter III; Appendices A–D).

IMPLICATIONS AND PRIORITIES

The report identifies six priorities for schools, governments, regulators, AI developers and EdTech providers, and funders including philanthropies, multilateral and industry actors who fund education. All six face the same constraint: time. AI tools can reach classrooms before evidence on their effects is available, or before teachers are prepared to use them. The benefits of education investment unfold over years or decades, while political mandates and funding commitments are often much shorter. This mismatch tends to leave long-term investments underfunded, such as teacher training, evaluation, and programme continuity (Chapter IV). The priorities below therefore favour commitments that can outlast political cycles: multi-year funding, recurrent budget lines and investment in human capacity. They complement public investment in regulators able to audit AI products used by children.

The following priorities are organized around the same logic as the key findings: ffrom the people around each child to the systems that support them, ending with our recommendation of a Universal Learning & AI Literacy Toolkit:

1. **Investing in teachers, their training, and in dedicated time for digital and AI literacy.** Teachers should help design curricula as it helps reflect classroom needs and build confidence in programme design. Training should begin in initial teacher education and continue throughout their careers, within paid working time. All teachers need training relevant to their subjects, with deeper preparation for those teaching digital and AI literacy. They also need safe, open or sovereign AI tools for planning lessons, administration and supporting students with special educational needs. Human oversight and relational mentoring in AI-mediated learning, as well as preserved shared references and collective discussion across students should be required by funders. Training and tools reach students only if digital and AI literacy has a defined place in the schedule: systems must decide whether it becomes a subject, is integrated into existing ones or become cross-curricular projects, and what it replaces (Section 2.1.1). This decision also shapes curriculum development, evaluation and alignment with AI competency frameworks.

2. **Supporting children's wellbeing through healthy digital habits and protected time offline,** such as protected daily outdoor and nature time, sleep-supportive routines, and explicit lessons in emotional awareness and self-regulation with planned screen-free periods (Section 4.2). Funders and governments can embed this by adopting "wellbeing-by-design" standards for schools and EdTech, financing outdoor and play infrastructure alongside digital infrastructure, and aligning school and home measures.

3. **Strengthening measurement and research.** Fund longitudinal studies to understand how AI affects children's skills, wellbeing, resilience and ability to think independently, and how these effects differ across groups. Evaluate curricula and teaching, and support age-appropriate assessments such as PISA 2029 MAIL for 15-year-olds. AI is becoming more capable while evidence on its risks is slow to study and hard to assess; public research agencies, philanthropic funders, and multilateral bodies all have a role in closing this gap.

4. **Sustaining the last mile by treating families, communities and the organisations that serve them as core infrastructure**. Provide multi-year, flexible funding to organisations delivering digital and AI literacy programmes, especially in underserved communities. Funding should reach those doing the work and sustain parent workshops, multilingual resources and community hubs that connect learning at school and at home (Section 2.1.2). Funders should also invest in these organisations' capacity to evaluate impact and to co-design interventions with youth, parents, and educators, recognising that NGOs and community services often provide the relational "last mile" that neither ministries nor technology providers can replicate.

5. **Supporting children's rights-respecting infrastructure and avoiding dependence on a single technology provider.** Promote open standards and privacy-preserving architectures, by favouring local and open-source infrastructure, safeguards and platforms, where possible. This helps education systems avoid platformisation issues such as vendor lock-in, allowing education systems to switch providers. This enables evidence-based decision-making without normalising pervasive surveillance of children.

6. **Seeding a Universal Learning & AI Literacy Toolkit.** Support the co-design and launch of an international AI Fundamentals Programme: free, openly licensed learning materials, quality-assured and adaptable to local languages and contexts. It would train learners of all ages in practical AI use, critical thinking, ethics and rights, leading to a free, vendor-neutral public certification modelled on France's Pix (Box 10). Piloted as a multi-stakeholder, public-interest consortium, this flagship project could serve as a replicable, internationally recognised, interoperable model for certifying AI knowledge across education, employment and lifelong-learning pathways. To ensure equitable access it should be freely accessible: a fee-based course or certificate would create a new barrier for those who cannot afford it.

Throughout implementation, investments should be judged against all three purposes of education rather than learning gains alone: (i) qualification, by building knowledge and skills without encouraging dependence; (ii) socialisation, by maintaining shared learning experiences that foster community, debate and civic cohesion; and (iii) subjectification, by preserving human-in-the-loop educational relationships in which young people learn to think for themselves and answer for their choices.

RECOMMENDATIONS AT A GLANCE

Table 1 summarises the report's six investment priorities by stakeholder. The extended explanations for rationale, evidence and pitfalls are set out in Sections 2.1.1, 3.3 and 4.1 to 4.6.

Table 1. Recommendations by Stakeholder

Schools and Teachers	Governments and Ministries	Regulators	AI Developers and EdTech Providers	Funders and Partners
Teachers and Dedicated Time to Teach (Sections 2.1.1 and 4.1)				
Co-design curricula; Decide whether and how GenAI serves their teaching, while keeping their own relational, ethical and evaluative responsibilities; Use AI toolkits safely for lesson planning and administration; Facilitate collaborative civic practices (group verification, deliberative protocols).	Decide whether DL and AI literacy is a subject or is integrated into existing ones, set hours per stage and state what it replaces; Build a distinct, modular and evolving teacher programme differentiated by role and by age-groups taught; Train pre-service and in-service teachers within paid working time; Embed DL and AI literacy in initial teacher education and professional standards (e.g., through micro-credentials); Prioritise multilingual, culturally adapted training; Provide open or sovereign AI toolkits for teachers.	Require human oversight of AI-supported decisions on assessment and student placement; Check that AI tools offered to teachers protect students' data privacy and are backed by independent evidence of efficacy.	Co-design AI tools with teachers and learning scientists; Design age-appropriate tools that guide students rather than supply answers, and that support rather than replace teachers' relational, ethical and evaluative roles; Disclose whether learning content is AI-generated or designed by learning experts; Never automate high-stakes decisions such as grading or educational placement.	Accept tools only if they are open, privacy-preserving, and non-discriminatory; Provide catalytic support for teacher training, including micro-credentials.
Wellbeing (Section 4.2)				
Protect daily outdoor time; Teach sleep hygiene, emotional awareness, and self-regulation; Plan screen-free periods.	Fund outdoor, nature-based and play infrastructure alongside digital infrastructure; Build healthy digital habits and align school and home measures.	Adopt wellbeing-by-design standards for schools and EdTech.	Apply wellbeing-by-design: avoid engagement-maximising features, false claims of humanhood and simulated intimacy for minors; Connect young users to human support in a crisis; Enforce age-appropriate access.	Back longitudinal research on high screen exposure; Provide teachers with educational resources and training on sleep, attention, and emotion regulation.
Research and Assessment (Section 4.3)				
Build capacity to teach and assess AI-literacy skills; Use formats that make reasoning visible (oral defences, team inquiry, process rubrics); Feed classroom evidence back to ministries.	Align curricula with MAIL competences; Survey caregivers, teachers, and students regularly; Track children's skills, wellbeing, resilience and ability to think independently, broken down by gender, socio-economic background and location; Fund 5–10-year longitudinal studies and independent evaluations.	Protect children's data in assessment and research; Expect providers to cooperate with independent evaluation of privacy and efficacy (Box 12).	Cooperate with independent longitudinal evaluation; Submit products to independent third-party audits of their behaviours with children, across repeated interactions and product updates, rather than relying on self-reporting; Give vetted researchers access to relevant data; Back efficacy claims with independent evidence.	Fund 5–10-year longitudinal studies and independent evaluations; Require child-rights and data-protection safeguards, and independent evidence of efficacy, as conditions of support.

Schools and Teachers	Governments and Ministries	Regulators	AI Developers and EdTech Providers	Funders and Partners
The Last Mile: Families, Communities and NGOs (Sections 3.3 and 4.4)				
Offer parent workshops, accessible guidance, and two-way communication with families; Work with local NGOs and community services.	Treat family engagement as core infrastructure; Produce resources in all locally relevant languages; Make funding for delivery organisations multi-year and recurrent, whether national, regional or local.	Ensure that children's AI products give families clear information on data use and on the evidence behind efficacy claims.	Give families clear, accessible information on data use, safety features and the evidence behind efficacy claims; Localise content genuinely rather than merely translate it.	Provide multi-year, flexible funding that reaches delivery organisations; Build their capacity to evaluate impact and co-design with youth, parents and educators; Fund family DL resources and community hubs with trusted local partners.
Interoperability and Infrastructure (Section 4.5)				
Prefer tools that meet the requirements in Box 10; Report technical and usability problems to the coordinating body.	Designate a coordinating body (national or regional); Promote open standards and favour local and open-source platforms where possible.	Ensure public oversight of private-sector participation; Prevent vendor lock-in and pervasive surveillance of children.	Adopt open standards and avoid lock-in; Protect students' data by design, without using it to train models or build commercial profiles.	Support system-wide interoperability rather than platform-specific adoption; Finance privacy-preserving data repositories.
Universal Learning & AI Literacy Toolkit (Section 4.6)				
Integrate the programme and its certification into existing school pathways; Encourage teachers to take it themselves.	Lead a public-interest consortium; Keep materials and certification free for learners; Allow local adaptation of materials around a common certified core; Embed certification in school, university and adult-training pathways.	Keep materials and certification vendor-neutral and aligned with public-interest frameworks (e.g., UNESCO guidance, MAIL).	Contribute in-kind support only under interoperability, privacy and vendor-neutrality conditions; Keep products and branding out of programme and certification content.	Provide catalytic grant funding; Accept industry in-kind support only if interoperability, privacy, and vendor-neutrality requirements are met.

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INTRODUCTION

iRAISE approaches digital literacy (DL) and AI literacy as skill sets critical for human agency: young people must be able to use digital tools without losing the relationships, agency, and critical thinking that underpin healthy development. Children increasingly encounter AI-generated content, AI-mediated social interactions, and AI-driven recommendation systems long before they can grasp how these systems work or where their limits lie (Stoilova & Livingstone, 2025). Still developing cognitively, emotionally, and socially, they may be particularly vulnerable to manipulation, surveillance, cognitive offloading, and emotional dependency (Neugnot-Cerioli & Muss Laurenty, 2024), even as GenAI holds promise for learning, creativity and personalised support (UNICEF Innocenti, 2023).

The 2025 Programme for International Student Assessment (PISA) report recorded the lowest average performance ever observed across OECD countries in science, reading, and mathematics (OECD, 2026b). Reading fell by 28 points between 2015 and 2025, the equivalent of about one and a half years of learning. This reported decline began well before GenAI reached classrooms, although about half of it (some 14 points) occurred between 2022 and 2025, coinciding, the OECD notes, with longer screen time and falling rates of reading for enjoyment. PISA 2025 also provides the first large-scale data on students' use of AI. PISA assesses representative samples of 15-year-olds enrolled in Grade 7 or above (more than 760,000 students in 91 countries and economies in 2025), and its data on AI use are self-reported and cross-sectional (OECD, 2026b). The first results show that students who do not use AI chatbots for schoolwork generally outperform those who do. Gains from thoughtful GenAI use are also comparatively modest and influenced by factors such as socio-economic status, immigrant status, and gender. The most favourable pattern, regular use "to help me learn" (a broad item that captures intentions as much as behaviour) combined with opportunities to develop AI literacy at school, is associated with scores only slightly above those of non-users. These associations do not establish whether AI use improves learning, but so far they show no meaningful learning gains associated with GenAI use, which matters as deployment expands worldwide.

Governments are taking two divergent paths on digital technology: one treats it as a learning resource to scale while the other treats it as a cost to contain, especially for younger students. Comparative work on six countries shows that national EdTech policies have diverged since the COVID-19 pandemic, and that countries interpret "what works" in EdTech differently, leaving teachers without clear guidance (Kucirkova et al., 2026). Several European governments have taken the second path. Sweden, an early leader in classroom digitisation, has funded textbook purchases since 2023 and is working towards one textbook per student per subject (Government Offices of Sweden, 2024). Since August 2025, Finland has prohibited mobile devices during lessons for students aged 7 to 16, except with a teacher's permission for learning or health reasons (AFP, 2025). Denmark made primary and lower-secondary schools mobile-free from 2026–2027 (Eurydice, 2026), and France extended its school phone ban to upper-secondary schools from September 2026 (Gouvernement français, 2026). On the opposite side, two of our case studies, Egypt and Qatar, have instead pursued near one-to-one device provision. These policies target two different things: phone bans address non-instructional use during school hours, whereas textbook and device policies concern instruction itself. GenAI fits neither category neatly, since the same tool can serve as a tutor, a writing aid, a productivity tool or a confidant. A similar divide now runs through GenAI use. In 2026, Norway announced that learners in grades 1 through 7 should, as a rule, not be given access to GenAI in their schoolwork, and asked the Directorate for Education and Training to issue national recommendations (Government of Norway, 2026); New York City suspended student-facing GenAI for nearly 600,000 students up to grade 8, while still allowing teachers to use AI for instructional planning and operational tasks (Associated Press, 2026; Lahiri, 2026); Los Angeles temporarily blocked it on

district-issued student devices across all grades (Liu, 2026); and the United Arab Emirates prohibited it for learners under 13 (Education Middle East, 2026). Meanwhile, after 2025 Estonia began giving about 20,000 students in grades 10–11 access to an AI chatbot adapted for learning and configured to ask guiding questions rather than give direct answers (Eurydice, 2025; e-Estonia, 2026). Additionally, India's Central Board of Secondary Education (CBSE) is introducing a computational thinking and AI curriculum for classes 3–8 from 2026–27 (Press Information Bureau, 2026), and the United States made AI education a federal policy priority (Executive Order No. 14277, 2025).

From these policy changes, three patterns emerge:

1. **Learning about AI is being separated from using AI.** AI literacy does not require giving students access to AI tools, a distinction between learning about AI and learning with it that a report for the Council of Europe drew early on (Holmes et al., 2022). Several systems now teach about AI while setting an age threshold for direct use of it. China teaches students about AI across primary and secondary schools but prohibits primary learners from independently using open-ended generation tools (Ministry of Education Steering Committee on Basic Education and Instruction, 2025; Henan Provincial People's Government, 2025). The UAE made AI a subject in public schools from kindergarten to grade 12 in 2025–26 (WAM, 2025), then restricted GenAI use for students under 13. These thresholds typically fall around the end of primary or lower-secondary school (about ages 12 to 14), on the logic that every child needs to understand AI, while the benefits of direct use for younger learners are less certain.

2. **Policy is unstable because governments are deciding as the evidence is evolving, and without shared guidance on appropriate use.** New York City banned ChatGPT in January 2023 and lifted the ban four months later (Bloomberg News, 2023), before restricting younger students again in 2026. South Korea introduced AI digital textbooks in March 2025 as a voluntary one-year trial, adopted by about a third of schools; to be later removed by the National Assembly that same year amid technical failures and complaints, (Choi, 2025; Kwon, 2025). These reversals suggest that governments are still working out what to do with a technology whose learning effects are not yet established, and adjusting strategy as evidence and public concern shift. Missing evidence is only one part of the problem. Many systems also lack shared guidance developed with educators and the public, on what safe and appropriate use looks like at each developmental stage.

3. **School rules govern institutional AI use, but children also access AI independently beyond school.** In Los Angeles, students with personal devices can still use GenAI at home, while classmates who rely on district devices cannot (Liu, 2026). Platform age limits do little to fill this gap: in a nationally representative US survey, half of 9–12-year-olds (49%) had already used AI chatbots or companions in their free time, despite platform policies requiring users to be 13 or older (Common Sense Media, 2026). Under the EU AI Act, the high-risk category for education (Annex III, point 3) covers AI systems that institutions use on students, such as admission, assessment and exam-monitoring tools. However, it does not cover the general-purpose chatbots students choose to use themselves, which face only lighter transparency duties (Art. 50) and the rules on general-purpose AI models (European Parliament & Council of the European Union, 2024). Since children use the same LLMs at home and at school, rules confined to school devices or institutional uses leave much of their AI use beyond reach.

Together, these patterns describe a policy debate moving faster than its evidence: most governments choose between deploying and restricting AI in schools, sometimes reversing course within months, while their rules stop at the school gate. Others, particularly at federal state and local level, have yet to set any policy. In the United States, only about half of states had issued AI guidance for K–12 schools in 2025, and fewer than half of

principals reported any AI policy (Doss et al., 2025). Three conditions are currently driving this: (i) evidence on how AI affects learning is still emerging, and the first large-scale data, such as PISA 2025, are observational, (ii) AI capabilities and uses change faster than curricula, teacher training and regulation can adapt, and (iii) the public debate is largely framed around access to tools rather than around what schools are for and what children need to learn. The deploy-or-restrict framing therefore leaves two challenges unresolved: determining which AI uses and designs are educationally appropriate at different ages, and preparing children to navigate general-purpose AI tools they encounter regardless of school policies. The first requires evidence of educational impact and appropriate pedagogical guidance. The second calls for digital and AI literacy, alongside product safeguards and regulation. Both require teacher preparation and coordination between school and home.

Addressing these challenges requires consideration of the fundamental nature and purpose of school. Following the philosopher Gert Biesta (2009, 2020), we distinguish three purposes that schools pursue together. (i) Qualification equips young people with knowledge, skills and dispositions. (ii) Socialisation introduces them to the history, values, rules and laws a society holds in common, and to everyday life with peers from other backgrounds, largely through what Jackson (1968) called the hidden curriculum. (iii) Subjectification is how a young person becomes a subject rather than an object: someone who reasons for themselves, makes choices and answers morally for their actions. AI bears on all three. It may support qualification by instantly providing answers and explaining complex concepts, but it can also bypass the effort through which students learn. Personalised pathways may erode the shared experiences on which socialisation depends, and tools that think on students' behalf may weaken the independent judgement that subjectification requires. As information becomes available anywhere, what school alone offers lies increasingly in the latter two purposes. This report therefore judges AI in education against all three, not learning gains alone.

Schools pursue these purposes, but many of the decisions that shape them are taken at the government level. DL and AI literacy sit at the crossroads of several policy agendas: curriculum and pedagogy (ministries of education); connectivity and platform governance (ICT or digital-transformation ministries); economic competitiveness and workforce readiness (innovation and labour portfolios); and cyber-resilience, child protection and democratic integrity (public-safety and justice frameworks). Children experience the combined effects of these decisions every time they go online: the institutional boundaries between ministries are invisible to them. DL and AI literacy are a holistic government challenge with schools at its centre, and we focus on how ministries of education work alongside ICT, innovation, and public-safety actors and influence the safety and agency of young people in digital environments.

Scope and Perspectives

This report focuses on school-aged learners and the K–12 system, not because DL matters only for young people, but because schools remain a universally accessible and accountable institution in young people's lives, well placed to provide structured, curriculum-aligned learning and to help mitigate digital inequities where home access is limited (UNICEF, 2019; ITU, 2025; OECD, 2021).

As a multi-stakeholder coalition, iRAISE prioritises collaboration and communication between governments, technology companies, regulators, NGOs, universities, and other societal partners for child wellbeing. This is reflected in the report's cross-disciplinary data sources, analysis, and recommendations. Although written primarily for education specific audiences (governments, schools, and regulators) and general audiences (the public, funding organizations), the report also sets out the conditions under which EdTech companies and AI providers can positively contribute (Table 1 and Box 12).

Our focus on school-based digital and AI literacy does not shift responsibility for the harms of AI onto children, families or teachers. Making AI products safe for children is primarily the responsibility of those who design and deploy them, and of regulators, who must be able to audit these products before and after they reach young users. Design matters: iRAISE's mapping of GenAI impacts on child development concludes that benefits are more likely when safety is treated as a prerequisite for them (Neugnot-Cerioli & Hipp, 2026). However, even the safest tools will change how children learn, how teachers teach and what schools assess. The features that make AI useful, such as personalisation, immediate feedback, and automation, can also reduce the cognitive effort children need to practise (Neugnot-Cerioli & Hipp, 2026), and some risks, such as cognitive offloading or the erosion of shared references, arise from how capable tools are used rather than from product defects alone. Children will also keep encountering AI that was not designed for them, often as consumers outside school. Safety by design and AI literacy are therefore complementary: the former limits the harm products can cause; the latter prepares children, teachers and families to understand, question and use AI in the service of learning, development, and democratic life.

This report is human-centred as our central assumption is that AI should augment, not replace, the relational, ethical, and motivational roles of teachers, caregivers, and peers. Any investment in DL and AI literacy must be judged by how well it strengthens human relationships and serves all three purposes, not qualification alone. International evidence points the same way: although AI systems can produce high-quality explanations and feedback, students perceive human feedback as more credible and meaningful, and more likely to influence their motivation, evaluative judgement and trust (OECD, 2026a, ch. 1, p. 24).

Methods

The report includes:

1. A structured review of global evidence on digital and AI literacy (e.g., OECD, UNESCO, UNICEF, recent meta-analyses and scientific research). Our report uses DL as a working umbrella term, in line with DigComp: AI literacy is its newest component, and MIL the older foundation on which it builds. The PISA 2029 assessment of Media and AI Literacy reflects a similar integration.

2. An analysis of policy documents, official statistics, and independent evaluations for four focus countries: France, Canada, Egypt, and Qatar. They were chosen to contrast governance models and resource levels: a largely centralised European system (France), a decentralised federation (Canada), a very large school system scaling under demographic pressure (Egypt), and a high-income, centrally coordinated Gulf state (Qatar) (Chapter III).

3. Interviews and consultations (see the list of questions in Appendix E) with government officials, NGOs, and experts in each country's context. This includes: (i) the Digital Community Development team of Egypt's Ministry of Communications and Information Technology (MCIT); (ii) leaders from Public Safety Canada, Actua and MediaSmarts in Canada; (iii) French digital-education officials; and (iv) a written consultation with Qatar's Ministry of Education and Higher Education (MOEHE), including its Office of the Assistant Undersecretary for Educational Affairs and its Department of Planning, Educational Policies and Innovation.

This mixed-methods approach links system-level strategies to classroom realities, foregrounding youth safety, mental health, and agency in our recommendations. The four country case studies follow a common framework that can be applied to other countries.

Report Structure

This report has five chapters and five appendices featuring selected national case-studies. Chapter I defines DL and AI literacy, tracing how these concepts have evolved, why they matter for children, and how they can be measured. Chapter II examines the evidence on what makes school-based DL programmes effective, identifying resources, content design, and pedagogical strategies as the three foundational pillars. Chapter III applies these insights to France, Canada, Egypt, and Qatar, each representing a distinct governance model and set of trade-offs, and maps the ecosystems that translate national strategies into children's lived experiences. Set side by side, systems with different governance models reveal trade-offs that are difficult to see from inside a single system. Chapter IV synthesises the intersecting challenges and investment opportunities, including a **Universal Learning & AI Literacy Toolkit** proposal. Chapter V sets out the report's limitations. Appendices A to D present the full country assessments, including priority partners for funders, government, and implementing organisations; numbered boxes in Chapters I, II, and IV draw on them to illustrate the evidence with country experience. Appendix E lists the interview questions.

1 Digital Literacy and Why it Matters

Schools have taught media education for decades (UNESCO, 1982), and digital literacy entered curricula after the term was coined in the late 1990s (Gilster, 1997). This long experience shows what helps a new literacy, such as AI literacy, take root in classrooms and what makes it fail. This chapter traces the evolution of DL and examines its importance for children's academic performance, safety and civic readiness, and explores the role of schools as its primary institutional anchor. It then turns to the new challenge posed by GenAI and closes with the state of measurement, a prerequisite for any evidence-based investment strategy.

1.1. Digital Literacy: An evolving concept

Digital literacy (DL) is a composite competence that enables individuals to access, evaluate, create, and share information safely, responsibly, and critically in digital environments. Its evolution reflects how schools have adapted to successive transformations in media and technology. Media education came first, in response to mass media: it was on UNESCO's agenda as early as the 1982 Grünwald Declaration (UNESCO, 1982). As computers and the internet spread, Gilster's (1997) original definition of DL focused on understanding and using digitised information. With mobile phones, messaging and then social media, the field broadened to digital citizenship, the norms of appropriate and responsible technology use (Ribble et al., 2004), and to digital and media literacy as a civic competence (Hobbs, 2010). Later work extended DL to technical, cognitive, ethical, and civic dimensions (Martin & Grudziecki, 2006; Ala-Mutka, 2011). In response, UNESCO combined media and information literacy into a single composite concept (MIL; Grizzle et al., 2013), and the Council of Europe set out a framework for digital citizenship education in schools (Richardson & Milovidov, 2019). Since the late 2010s, the growth of big data and AI led researchers to define what every child should know about AI (Touretzky et al., 2019) and to design curricula that teach AI concepts together with their ethical implications (Williams et al., 2023). UNESCO's global MIL curriculum has also started addressing AI since 2021 (Grizzle et al., 2021). GenAI is the latest stage: data, media, and AI literacy are converging under a broader DL umbrella, though their boundaries remain contested (Polomoshnov et al., 2025).

The latest edition of the EU reference, the Digital Competence Framework for Citizens (DigComp 3.0), integrates AI into all 21 of its competences, across five areas and four proficiency levels, treating AI literacy as part of digital competence rather than an add-on (Cosgrove & Cachia, 2025). Frameworks alone, however, do not guarantee implementation: the gap between policy standards and classroom practice persists (Tinmaz et al., 2023).

While technologies have evolved, from mass media to the internet, social media, and now generative AI, the core goals of literacy have remained largely consistent: evaluating sources, recognising misinformation and manipulation, understanding how media shape perceptions, and participating in public life. These aims are collective as well as individual. Audrey Tang, Taiwan's former Minister of Digital Affairs, distinguishes an individual interpretive capacity from a collective civic competency: co-producing verified information, deliberating publicly, and acting on shared evidence (Sismique, 2026). Schools are well placed to help students turn information into coordinated, prosocial action. Ultimately, DL is about whether students can think critically, ethically, and independently in technology-mediated environments, and answer for what they do there. GenAI makes this urgent: it demands technical fluency and the ability to evaluate AI-generated content, understand algorithmic bias, and maintain cognitive autonomy. Within this umbrella, AI literacy overlaps with media, computational and data literacy, which calls for an integrated rather than siloed approach (Hackl et al., 2026; Fig. 1).

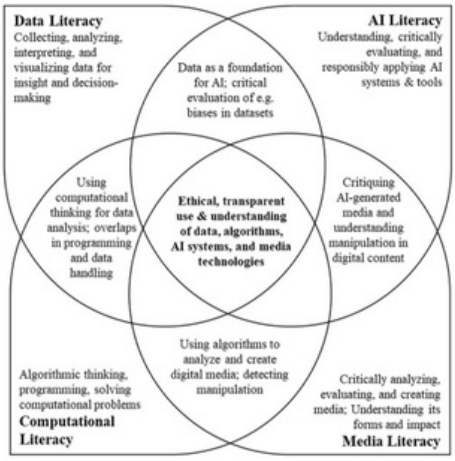


Fig. 1. AI Literacy and its overlaps with media, computational and data literacy. Reproduced from Hackl et al. (2026, Fig. 2; CC BY 4.0)

1.2. Why Digital Literacy Matters for Children

The case for investing in children's DL rests on converging evidence in three domains: academic achievement, online safety, and children's rights and participation.

First, DL is associated with academic achievement. A 2025 meta-analysis of 33 studies involving more than 48,000 students from primary school to university found a significant positive correlation between students' digital literacy and academic achievement (F. Li et al., 2025). The strength of the association varies considerably by grade level, subject and gender, and the primary studies are correlational: DL and achievement go together, but this does not show that improving DL causes higher achievement. Access to technology may also confound the association, since students with more access tend to have both stronger digital skills and more practice with digital tests, and since PISA has been computer-based since 2015. This is one reason why this report treats DL as both a skill in using tools and a broader understanding of how technology works. A systematic review of 31 studies. on digital tools in primary and secondary education

adds that technology use is broadly associated with better engagement and performance when enabling conditions are in place (Abdykerimova et al., 2025).

Second, DL shapes how children cope with online risks such as misinformation, cyberbullying and data-privacy threats. Evidence suggests that children with stronger digital skills encounter more online risks because they engage in a wider range of activities, but may be better equipped to avoid harm (Livingstone et al., 2018; UNICEF, 2019). Countering misinformation, hate speech, and other online harms has long been a core aim of MIL (Grizzle et al., 2021). Across 50 studies, school-based programmes reduced cyberbullying perpetration and victimisation, though modestly ($g = -0.18$ and -0.13; Polanin et al., 2022). Games that expose players to manipulation techniques, known as "prebunking", reduced susceptibility to misinformation in several languages and countries (Roozenbeek et al., 2020). Finally, teaching students to check what other sources say about a website, called lateral reading, improved high-school students' evaluation of online sources in a district-wide field study (Wineburg et al., 2022).

Third, DL underpins children's rights and future civic participation. UNICEF (2019) and UNESCO highlight DL's importance to children's rights to education, information and participation, for freedom of expression and quality education , while the OECD (2021) emphasise its role in future employment, civic participation and lifelong learning.

Overall, while this evidence base is still growing and remains uneven due to methodological limitations, results are indicative. Across these three domains, weaker DL is associated with lower academic achievement (F. Li et al., 2025), may leave children less able to cope with the online risks they encounter (Livingstone et al., 2018) and limit their ability to exercise rights that increasingly depend on digital access (UNICEF, 2019). This is why DL should be treated as foundational rather than supplementary in school curricula.

The next section examines why schools are the institution best placed to teach it to all children, and to do so effectively.

1.3. The Role of Schools in Digital Literacy Education

Schools are uniquely positioned to deliver structured, equitable DL and AI literacy education. Because DL and AI literacy sit at the crossroads of several policy agendas, schools are where these agendas meet children, which is why the education ministry is well placed to coordinate them. Schools play this role through four functions, each linked to one of these agendas: a distributive function (connectivity and platform governance), a pedagogical function (curriculum and instruction), a relational function (child protection and wellbeing), and a civic function (democratic integrity).

1. **A distributive function: schools reduce structural inequality in access**. In 2020, two-thirds of the world's school-age children (1.3 billion aged 3–17) had no internet access at home (UNICEF & International Telecommunication Union (ITU), 2020), and in 2025 almost one in five young people aged 15–24 worldwide was still offline (ITU, 2025). Schools can provide shared devices, offline resources, and connectivity solutions that partially offset household-level disparities. The COVID-19 school closures showed both the reach and the limits of this role: where devices and content platforms were already in place, they helped maintain some continuity of learning, while under-equipped primary and rural schools had to rely on offline methods (Box 1). When DL is mandatory and curriculum-embedded, access becomes less dependent on family income, parental digital competence, or local infrastructure.

2. **A pedagogical function: schools organise guided learning and protect the time it requires**. The word school derives from the Greek scholē, free time: time released from the demands of production, in which things can be studied for their own sake (Masschelein & Simons, 2013). Schools have always balanced this "free time" between curiosity, discovery, and trial and error to unfold, and the duty to prepare young people for adult life. Those dispositions are important for learning: in a longitudinal study of 1,021 Finnish adolescents, persistence and curiosity were associated with higher

learners monitor their own understanding and adapting instruction in real time. For example, teachers may provide support to students who struggle with source evaluation while giving advanced learners more complex tasks. This matters for AI literacy, because tools that save people time can also remove the effort, formative feedback and self-monitoring through which we learn.

3. A relational function: schools place learning within relationships where learning is both socio-affective and cognitive. Drawing on attachment theory, Virat (2019) argues that learners develop the confidence to try, make mistakes, and start again when they know their teacher supports them. Among middle-school students, perceiving their mathematics teacher's "compassionate love" (a professional form of care that involves noticing students' difficulties and sincerely wanting to help them) is linked to stronger mastery goals and emotional engagement in the subject (Adler & Virat, 2022). Teachers also pass on their enjoyment of a subject: teacher and student enjoyment are linked through the enthusiasm students perceive, and this link runs both ways over the school year (Frenzel et al., 2009, 2018). This relational layer matters especially with GenAI: disengagement may plausibly be easier and less socially costly with an AI tutor than in a human tutoring relationship, where accountability, reciprocity, and trust can support persistence over time (OECD, 2026a).

4. A civic function: While the relational function rests on the teacher-learner relationships, the civic school engagement and lower school burnout (Huttunen et al., 2024). Since the digital revolution, academic knowledge is no longer only transmitted by teachers and it has become available almost instantly. This is now amplified by GenAI as LLMs can now interactively answer learners' questions and explain complex concepts. The teacher's role is therefore partly shifting from transmitting knowledge to guiding learning, in schools that need to become less vertical and more horizontal. This is not a retreat to facilitation (Biesta, 2017) as guiding learning requires expertise in selecting and structuring content, organising effort, giving feedback, helping function rests on social integration: learning alongside classmates from different backgrounds. Schools provide a shared space where ethical reasoning and common cultural knowledge are built. This serves socialisation, much of which happens outside the syllabus, through the hidden curriculum (Jackson, 1968), sitting beside classmates from other backgrounds, learning to disagree with them and sometimes becoming their friends. The same shared space also serves subjectification. Schools provide opportunities for students to explore complex questions without definite answers, test their judgement against that of others and learn to take responsibility for their opinions. This idea is close to the "sanctuary" learning spaces now emphasised in French policy (Appendix A.4). If AI-enabled personalisation generates increasingly parallel knowledge trajectories, students may lose shared cultural ground for belonging, disagreement, and collective deliberation, all of which are central to democratic social cohesion (UNESCO International Commission on the Futures of Education, 2021).

Taken together, these four functions are how schools pursue the three purposes of education set out in the Introduction, of qualification, socialisation, subjectification, and most serve more than one. The distributive function makes qualification more equitable. The pedagogical function protects the time and guidance that qualification requires, and the room for curiosity and trial and error on which subjectification depends. The relational function sustains the motivation and confidence on which both qualification and subjectification rest. The civic function carries socialisation and, by giving young people a space to test their judgement against that of others, also serves subjectification. These functions are interconnected, and AI may affect each differently. While AI can improve access to knowledge and personalise learning, it may also reduce the cognitive effort, human relationships, and shared experiences that support children's cognitive, social, and emotional development. Evaluating AI in education therefore requires looking beyond academic performance to consider its broader developmental effects. This is why we argue that schools should remain the institutional anchor of DL and AI literacy in child-centred education systems.

Box 1. The distributive function at national scale: Egypt

Egypt's pre-university system serves more than 28 million students, including Al-Azhar (Central Agency for Public Mobilization and Statistics [CAPMAS], 2024). By late 2018, around 2,500 public general secondary schools had been connected to fibre (Reda, 2018; Zayed, 2025), by 2021 some two million tablets had been provided to secondary students and teachers (UNICEF, 2021), and the Egyptian Knowledge Bank (EKB) provides free access to a vast digital repository of academic, cultural and scientific resources (Arab Republic of Egypt, 2022), giving students access to high-quality, Arabic-language content. A secondary-school student in Upper Egypt can access the same curated content as her peers in Cairo, on the same device, and sit for the same standardised national exam. When COVID-19 closed schools, the pre-existing EKB and student tablets helped maintain some continuity of learning and assessment.

The same assessment shows where the distributive function stops: primary schools and remote rural areas remain under-equipped and reliant on teacher-led and offline methods. Because student logins are linked to national identifiers, issued from age 15, student activity can be logged and traced to individuals, raising data-protection questions that the governance framework has only begun to address.

→ *Full assessment: Appendix C (sections C.1, C.4 and C.6).*

If schools remain the institutional anchor of digital literacy, the next challenge to address is how the rapid diffusion of GenAI is reshaping what schools must now teach, assess, and safeguard under the domain of AI literacy.

1.4. AI literacy: a New Entrant in the DL Space

1.4.1. The Rise of GenAI: A Paradigm Shift

GenAI entered the public spotlight with the release of OpenAI's ChatGPT in 2022, but it builds on earlier AI systems designed for narrower tasks such as classification, prediction and recommendation. What sets GenAI apart is its ability to produce content, including text, code, and images, in response to human prompts, powered by advanced machine learning techniques such as transformer-based neural networks (Sparks et al., 2024; UNESCO, 2023a). Unlike many educational AI tools, which are often restricted to institutional or paid contexts, GenAI tools are widely accessible, with free versions integrated into everyday life for information-seeking, task automation, and even emotional support (OECD, 2026a; Pew Research Center, 2026). In the US, 64% of teens aged 13–17 use them, 54% for help with schoolwork and 12% for emotional support or advice (Pew Research Center, 2026). In Europe, 72% of children aged 9–16 reported having used GenAI in the past month, though they also reported limited knowledge of misinformation, bias and privacy (Staksrud et al., 2026).

Much of this use happens through AI built into services children already use, not only through standalone chatbots. Among US 9–17-year-olds who had used GenAI in their free time, a quarter had used Meta AI and almost one in five Snapchat's My AI (Common Sense Media, 2026). As GenAI is now also built into search engines, messaging apps and voice assistants, surveys that ask only about chatbots may underestimate children's exposure. This fast and widespread adoption means that GenAI increasingly mediates how students learn, how teachers instruct, and how families access and interpret information.

Focusing on learning, a systematic review of 179 publications on AI literacy in K-12 education describes AI literacy as a pedagogical and cognitive challenge in its own right, and shows that few studies assess what students actually learn, and that a competency framework is needed to sequence and guide teaching (Casal-Otero et al., 2023). This ubiquity raises a critical question: does GenAI help or hinder learning?

1.4.2. The Dual Impact of GenAI on Learning

The integration of GenAI into education presents a paradox: it can improve the work students produce while undermining what they actually learn, depending on its design, implementation, and pedagogical context. The OECD (2026a) warns that unguided GenAI use may lead students to rely on AI for planning, monitoring and evaluating their work, rather than developing these skills themselves. In a randomised experiment with 117 university students, ChatGPT improved essay scores but did not improve knowledge acquisition, transfer of learning or intrinsic motivation (Fan et al., 2025). Understanding this duality is essential for designing AI-literacy curricula that maximise benefits while mitigating harms.

A recent expert consensus study involving 30 learning scientists and educational researchers further clarifies this duality by examining how GenAI may support or undermine specific cognitive processes involved in learning (Kendeou et al., 2026). The experts identified potential benefits for processes associated with consolidating knowledge (eg., feedback, practice and self-testing), but raised concerns about its effects on knowledge acquisition, memory retrieval, critical thinking and metacognition. These findings suggest that the impact of GenAI depends not only on how it is implemented, but also on which cognitive processes it supports or replaces. Even when GenAI improves the work students produce, it may reduce opportunities to develop the knowledge and skills needed to work independently. Critically, the study identifies elementary school students as the most vulnerable to disruptions in learning, and highlights the limited evidence on how AI affects specific learning processes.

Research on GenAI in education is growing, with emerging findings on its potential to support creativity, feedback and learning, though much of the evidence remains preliminary, particularly for children. Questions remain about how AI affects the cognitive processes involved in learning, and understanding both its potential benefits and risks requires examining not only what students produce with AI, but also how they learn through its use.

Creativity offers an example of both potential benefits and limitations. A systematic scoping review of 22 primary studies, mostly with school-aged children, found reported benefits for divergent thinking, narrative creativity and creative self-efficacy, but the studies were small, short-term and adult-facilitated, none was longitudinal, and their designs do not allow conclusions about efficacy (Niu et al., 2026). In a series of co-design workshops, children aged 7 to 13 needed adults or peers to understand what the tools could do, and tended to abandon their own ideas when the outputs did not match them (Newman et al., 2024). Evidence of benefits for children's creative development therefore remains limited. For adults, evidence points to a further trade-off: in an online experiment with 293 writers, access to GPT-4 story ideas made short stories more creative and better written, but also more similar to one another (Doshi & Hauser, 2024). Whether this holds for children, whose creative and executive skills are still developing, remains to be established.

Beyond individual creativity, GenAI may also influence the diversity of ideas students encounter. GenAI's tendency to reinforce dominant narratives may stifle creativity and critical inquiry; UNESCO (2023a) warns that AI-generated outputs may limit pluralistic thinking and independent inquiry, and encourages educators to design assignments requiring students to compare, critique, and build upon AI-generated content. Together, these findings highlight the need for pedagogical strategies that encourage iterative refinement and critical engagement with GenAI outputs, so that individual creativity is fostered while collective diversity is preserved.

AI-generated feedback may also support learning, but evidence of an advantage over human feedback is lacking. A meta-analysis of 41 studies (4,813 students), most of them on language and writing in higher education, found no statistically significant difference in task performance based on whether they received AI-generated or human feedback, with substantial heterogeneity, and students did not perceive AI feedback more favourably (Kaliisa et al., 2026).

The OECD (2026a) judges hybrid approaches, where GenAI drafts initial feedback and teachers refine it, the most promising, partly because students tend to find purely AI-generated feedback less credible (Gašević & Yan, 2026).

A more immediate concern is the gap between improved task performance and actual learning. The OECD (2026a) argues that students who use GenAI without reflective engagement often struggle to recall or apply knowledge independently. When part of a task is delegated to AI, students no longer practise it, and what is not practised is less likely to be learned. Preliminary neuroscientific work is consistent with this: a small EEG study found lower neural connectivity and weaker recall among participants who wrote essays with an AI assistant, a pattern its authors term "cognitive debt" (Kosmyna et al., 2025), although its small sample makes these results suggestive rather than conclusive.

Repeated offloading can increase dependency, eroding students' capacity to learn and perform without the tool. In a field study with nearly 1,000 high-school mathematics students, access to a standard GPT-4 interface improved performance during practice, but once access was removed these students scored 17% lower than students who had never had access, having used the tool as a crutch (Bastani et al., 2025). This suggests that, under certain conditions, AI assistance can undermine independent learning despite improving immediate performance. However, this is in part a design challenge: a version designed as a tutor, with safeguards that guide students rather than supply answers, largely mitigated this harm (Bastani et al., 2025).

Taken together, the emerging evidence suggests that GenAI's effects on learning depend on its design and how it is used. Potential opportunities and risks are not symmetrical either. The harms of unguided use are better documented than the benefits: so far, careful design and guided use mainly limit these harms, while clear learning gains have yet to be shown.

The PISA 2025 data reported in the Introduction point in a similar direction, although they are attention in its own right (UNESCO, 2023a; UNICEF Innocenti, 2023).

correlational, and add an important distinction: frequent users of AI performed slightly better when they also had opportunities to develop AI literacy skills (OECD, 2026b). This does not establish that guided use or AI literacy caused better performance, nor that AI improved learning. However, it is consistent with the possibility that AI literacy and pedagogical guidance may help mitigate some of the difficulties associated with unguided use.

As GenAI increasingly performs tasks involving planning, monitoring and evaluation, teachers need to understand when these tools support learning and when they replace cognitive processes that students need to develop themselves. This is particularly important for attention, executive functions and metacognition, which are central to independent learning and closely associated with academic achievement and educational inequality (Houdé & Borst, 2018). In a 2024 French assessment of 4,200 lower-secondary students, disadvantaged students who succeeded stood out by stronger executive and metacognitive skills than their peers from similar backgrounds (Rémeau et al., 2026). Protecting opportunities to develop these skills is therefore both a learning and an equity concern. This is also what makes the teacher's role as a guide of learning more demanding, not less, and why teacher training should cover the learning sciences.

The stakes of GenAI extend well beyond the classroom: its influence on privacy, emotional development, and democratic integrity demands

1.4.3. Beyond Learning: GenAI as a Societal Risk

The UNESCO report (2023a) notes that because GenAI tools are ubiquitous, their design and deployment raise critical concerns about how societies govern data, nurture independent thought, and safeguard public discourse. UNICEF Innocenti (2023) makes a parallel argument specifically for children, highlighting that GenAI introduces distinctive risks, including exposure to age-inappropriate content, heightened vulnerability to manipulation, and unequal access, alongside opportunities for creativity and personalised support.

The erosion of data privacy is one of the most immediate concerns. User interactions, including

prompts and outputs, may be retained and, depending on providers' terms, used to train or improve models, often under consent mechanisms that are hard for users, let alone children, to understand. The European Data Protection Board (2024) has stressed that AI models trained on personal data are not automatically anonymous: if such data can be extracted, data-protection law still applies, and developers must justify their use on a valid legal basis. This matters particularly for children, whom the General Data Protection Regulation singles out for specific protection (European Parliament & Council of the European Union, 2016, Recital 38, Art. 6(1)(f)), and who are unlikely to expect their photos, posts or schoolwork to end up in training data. Some education systems have built safeguards to keep the data students generate at school out of commercial use (Box 2).

Box 2. Keeping students' data out of commercial profiles: France and Qatar

In **France**, the GAR (Gestionnaire d'Accès aux Ressources) acts as a sovereign data-protection gateway: it pseudonymises student data before they are shared with EdTech providers and enforces interoperability standards such as Learning Tool Interoperability (LTI) and the Security Assertion Markup Language (SAML). A student browsing a school platform does not feed a commercial profile. Whether this protection extends to the GenAI tools she encounters outside school hours remains an open question, which illustrates the third pattern described in the Introduction: children also access AI beyond the reach of school rules.

Qatar takes a legislative route: its Personal Data Privacy Protection Law (PDPPL; Qatar, 2016, arts. 16–17) classifies children's data as sensitive and mandates privacy-by-design.

→ *Full assessments: Appendix A (section A.1) and Appendix D (section D.1).*

GenAI also creates new forms of abuse that reach schools directly. Image generators make it easy to produce sexualised deepfakes of real classmates and teachers. In the United States, 15% of public high-school students said they knew of AI-generated non-consensual intimate imagery depicting someone associated with their school in 2023–24, and very few schools had policies to prevent it or resources to support victims (Laird et al., 2024). In interviews in eight UK schools, both teachers and students were unsure how deepfake technology works, students tended to equate AI with chatbots such as ChatGPT, and they also reported receiving no explicit teaching on the topic, even though sexualised deepfakes were occurring in their schools (Ringrose et al., 2026). AI literacy therefore needs to cover image generation and image-based abuse, not only text-based chatbots.

Another concern is the potential impact of GenAI on emotional dependence and relationship formation. Neugnot-Cerioli and Muss-Laurenty (2024) argue that AI companions may affect emotional independence by displacing human interactions and by fostering anthropomorphism and attachment in children, and therefore call for close monitoring of child–AI parasocial relationships to detect and prevent unhealthy dependency. Children are especially likely to treat chatbots as quasi-human confidants, even though these systems often handle the emotional side of a conversation poorly, an "empathy gap" that calls for child-safe design (Kurian, 2024). Sun et al.'s review (2026) shows emerging evidence that some adolescents turn to AI companions for emotional and mental-health conversations and warn that this could displace human support. In a nationally representative US survey of 13–17-year-olds, one in three adolescents who had used AI companions reported having chosen to discuss important or serious matters with those instead of a real person (Robb & Mann, 2025).

The OECD (2026a) adds that the concentration of GenAI development among a handful of corporate actors could compound these risks for the pluralism democratic societies depend on.

The UN Committee on the Rights of the Child has formally recognised these stakes. General Comment

No. 25 (UN Committee on the Rights of the Child, 2021) establishes that children's rights to privacy, non-discrimination, education, and protection apply fully in the digital environment, and that member states must adopt legislative, policy, and other measures to ensure AI systems respect these rights.

1.4.4. International reference frameworks for AI literacy

International organisations have published reference frameworks that define what AI literacy should cover in school education. UNESCO's AI competency frameworks set out 12 competencies for students, organised in four dimensions (a human-centred mindset, ethics of AI, AI techniques and applications, and AI system design) and three progression levels (understand, apply, create), and 15 competencies for teachers in five dimensions, including AI pedagogy and AI for professional learning (Miao & Shiohira, 2024; Miao & Cukurova, 2024). In June 2026, the European Commission and the OECD published the AI Literacy Framework (AILit) for primary and secondary education, which organises 19 competences into four domains, engaging with AI, creating with AI, managing AI, and shaping AI, describes three proficiency levels, and contributes to the PISA 2029 Media & AI Literacy assessment (European Commission & OECD, 2026; Fig. 2). The four domains overlap in practice, since a single conversation with a chatbot can involve engaging with, creating with and managing AI, and are best read as complementary lenses rather than separate activities. UNICEF's updated *Guidance on AI and children* identifies ten requirements for child-centred AI, grounded in the Convention on the Rights of the Child. One specifically calls for equipping children with the skills to navigate current and future AI developments (UNICEF Innocenti, 2025).

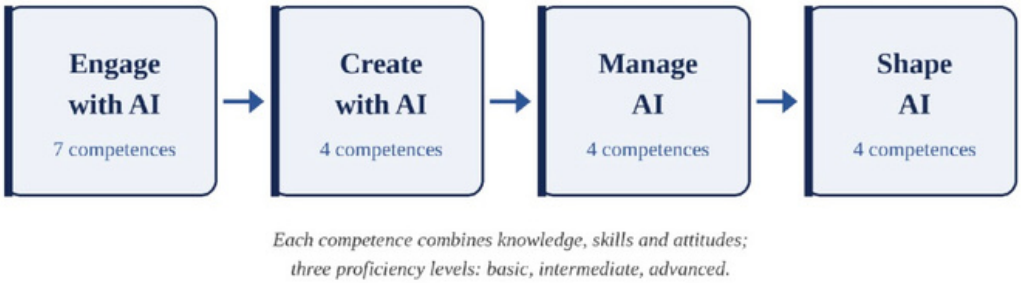


Fig. 2. The four domains of the AI Literacy (AILit) Framework for primary and secondary education and the number of competences in each (based on European Commission & OECD, 2026).

These frameworks define what children and teachers should learn, though they largely describe proficiency levels rather than what to teach at which age. Curricula then translate them into sequenced learning experiences, and most systems fall short in this translation and in classroom teaching. This report therefore addresses a complementary question: under which conditions these competences can be taught equitably and sustainably in school systems. Answering it also requires credible ways to measure what students know and can do in AI-mediated environments, to which we now turn.

1.5. Measuring Digital and AI Literacy

Designing effective DL and AI-Literacy policies requires robust assessment tools. However, existing digital-literacy instruments rely heavily on self-report questionnaires, have limited cross-cultural validation, and include few authentic performance assessments (Suri et al., 2025). AI-literacy instruments share these weaknesses and are rarely designed for children: of 16 validated scales identified in a systematic review, most target adults or university students, only three target secondary-school students. (Lintner, 2024). Additionally, none has been

tested for cross-cultural validity. There is therefore a need for age-appropriate assessments across different developmental stages, particularly for younger children who will not be covered by PISA's Media and AI Literacy assessment, which targets 15-year-olds.

DL assessments must evolve for the AI era (Sparks et al., 2024). While traditional competencies such as evaluating sources and recognising misinformation remain essential, GenAI introduces additional skills to capture such as refining prompts, verifying AI-generated information, and reasoning about bias and privacy. In the 2018 PISA, fewer than one in ten 15-year-olds across OECD countries were able to distinguish between fact and opinion on the basis of implicit cues about the content or source of information (OECD, 2021). As GenAI introduces new ways of generating and manipulating information, assessments need to capture both established MIL competencies and emerging AI-specific skills. Without appropriate measures, policymakers and educators will struggle to identify curricular deficits, target resources, and evaluate programme effectiveness, , a gap Canadian interviewees described as a persistent limitation (Box 3)

Box 3. The measurement gap seen from the ground: Canada

Canadian interviewees described a persistent "blind spot": there is no coordinated national assessment of youth or teacher digital or AI-literacy levels, despite pockets of high-quality practice. Because school boards choose their own learning-management and analytics tools, Canada lacks a unified picture of where young people are struggling. MediaSmarts' "research-to-resource" model, in which national surveys of youth digital habits inform classroom materials, professional development, and parent guides, shows how such evidence can be used; yet no coordinated survey currently measures what Canadian youth, teachers, or parents understand about algorithmic systems.

Elsewhere, Qatar has committed to the PISA 2029 MAIL assessment, and Egypt has signalled interest in aligning its emerging AI-literacy programmes with the MAIL domain.

→ *Full assessments: Appendix B (sections B.3 to B.5), Appendix C (section C.3) and Appendix D (section D.3).*

International bodies are beginning to address this limitation. UNESCO's 2023 Global Education Monitoring Report found that only about half of countries had defined the digital skills they expect learners to acquire, and recommended that governments establish a broader curriculum and assessment framework of digital competences (UNESCO, 2023b). A major upcoming milestone is the PISA 2029 Media and Artificial Intelligence Literacy (MAIL) assessment, a new domain of PISA 2029. MAIL is defined as "a set of competences required to engage effectively, ethically and responsibly with digital content, media platforms, and AI systems" (OECD, 2026a, p. 25). The draft framework identifies five competences: reflecting and acting ethically and responsibly, accessing and using, analysing and evaluating, participating and collaborating, and creating. It assesses competencies across five purposes: relationships, learning, entertainment, persuasion and citizenship (pp. 35–38). Alongside the test, a student questionnaire will measure students' opportunities to learn about AI (p. 46). The framework positions MAIL as complementary to the EC–OECD AI Literacy Framework, which focuses more specifically on AI systems (OECD, 2025a).

The Australian Council for Educational Research (ACER) has been appointed to lead the development and implementation of the PISA 2029 cycle, with a field trial in 2028 and the main survey in 2029 (The Educator, 2026). For policymakers, these developments signal a shift from asking "do students use technology?" to "can students think critically, ethically, and independently in AI-mediated environments?" The rest of this report therefore treats assessment not as an isolated technical exercise, but as a driver of curriculum design, teacher training, and investment strategy.

To achieve effective assessment, however, we must first understand what makes a DL programme effective in the first place, which we explore in depth in the following chapter.

2 Foundations of Effective Digital Literacy Programmes

This chapter examines the three foundational pillars that evidence identifies as necessary for effective DL programmes: (i) resources, (ii) content design and (iii) pedagogical strategies. Rather than treating these as isolated checklists, we analyse how they interact, where the evidence is strongest, and where gaps persist. This later informs the investment priorities developed in Chapter IV.

2.1. Resources

2.1.1. Teacher Training, Digital Competence and Time to Teach

Teacher digital competence is widely identified as a key enabler of students' DL. In a survey of 37 UNICEF country and regional offices, "lack of teachers' and trainers' capacity" was the most frequently cited barrier to DL for children (Nascimbeni & Vosloo, 2019). Literature reviews emphasise that teacher preparation programmes must integrate DL across both technical and pedagogical dimensions (Falloon, 2020; Pettersson, 2018). Teachers' self-efficacy is associated with their own digital competence and classroom ICT use (Hatlevik, 2017), and teacher characteristics, including self-efficacy and professional development, predict how far secondary teachers foster students' computer and information literacy (Lorenz et al., 2019).

Yet the challenge is as much about positioning as about training. Teacher resistance to digital technology has long been attributed to fear and increased workload (Nascimbeni & Vosloo, 2019), and three in four teachers who do not use AI cite a lack of knowledge and skills as a reason (OECD, 2025b)., GenAI adds a further reason for caution, as the 2025 PISA data and the expert consensus of learning scientists (Kendeou et al., 2026) both point to risks for learning from unguided student use. It is crucial to empower teachers with the understanding and competence required to effectively make decisions about how and when they can use GenAI in their teaching, if they choose to. This could mean using it as a collaborative tool, a "pedagogical coach" or administrative assistant that can help them with lesson preparation and grading workflows. Early evidence on such uses is encouraging. In the United States, 59% of K–12 educators used AI tools during the 2025–26 school year, and nearly two-thirds of them said it gave them more time for the parts of their work that matter most to them (Brenan, 2026). In England, a randomised trial in 68 secondary schools found that science teachers who used ChatGPT with a guide cut lesson-preparation time by 31%, without detectable difference in resource quality (Roy et al., 2024; see also Baker et al., 2026). In Estonia, a survey of 3,848 general-education teachers found that just over half (53.2%) had used AI tools in their work. They rated them most useful for making lessons more efficient, and least useful for individualising instruction (Granström & Oppi, 2025). Clear boundaries remain essential: AI can assist with content generation, but the relational, ethical and evaluative responsibilities of the teacher are non-delegable. Finland illustrates the potential value of sustained national support: it supports teachers' digital competence through national programmes (Finnish National Agency for Education, 2022), and its students scored above the international average in the IEA's International Computer and Information Literacy Study (ICILS; Fraillon, 2024). Teachers also gain confidence when they help design the curricula they teach. Training can also adopt a technoskeptical approach that encourages educators to critically evaluate whether, when, and how digital technologies support learning, rather than assuming that greater technological integration necessarily leads to better educational outcomes (Pleasants et al., 2023). France, Egypt and Qatar illustrate three different routes to building teacher capacity (Box 4).

Box 4. Three routes to teacher capacity: France, Egypt, and Qatar

France offered the Pix+ Édu certification to all teachers through a national email campaign in October 2023, sent to about 900,000 recipients; within about six weeks, just over 20,000 (about 2%) had completed its initial self-positioning module (Julien, 2023). Pix+ Édu remains voluntary: its self-assessment pathways are open to all teachers, while certification is reserved for those aiming at an advanced or expert level, and a dedicated Pix+ Édu AI pathway has since been added (Ministère de l'Éducation nationale, 2026c). However, French teachers are among the least likely to use AI: in the 2024 Teaching And Learning International Survey (TALIS), fewer than 20% of lower secondary teachers in France reported having used AI in their work in the previous 12 months, compared with 36% on average across OECD countries (OECD, 2025b).

Egypt has enrolled hundreds of thousands of teachers in digital-integration professional development, yet many report anxiety about technical failures during exams and revert to traditional pedagogy (Middle East Eye, 2019; Zahran, 2023). Its cascade "train-the-trainer" model, where a small group of trainers is trained centrally, then trains other trainers, who in turn train teachers locally often suffer from "transmission loss" in remote areas.

Qatar launched a professional licensing programme for teachers and school leaders in October 2025, which assesses educators against the National Professional Standards (Doha News, 2025). According to the Ministry of Education and Higher Education, teaching candidates are assessed separately on their computer skills and on their pedagogical use of technology. Digital competency is a core requirement for licence renewal, and teachers are supported with turnkey resources such as cybersecurity guidebooks and AI "Teacher Copilot" lesson-planning tools (MOEHE, 2026).

→ *Full assessments: Appendix A (section A.4), Appendix C (section C.4) and Appendix D (section D.3).*

Even well-trained teachers need dedicated time to teach digital and AI literacy whether through scheduled lessons or within multidisciplinary or inquiry-based projects, yet the requirement is often overlooked. When education systems develop a curriculum, train teachers and buy materials without setting aside time for digital literacy or deciding what it replaces, much of the investment is unlikely to reach the classroom. This risk is well illustrated by UNESCO's first global mapping of media and information literacy (MIL). Although 171 of 194 Member States reference MIL or related competences in their national frameworks, only 84 (43%) include MIL elements beyond technical digital skills in their school curricula, where it is rarely taught as a standalone subject and is usually embedded across several subjects. That is where policy choices can make a difference: 70% of the 17 countries with a standalone or hybrid MIL policy have integrated MIL into formal education (UNESCO, 2025). Allocating time therefore requires explicit decisions: whether digital and AI literacy should be taught as a separate subject or integrated into existing subjects and cross-curricular projects, and what should be reduced or removed from the curriculum to make room for it. The case-study countries illustrate both routes. Qatar teaches Computing and Information Technology as a separate subject from Grade 1 to Grade 12 (Box 7). Egypt integrates technology into multidisciplinary subjects in the early grades, then introduces ICT as a standalone subject in Grades 4–6 (Appendix C.3). France makes digital science and technology (SNT) compulsory in Grade 10, with one hour a week of AI teaching from September 2027 (Box 7). Cross-curricular integration does not remove the need for such decisions.

These decisions also affect teacher training and programme evaluation. Teachers' training needs will depend on how digital and AI literacy is integrated into the curriculum, while the time allocated to instruction will influence its effectiveness and how outcomes are measured. This is why the report recommends tracking instructional hours by educational stage (Table 4.3.1) and includes curriculum planning among its investment priorities.

2.1.2. Partnerships and Community Involvement

Schools alone cannot address all barriers to DL and AI literacy. Children's online experiences are shaped just as much by parents, peers, platforms, and local infrastructures as by classroom curricula (Ito et al., 2010; Livingstone & Helsper, 2008). Partnerships with NGOs, community organisations, and private-sector actors expand reach into underserved communities, bring specialised expertise on issues such as online safety, AI awareness, and mental health, and create feedback loops between national strategies and on-the-ground realities.

Caregivers, in particular, are best understood not as passive recipients but as strategic partners. Interviews with representatives of the case-study countries and related evidence suggest that "home–school alignment", where families understand and reinforce what children learn about safe, critical, and balanced technology use, is a precondition for both effective digital literacy and youth online safety. Where this alignment is absent, school-based gains are easily undone in the home environment. It is hardest to achieve where young people's access has outpaced that of the adults around them: in low-income countries, 15–24-year-olds are almost twice as likely as the rest of the population to use the internet, the largest generational gap of any income group (ITU, 2025; see Egypt in Box 5). This makes parent-facing workshops, accessible guidance, and two-way communication channels integral to any serious DL strategy and not optional add-ons.

Box 5. When home and school pull in different directions: Egypt, France, and Qatar

In **Egypt**, many parents who succeeded in the rote-learning exam system do not trust tablet-based learning or online exams, and a large private tutoring sector has strong incentives to keep families dependent on off-platform preparation (Moreno Olmedilla, 2022; Zahran, 2023). Egyptian interviewees described this cultural resistance as an obstacle to the development of digital literacy in the country.

In **France**, a "mediation fracture" means that the parents most in need of support are the least likely to access purely digital resources; organisations such as Emmaüs Connect provide on-the-ground digital mediation for families in disadvantaged neighbourhoods (Emmaüs Connect, 2025).

In **Qatar**, the Mada Center combines specialised video feedback and messaging-based reinforcement to engage parents of children with disabilities in their child's digital-literacy learning, a model of caregiver engagement that could be adapted well beyond the disability context.

→ *Full assessments: Appendix A (section A.5), Appendix C (section C.4) and Appendix D (section D.5).*

Surveys from Global Kids Online suggest that enabling rather than restrictive parental mediation is associated with children engaging in a wider range of online activities and having stronger digital skills (UNICEF, 2019). This supports combining school-based instruction with parent-facing components. Youth-serving NGOs and community centres can complement schools in reaching groups whose digital skills lag behind, such as rural and remote youth, Indigenous youth and newcomers, and programmes can be adapted to these audiences by tailoring examples to their geography, culture and recent incidents, including on topics such as cyberbullying and misinformation (Buchan et al., 2024). Chile's Enlaces programme (1992–2018) illustrates this approach: launched to connect schools and train teachers, it later opened school computer labs to families and communities as local telecentres, notably through the Red Enlaces Abierta a la Comunidad initiative (Centro de Innovación, n.d.; Claro & Jara, 2020).

2.1.3. Resource Access and Infrastructure

Lack of information and communication technologies (ICT) infrastructure is the second most frequently cited barrier to DL (Nascimbeni & Vosloo, 2019). Without access to devices, internet, and technical support, even well-designed programmes cannot reach all students. However, infrastructure has to be rolled out along with an implementation plan to be effective. Hardware distribution without accompanying teacher training, local-language content, and maintenance support has repeatedly failed to deliver lasting outcomes: a large randomised evaluation of One Laptop per Child in Peru, a programme intended to improve learning, found no effects on mathematics or language scores despite a tenfold increase in computer access. However, some gains in general cognitive skills were reported (Cristia et al., 2017). Overall, though, experimental reviews conclude that devices without accompanying pedagogy yield limited gains (Escueta et al., 2020). Chile's Enlaces access programme points the same way: after 25 years, Chilean students' digital skills remained at middle to low levels in international assessments, and inequalities tended to reproduce themselves in digital environments (Claro & Jara, 2020). Offline and hybrid solutions, such as solar-powered labs, and initiatives such as Giga, the UNICEF–ITU initiative to connect every school to the internet (Giga, n.d.), aim to extend reach to low-connectivity environments. India's DIKSHA platform (National Council of Educational Research and Training, 2017) offers another model: a national-scale digital infrastructure for knowledge-sharing that aggregates curriculum-aligned content across languages and states, demonstrating that large, diverse school systems can build their own national content platforms. The lesson from the evidence is clear: infrastructure is the baseline for DL but is insufficient on its own. Its value is unlocked only when embedded in coherent pedagogy and organisation, extending beyond the school building itself.

Box 6. Infrastructure is necessary but not sufficient: Qatar and France

Qatar has effectively eliminated the physical digital divide: fibre networks cover 100% of the population and 5G 99% (Qatar News Agency, 2026), every government school is connected to high-speed fibre, and the Ministry of Education and Higher Education supplies devices to state-school students. Its assessment concludes that these inputs are necessary but not sufficient for healthy outcomes: as access became near-universal, the binding constraint shifted to wellbeing, as students report around seven hours of daily internet use, levels comparable to those in other high-income countries but now reached with near-universal access (Chemnad et al., 2025; see Section 4.2).

France shows a different gap. National fibre coverage is high, but many schools face an in-building connectivity bottleneck: internal Wi-Fi and cabling cannot reliably support full-class connectivity, especially in older buildings. Primary schools lag behind, with ageing desktops and limited technical support, and rural municipalities struggle to maintain equipment.

→ *Full assessments: Appendix A (sections A.1 and A.4) and Appendix D (sections D.1 and D.4).*

Having established that the human and material resources are in place, it is important to better understand how the content should be designed.

2.2. Content Design

2.2.1. Theory-Based, Structured Curricula

Programmes built around a clear theory-based approach where the competencies to develop, their sequence and their learning mechanism are clearly defined, appear to be associated with better outcomes. In a meta-analysis of 10 studies (6,250 participants aged 8–18), C. Li et al. (2026) found a small overall effect of school-based DL interventions (SMD = 0.16), with larger effects for explicitly theory-driven interventions (a marginally significant difference). Effects also differ by outcome and by age. In a cluster-randomised trial of Google's Be Internet Awesome curriculum with 1,072 students in Grades 4–6, they gained knowledge of online-safety concepts and confidence in handling online problems, but their privacy behaviours, online harassment and help-seeking did not change (Jones et al., 2024). A larger quasi-experimental evaluation of Common Sense Media's curriculum, following 2,798 students in Grades 6–8 in 15 US middle schools, found knowledge gains in every grade, but behavioural change, such as limiting the data apps collect or blocking uncomfortable contacts, only among older students (Jones et al., 2026). Both teams call for clearer, measurable programme goals and suggest combining digital-citizenship content with social and emotional learning or bullying-prevention programmes for harder-to-change behaviours. Holistic frameworks such as DigComp 3.0 (Cosgrove & Cachia, 2025) offer structured guidance for curriculum development. By contrast, commentators note that programmes without a clear competency framework risk focusing only on technical skills without addressing critical thinking, ethics, or civic engagement (Tinmaz et al., 2023). They also risk teaching how to use specific tools rather than the concepts behind them, which leaves learners struggling to transfer their skills when the tools change. As UNESCO (2023b) cautions, technology in education should not become an end goal, but should be used to prioritise pedagogical goals and learner agency.

Spiral progression (Bruner, 1960), in which core concepts are introduced early in simple form and revisited at greater depth as students mature, is a widely adopted structuring principle, notably in computing curricula such as England's (National Centre for Computing Education, 2020). Applied to DL and AI literacy, it would mean revisiting source evaluation, data, online safety and AI at each stage, so that critical competences accumulate across the school years rather than being taught in one-off units.

Box 7. Spiral progression in national curricula: Qatar and France

Qatar's Computing and Information Technology (CIT) curriculum, introduced in 2018 and taught as a separate subject from Grade 1 to Grade 12, is explicitly organised as a spiral: students implement simple algorithms in a Logo environment, a programming language designed for children in which they give instructions to move an on-screen turtle, in the early primary grades, move to block-based programming from Grade 4, and progress to text-based programming from Grade 9, alongside data modelling and relational databases (MOEHE, 2018). AI is covered in Grades 11–12 under its Emerging and Applied Technologies sub-domain (MOEHE, 2018).

France specifies 16 competencies across five domains in its DigComp-aligned framework (Cadre de Référence de Compétences Numériques - CRCN), with eight levels of mastery, the first five of which span primary, lower- and upper-secondary education, so that the same competences are revisited at increasing depth; it certifies them through Pix at the end of lower- and upper-secondary education, and will add one hour a week of AI teaching to the compulsory Grade 10 in the general and technological track within its digital science and technology course (SNT) from September 2027 (Ministère de l'Éducation nationale, 2026a).

→ *Full assessments: Appendix A (section A.3) and Appendix D (section D.3).*

2.2.2. Cross-Curricular Integration

Cross-curricular integration is widely recommended as a way to help students apply skills in real-world contexts. For example, history classes could develop source evaluation skills through digital timelines, or mathematics lessons could incorporate coding and analytics. This is consistent with the Technological Pedagogical Content Knowledge (TPACK) model (Mishra & Koehler, 2006), which holds that technology is best taught in combination with subject content and pedagogy rather than as a separate skill. Teachers are best placed to make these connections when they help design the curriculum. Our country's interviews suggest that involving teachers in developing digital literacy curricula, rather than simply asking them to implement them, can strengthen their confidence in using digital tools. This involvement also helps teachers connect technology, pedagogy and subject knowledge, the three areas described in the TPACK model (Koehler & Mishra, 2005). Through their daily interactions with students, teachers can identify emerging challenges, assess which strategies work in practice, and bring students' perspectives into curriculum and policy development through consultations with education authorities. However, integration delivers these benefits only when it is purposefully implemented. Without dedicated time, assigned responsibility and assessment, teaching becomes inconsistent, progress is difficult to measure, and delivery becomes dependent on individual teachers' initiative rather than a sustainable school-wide approach (UNESCO, 2025). Finland illustrates how national coordination can help address these risks: ICT competence is one of the transversal competences of its national core curriculum, and national programmes support teachers' digital competence (Finnish National Agency for Education, 2014, 2022).

2.2.3. Holistic and Inclusive

Effective DL education is not limited to technical skills; it must also address ethical, social, and emotional competencies. Inclusive design matters since AI-based tools can widen digital-literacy gaps that are already uneven, including between gender (OECD, 2023b). In Canada, where Indigenous youth, newcomers and youth in rural and remote communities face digital-literacy gaps, Buchan et al. (2024) developed a programme and assessment tool covering digital fluency, privacy and safety, ethics and empathy, and consumer awareness. Designed for culturally diverse and remote communities, this initiative illustrates efforts to make digital-literacy education more inclusive, although its effectiveness still needs to be evaluated.

Inclusion is social, economic, cultural and linguistic, and its cultural and linguistic dimensions are becoming more salient as AI enters the classroom. Discussions with education ministry officials in Egypt and Qatar highlight this as well. Existing and largely Western AI models often lack the linguistic, cultural or religious nuance required in many non-Western contexts. Content that is merely translated, rather than genuinely localised, can therefore misrepresent local values, examples and norms (Box 8).

Box 8. The recurring cost of localisation: Qatar, Egypt, and Canada

In **Qatar**, high-quality technical and AI materials remain scarcer in Arabic than in English, leaving schools and teachers with a heavy translation-and-adaptation workload.

Egypt has opted for curated, nationally hosted content: the Egyptian Knowledge Bank (EKB) has signed contracts with international publishers such as Britannica and Discovery Education to host verified, culturally adapted content, so that digital literacy is built on high-quality information rather than unverified open-web sources.

In **Canada**, digital-safety and media-literacy resources are plentiful but not always localised to cultural and linguistic contexts such as Francophone minority communities and newcomer families.

→ *Full assessments: Appendix B (section B.1), Appendix C (section C.1) and Appendix D (section D.4).*

Therefore, truly holistic and inclusive content design should treat culturally and linguistically responsive resources as a first-order requirement. In practice, this means investing in national or openly licensed content. This material has to be adapted with local educators and communities involved in its design and review, and with bias-checking and re-contextualisation built in, to ensure that digital literacy is taught through materials children recognise as their own. Three levers can make this possible at scale: open licences, so that resources can be adapted rather than rebuilt; national or regional platforms that aggregate adapted content across languages; and regional pooling where several countries share a language (See Table 3.3 on Arabic-language resources and standards identified in Egypt and Qatar).

However, well-designed content can only reach students if it is delivered through effective pedagogical methods. Therefore, the final pillar concerns how DL is taught: the duration, age-appropriateness, and assessment strategies that determine whether programmes produce lasting change.

2.3. Pedagogical Strategies

2.3.1. Duration and Sustainability

Evidence on programme duration remains limited, though indirect evidence suggests that sustained programmes would be more likely to produce lasting effects. A meta-analysis of 10 school-based DL interventions found that DL programmes lasting more than two months showed significant effects while shorter ones did not, although duration was not a statistically significant moderator (C. Li et al., 2026). A meta-analysis of school-based interventions targeting reducing screen time and problematic technology use, points to a similar pattern: interventions lasting three months or more showed slightly larger reductions in screen time (Žmavc et al., 2025). Earlier meta-analytic evidence on media literacy interventions likewise found larger effects for programmes with more sessions (Jeong et al., 2012). Research on general learning shows that spacing practice over time, rather than concentrating it in a single session, improves long-term retention (Cepeda et al., 2006). Estonia's ProgeTiger multi-year programmes has supported schools in teaching programming and robotics since 2012, and illustrates the feasibility of a sustained alternative to one-off workshops. Its AI Leap extends this approach to AI: it began with teacher training in autumn 2025, reached almost all upper-secondary schools by early 2026, and its student application is designed to question learners rather than supply ready-made answers (e-Estonia, 2026; ERR News, 2025; Eurydice, 2025). The authors of the Common Sense evaluation add that a one-off programme may not be enough to counter the decline in self-reported digital-citizenship skills they observed as technology use rises from Grade 6 to Grade 8, and call for testing multi-year exposure (Jones et al., 2026). These findings support sustained programmes over one-off interventions, highlighting the need for longer funding cycles and evaluations of lasting effects (Box 9).

Box 9. The funding cliff: France and Canada

In **France**, dedicated digital investment flows mainly through time-limited national plans such as France 2030 rather than recurrent budget lines. Pilots such as the MIA Seconde AI remediation tool (Éduscol, 2026) risk falling off a "funding cliff" after 2027 if no recurrent budget line is created. Pix offers a contrasting model: free for the education sector, it also sells "Pix Pro" services to companies, a cross-subsidy that helps fund R&D alongside public funding.

In **Canada**, national NGOs such as Actua and MediaSmarts rely on time-limited federal grants such as CanCode. CanCode, which had been due to end in March 2026, was renewed in the 2026 Spring Economic Update (Actua, 2026); the renewal preserves the capacity built since CanCode's launch in 2017, but reliance on time-limited funding rounds continues to constrain long-term planning and impact evaluation.

→ *Full assessments: Appendix A (sections A.1, A.4 and A.6) and Appendix B (sections B.4 and B.5).*

2.3.2. Age-Tailored Approaches

A meta-analysis found that interventions delivered in primary school had a larger effect on digital literacy than those delivered in secondary school and above, although the difference between the two groups was only marginally significant (C. Li et al., 2026). Age also influences programme outcomes, as illustrated in the Common Sense evaluation. Grade 6 students improved their knowledge, while Grade 8 students showed stronger gains in behaviours and self-reported skills. The authors suggest that younger students may have fewer opportunities to apply these skills online, but that early education could lay the foundations for later behaviour (Jones et al., 2026). Curricula also need to follow children's cognitive development: children learn to use a tool long before they understand how it works, and concepts that require abstraction, such as how the internet connects computers, develop with age. In one study, understanding of the internet's technical and social complexity differed markedly between 9–10- and 11–12-year-olds, and depended less on internet experience than on age (Yan, 2005). Indeed, UNESCO's student framework suggests adapting intervention formats to students' developmental stages, from guided, hands-on activities in primary school to more autonomous, project-based learning in secondary school, such as creating digital content or campaigns. This reflects a progression from understanding to applying and creating. Finland's national digital competence framework operationalises this by setting progressive goals from early childhood education and care through pre-primary and basic education (Finnish National Agency for Education, 2022).

2.3.3. Assessment and Adaptation

Because assessment systems determine what schools ultimately reward, this makes them important to consider. They serve three different and complementary purposes: diagnostic assessment establishes what learners already know, formative assessment guides learning as it happens, and summative assessment certifies what has been learned. Curricula themselves also need to be evaluated, to check whether they deliver what they promise for the ages they target.

As Gašević and Yan (2026) note, GenAI can improve measurable performance and grades, without necessarily being associated with proportionate gains in underlying understanding. This creates a pedagogical mismatch when evaluation prioritises polished outputs over procedure, technique, or reasoning processes. Schools may end up overestimating learning progress while underestimating weaknesses in knowledge formation. New Zealand offers a useful example: since 2022, its e-asTTle platform has allowed teachers to build curriculum-aligned tests in reading, writing and mathematics using a large bank of calibrated questions. The platform then generates individualised feedback on each student's strengths and areas for improvement, to a level of detail that the OECD argues would be impossible to achieve without digital tools (OECD, 2023b). Yet, like most national digital assessments, it focuses on literacy and numeracy, whereas log-data analytics could reveal how students reason, not only whether they reach the right answer (OECD, 2023b). Biesta (2009) describes a growing tendency in education to move from measuring what we value, to valuing what we can measure. Because knowledge is easiest to test, qualification now dominates what systems report and reward. GenAI makes this limitation particularly important: when AI can produce high-quality answers to standardised tasks, the quality of students' work may reveal less about what they actually know, understand or can do independently. Digital and AI literacy assessment must therefore go beyond procedural tool use to capture critical thinking, durable memory, and metacognitive judgment. This implies complementing traditional tests with approaches that make students' reasoning visible, such as explaining and defending their choices, collaborative inquiry, and projects that require students to apply what they have learned. These approaches can also support socialisation and subjectification by creating opportunities for students to question one another, exercise independent judgement and take responsibility for their reasoning.

The critical takeaway from the evidence reviewed in this chapter is that effective DL programmes depend on how well their components fit together. This

necessitates well-trained and empowered teachers, adequate and maintained infrastructure, theory-based and cross-curricular content, sustained and age-appropriate pedagogy, and meaningful partnerships that extend learning beyond school walls. In the following chapter, we examine how four governments, France, Canada, Egypt and Qatar, are building AI literacy into their curricula, and the successes and challenges they face.

3 Case studies: France, Canada, Egypt, and Qatar

This chapter analyses four countries that illustrate different ways governments are building national DL strategies with a particular focus on AI literacy, youth safety, and wellbeing. The full case studies, presented in Appendices A–D, each follow the same structure: demographic and connectivity context, governance structure, curriculum, remaining challenges, priority NGO partners, and an outcome snapshot. This chapter summarises what they show.

3.1. Comparative Snapshot

The following table synthesises key structural indicators for the four case-study countries. Figures are approximate, drawn from official statistics and government announcements (2023–2026), and are not fully harmonised across countries.

Table 3.1. Key structural indicators for the four case-study countries

Indicator (latest available)	France	Canada	Egypt	Qatar
K12 students	≈ 11.6 million students in schools (primary and secondary) (Ministère de l'Éducation nationale, 2026b)	≈ 5.5 million students in public elementary and secondary schools, 2023/2024 (Statistics Canada, 2025a)	≈ 28.5 million students in pre-university education, 2023/24 (CAPMAS, 2024)	≈ 419,000 students in 649 public and private schools and kindergartens, 2026–27 (Tribune News Network, 2026)
Teachers (K12)	≈ 851,500 teachers (public and private under contract, 2025–26) (DEPP, 2026)	≈ 422,000 educators in public elementary and secondary schools (Statistics Canada, 2025a)	≈ 1.0–1.1 million teachers across pre-university levels (CAPMAS, 2024)	≈ 17,700 teachers in government schools and kindergartens, plus ≈ 25,400 teaching and administrative staff in private schools and kindergartens, 2026–27 (Tribune News Network, 2026)

Average student–teacher ratio	≈ 14:1 system-wide	≈ 13:1 in public K–12 (students per educator)	≈ 25:1 system-wide; ≈ 31:1 in primary schools (CAPMAS, 2024; Human Rights Watch, 2025)	≈ 10:1 system-wide
Approx. device–student access (school use)	Primary: ~7–18 terminals per 100 students (pre-primary to elementary); lower secondary: ~43; upper secondary: ~66 (general/technological) to ~95 (vocational) per 100 students (public sector, 2024–25), with strong territorial disparities (Charpentier, 2026)	At least 1 computer per student in schools in 2022, vs ≈ 0.9 on average across the OECD (2025)	≈ 84% of primary, ≈ 87% of lower-secondary and ≈ 83% of upper-secondary schools have computers for teaching, 2023 (Our World in Data, 2025)	Near 1:1 in government schools (MOEHE-provided devices); ~100% fibre and ~99% 5G population coverage (Qatar News Agency, 2026)
State education budget (approx., US$; share of GDP or of public spending)	≈ US$68 billion for the "Enseignement scolaire" mission excluding pensions (PLF 2026), ≈ 2.2% of GDP (Sénat, 2025)	≈ US$58 billion public school-board expenditure in 2022/23, ≈ 2.8% of GDP (Statistics Canada, 2025b)	≈ US$6 billion for the whole education sector in FY2024/25, ≈ 1.7% of GDP (Human Rights Watch, 2025)	≈ US$6.0 billion in 2026, ≈ 10% of total government expenditure (Qatar News Agency, 2025b); ≈ 3.2% of GDP for all levels of education in 2020, the latest comparable figure (World Bank, n.d.)

3.2. Four governance models

The four systems differ most in how responsibility is shared (Table 3.2), a dimension the OECD (2023a) identifies as shaping digital education. In France, the State defines standards, certification, and national guidance (the "brain"), while municipalities, départements, and régions fund devices and cabling (the "walls and wires"), a division that French officials describe as a *millefeuille* of governance. In Canada, education is an exclusively provincial responsibility, so the federal role is indirect and led by investment. Egypt follows a whole-of-government model, coordinated at cabinet level across the education and ICT ministries and other partners. In Qatar, coordination is structural, which allows the system to integrate GenAI into national guidelines quickly. The Qatari assessment draws a principle relevant to all four: as digital and AI literacy cuts across education, ICT, health, child protection, and culture, a clear coordinating authority, most often the education ministry, is decisive for coherent policy. Outside our case studies, Indonesia illustrates this as well. In March 2026, seven ministers, including those for primary and secondary education, higher education and communication and digital affairs, signed a joint decree regulating digital technology and AI in education from early childhood to university, coordinated by the Coordinating Ministry for Human Development and Culture (Lai, 2026).

Table 3.2. Governance models, strengths, gaps, and priority needs identified in the four assessments

Country and model	Strengths and recent measures	Remaining gaps	Priority needs identified
France Centralised, sovereign, and protection-oriented *Appendix A*	National competency framework aligned with DigComp (CRCN); mandatory Pix certification; compulsory SNT course in Grade 10, with weekly AI teaching from September 2027; GAR data-protection gateway; AI usage framework requiring teacher oversight, with student use from Grade 8	Territorial inequality in primary-school equipment; no dedicated timetable slot for DL before Grade 10, where it relies on cross-curricular integration; Pix certification compulsory but with no weight in national exams; teacher-training bottleneck; rising mental-health and attention concerns; France 2030 pilots exposed to a funding cliff after 2027	Investment in human infrastructure: teacher competence, parental mediation, and psychological support
Canada Decentralised, innovative, but fragmented *Appendix B*	Strong provincial initiatives (e.g., Québec's Digital Competency Framework, British Columbia's ADST curriculum); national NGOs (e.g., MediaSmarts, Actua) with broad reported reach and a shared "Use, Understand & Engage" framework; CanCode renewed in 2026	National AI-literacy approach new and still developing (AI strategy June 2026; National AI Literacy Initiative September 2026); no coordinated assessment of youth or teacher DL/AI literacy; data fragmentation across school boards; time-limited NGO funding and unmeasured depth and impact of NGO programmes; connectivity gaps in rural, northern, and Indigenous communities	Pan-Canadian AI-literacy programme for in-service and pre-service teachers, coordinated with provinces and adapted to their curricula and languages; Stable, multi-year NGO funding; shared indicators and communities of practice to compare outcomes; evaluation capacity
Egypt Rapid scale under demographic pressure Appendix C	Egyptian Knowledge Bank offering free access to a national digital repository; tablets for secondary students and teachers (about two million by 2021); Education 2.0 skills-based curriculum; Digital Citizenship and Internet Safety initiative with UNICEF and NCCM; resilience during COVID-19	Under-equipped primary and rural schools; teacher techno-anxiety and cascade-training "transmission loss"; parental distrust and a parallel tutoring market; nascent data governance	Parental and community DL/AI-literacy programmes; gamified content for primary grades; stronger teacher training, especially pre-service; algorithmic auditing and child-rights-based data governance

Qatar High-resource and centrally coordinated Appendix D	Near-universal connectivity and device provision; CIT curriculum taught as a separate subject from Grade 1 to Grade 12, with AI covered in Grades 11–12; structural inter-ministerial coordination; NCSA cybersecurity curriculum in 433 schools; teacher licensing tied to digital competency	Wellbeing gap linked to high screen exposure; "Arabic content lag"; standardising DL across plural curricula; formal curriculum cycles lagging AI development	Longitudinal research on high screen exposure; "wellbeing-by-design" standards; culturally grounded Arabic AI content; mentorship pathways for legacy educators

3.3.
Cross-country lessons

Across these four cases, a common pattern emerges when we examine what is working and what remains to be done. Effective DL education depends as much on human factors, such as teacher confidence, parental mediation and community trust, as on policy design.

While France has clear standards, there remain concerns around teacher uptake and implementation. Canada has a network of national NGOs with broad reported reach however there are challenges around country-wide coordination and national measurement of youth and teacher digital and AI literacy levels. Egypt has an impressive scale of initiatives however there remain considerations regarding technological adoption across generations and equipment gaps in primary and rural schools. Lastly, Qatar has abundant funding and infrastructure however there are issues around a digital-wellbeing paradox and needs DL and AI tools built on Arabic-language content and adapted to its cultural context.

If national, regional and local authorities provide the architecture and schools deliver the curriculum, who ensures that the child at the centre of both actually feels safe, capable, and critically engaged? Local authorities can play this role themselves, through libraries, youth services and community centres, but in all four countries much of it falls to NGOs and universities that provide a last-mile "human infrastructure" connecting public strategies, whether national or local, to children's lived experiences.

These organisations, along with community groups and research bodies, serve a function that neither ministries nor private companies can easily replicate. They ensure that digital and AI tools are embedded in caring relationships, and surface ground-truth evidence about what youth actually need. Table 3.3 lists the priority partners identified in each assessment.

Table 3.3. Priority NGO and public-interest partners identified in the four assessments

Organisation	Role	Opportunity identified in the assessment
France (Appendix A.5)		
Internet Sans Crainte / CLEMI	Awareness campaigns and pedagogical resources; training of teachers, librarians, and youth workers in media education	AI-focused media-literacy modules aligned with PISA 2029 MAIL and embedded in Pix and CRCN pathways; impact evaluations
e-Enfance / 3018	National helpline for cyber-harassment and online violence; "trusted flagger" under the EU Digital Services Act	AI-assisted triage of high-risk cases; structured referral pathways to local mental-health services
Emmaüs Connect and allied NGOs	Digital mediation for families in disadvantaged neighbourhoods	Family digital-literacy hubs in rural and peri-urban areas
Canada (Appendix B.5)		
MediaSmarts	Research-to-resource model: national surveys inform classroom, teacher, and parent resources	AI-literacy tutoring videos produced through its content platform; multi-year support; National AI-literacy baseline; resources co-created with Indigenous and Francophone organisations
Actua	National STEM and digital-skills delivery network for under-represented youth	Multi-year support for train-the-trainer AI-literacy programmes that extend beyond coding to the critical, ethical and civic dimensions of AI, and for longitudinal evaluation
Boys and Girls Clubs, YWCA/YMCA, Indigenous friendship centres	Physical presence in communities; reach youth disengaged from formal schooling	Delivery partners for specialist content
Egypt (Appendix C.5)		
Qatar Scouts & Guides Association (Arab region)	Peer education on online safety and digital citizenship, including in rural and low-income areas	AI-aware digital-safety tracks on manipulation and misinformation
Arab Council for Childhood and Development (ACCD)	Child rights, early childhood development, and policy advocacy	Longitudinal research on Arabic-speaking children; Arabic parent and caregiver toolkits

National Council for Childhood and Motherhood (NCCM)	Statutory child-rights body; helplines and a nationwide network of social workers	Training on AI risks; age-segmented resources for the Wa3i portal; anonymised data insights on online harms
Qatar (Appendix D.5)		
Qatar Scouts and Guides Association	Peer channel aligned with the national "human firewall" agenda	AI-aware safety tracks extended to families and lower-income communities
Mada Center	Assistive technology and accessible content	Standards for accessible, Arabic-language AI tools, shared regionally
Doha International Family Institute (DIFI)	Research recommending parental guidance and offline activities to counter adolescents' technology overuse	Longitudinal research on digital wellbeing; "wellbeing-by-design" benchmarks
Qatar Foundation, WISE, Education Above All	Education R&D, global convening, and equitable access	Arabic-native AI tools; independent evaluation; regional convening

Across all four countries, the effectiveness of these organisations is constrained by a common structural vulnerability: project-based funding cycles that prevent long-term planning, workforce stability, and rigorous impact evaluation. The organisations most trusted by children and families are often the least equipped to demonstrate their value in the metrics that governments, funders, and implementing partners require. Strengthening their capacity, coordination, and evaluation is therefore not a supplementary investment but a precondition for making public systems more humane, inclusive, and resilient. Funding for these organisations should therefore be multi-year and flexible, whatever its source, and should include their capacity to evaluate impact and to co-design interventions with youth, parents, and educators. Alliances such as iRAISE can act as multistakeholder convening platforms that connect ministries and NGOs, share tools, and generate comparative evidence on what works for children in AI-mediated environments.

4 Remaining Challenges, Pitfalls to Avoid and Recommendations

Drawing on the four case studies and the NGO mapping (Chapter III and Appendices A–D) as much as on our interviews with governments, experts and practitioners, this chapter synthesises the common obstacles and investment levers. It examines which investments lead to lasting improvements in children's digital experiences, and which simply introduce new technologies without improving outcomes.

The first answer is time: the investments that matter most take decades to pay off. Education is among the public investments with the highest and best-documented returns, about 9% per additional year of schooling on average across 139 countries (Psacharopoulos & Patrinos, 2018). However, these returns accrue over decades, whereas electoral mandates typically last four to five years, a mismatch political scientists identify as a structural obstacle to long-term policy investment (Jacobs, 2011).

Research on public spending in general, not only on education, shows the same pattern around elections. Across 67 democracies, the growth of public investment peaks around 28 months before an election and slows as the election approaches (Gupta et al., 2016). A study of 19 established OECD democracies found that elections tend to shift public spending towards expenses with immediate benefits for voters, such as wages, transfers and subsidies, and away from longer-term investments such as infrastructure (Katsimi & Sarantides, 2012). This constraint may be tighter for EU countries, as governments now stay in office for shorter periods and snap elections have become more frequent (Lehne, 2026), as illustrated by early elections in the Netherlands (2023, 2025), France (2024), Portugal (2024, 2025) and Germany (2025). Shorter and less predictable political horizons are likely to make it even harder to sustain investments whose returns take decades to materialise.

The time-limited funding rounds and funding cliffs described in Box 9 are consistent with this pattern, and several of the priorities that follow, including teacher-centred pathways, multi-year research funding and sustained support for delivery organisations, respond directly to this constraint.

4.1. Investing in teachers, their training, and in dedicated time for digital and AI literacy.

Teachers' digital competence shapes how far students' digital skills are fostered, yet in TALIS 2024, three in four lower-secondary teachers who did not use AI cited a lack of knowledge and skills as a reason (OECD, 2025b), a gap that rapid AI advances risk widening. Teacher training must therefore go hand in hand with curriculum planning: how digital and AI literacy are integrated into teaching, and the time allocated to them, determine which teachers need in-depth preparation and which need more targeted training.

Teacher training can be organised around a competence framework, as with France's Pix+ Édu, which now includes a dedicated AI pathway but has had low voluntary uptake, or tied to professional standards, as with Qatar's licensing programme (Box 4).

Evidence and country interviews point to four features to implement teacher training effectively:

1. **Teachers should be co-designers and allowed to keep their professional autonomy.** Top-down mandates without teacher input or incentives tend to produce compliance without genuine adoption, and teachers should be equipped to decide whether and how GenAI serves their teaching. South Korea's AI digital textbooks, which lost their official status within months amid technical failures and teacher and parent complaints, illustrate the risk (see Introduction; Choi, 2025; Kwon, 2025).

2. Training should be modular, ongoing and differentiated by role. What teachers need to know differs from what students need to learn, so teacher pathways should form a distinct programme that overlaps with, but does not duplicate, the student curriculum. Teachers who teach digital and AI literacy need in-depth preparation, whereas other subject teachers may need shorter, subject-specific training where GenAI is relevant to their discipline (see Priority 1 in the Executive Summary). Training should start in teacher education programmes at universities, so that all new teachers are prepared, and continue within paid working time.

3. Training must cover pedagogy integration, ethics and civic practice as well as technical skills. Current international guidance treats the ethics of AI, including risks such as bias, misinformation and data privacy, as a core teacher competence alongside technical knowledge (Miao & Cukurova, 2024). UNESCO's MIL curriculum for educators and learners now also addresses AI, and offers an existing foundation for such training (Grizzle et al., 2021). Training should also prepare teachers to consider how AI integrates into their pedagogical practices and how to facilitate collaborative civic digital practices (e.g., group verification workflows or community data interpretation), so that AI literacy strengthens collective agency as well as individual productivity. Lastly, it should also cover key concepts of learning sciences, so that teachers can judge when AI supports attention, memory, executive functions and metacognition, and when it replaces them (Houdé & Borst, 2018).

4. Training should reach rural teachers and any underserved areas. Neglecting rural areas for teacher training may exacerbate urban–rural divides that are a concern in France, Canada and Egypt.

All teachers can benefit from open or sovereign AI toolkits for their own work, such as lesson planning, administrative tasks and support for students with special educational needs, provided these are used safely. Qatar's "Teacher Copilot" lesson-planning tools and the sovereign AI assistant France is developing for its teachers are examples (Box 4; Appendix A.3).

AI literacy curriculum and micro-credentials (e.g., in bias detection, ethical integration and AI pedagogy) should clearly lay out technical content, functional knowledge, pedagogical integration, and ethics considerations for educators. These can be developed cross-functionally with non-profit organisations and teachers as co-designers and delivered through trusted partners such as teacher unions, universities, ISTE, UNESCO, and civil-society networks. Investments should emphasise students' safety, critical thinking, and wellbeing, and prioritise multilingual, culturally adapted teacher training in low-resource regions. Public authorities can embed DL and AI literacy in initial teacher education and professional standards; philanthropic and multilateral funders can provide catalytic support for design and scale; industry partners can contribute in-kind tools only where they meet open, privacy-preserving, and non-discriminatory criteria.

Table 4.1. *Recommendations by stakeholder*

Priority	Recommendations for Teachers and time to teach
Schools and teachers	Co-design curricula and AI tools; decide whether and how GenAI serves their teaching, keeping its relational, ethical and evaluative responsibilities; use AI toolkits safely for lesson planning and administration; facilitate collaborative civic practices (group verification, deliberative protocols)
Governments and ministries	Decide whether DL and AI literacy is a subject or integrated into existing ones, set hours per stage and state what it replaces; build a distinct, modular and evolving teacher programme differentiated by role and by age-groups taught; train pre-service and in-service teachers within paid working time; embed DL and AI literacy in initial teacher education and professional standards (e.g., through micro-credentials); prioritise multilingual, culturally adapted training; provide open or sovereign AI toolkits for teachers
Regulators	Require human oversight of AI-supported decisions on assessment and student placement; check that AI tools offered to teachers protect students' data and are backed by independent evidence of efficacy
AI Dev & EdTech Providers	Co-design tools with teachers and learning scientists; design age appropriate tools that guide them rather than supply answers, and that support rather than replace teachers' relational, ethical and evaluative roles; disclose whether learning content is AI-generated or designed by learning experts; never automate high-stakes decisions such as grading or student placement
Funders and partners	Accept tools only if open, privacy-preserving, and non-discriminatory; provide catalytic support for teacher training, including micro-credentials

4.2. Supporting children's wellbeing through healthy digital habits and protected time offline

The case studies surface a challenge that intensifies where investment succeeds. As access becomes near-universal, the binding constraint shifts from connecting children to protecting their wellbeing from technology saturation. Qatar's students do not necessarily spend more time online than peers in other high-income countries, but because access there is near-universal, the issue concerns almost every learner. In a survey of 377 students aged 11–17 in 16 Qatari schools, self-reported non-essential internet use averaged about 4.5 hours a day, on top of 2–3 hours of essential use (Chemnad et al., 2025). Other high-income countries show the same pattern of screen use competing with sleep, movement, outdoor play and unstructured social interaction. In the United States, a typical teenager spends about eight hours a day on screen media specifically for entertainment

(Common Sense Media, 2026). A mature digital-literacy strategy should therefore make understanding how technology use affects health and wellbeing, including emotional and cognitive dimensions, an explicit design goal, alongside technical skills (Cosgrove & Cachia, 2025).

Encouragingly, several promising counterweights are low-cost and school-implementable. Child-development research points to three practical levers: (i) structured outdoor and green time, (ii) sleep supportive practices, and (iii) universal school-based social and emotional learning (SEL) programmes. First, structured outdoor and green time, such as protected daily time outside and outdoor teaching, show evidence of improving positive affect, physical activity, and social relationships, although the evidence base is small and findings on stress are mixed (Ly & Vella-Brodrick, 2024). Short nature breaks have also been linked to better attention (Vella-Brodrick & Gilowska, 2022). Second, schools can support healthy sleep practices, by teaching sleep hygiene, discouraging late-night device use, and aligning homework and notification norms with healthy routines. This is particularly important because sleep plays a critical role in learning, memory consolidation, emotional regulation and mood, while cohort studies consistently associate greater screen time with shorter sleep duration (He et al., 2025). Third, schools can strengthen students' social and emotional skills through universal SEL programmes that explicitly build core competencies such as self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. A meta-analysis of 424 studies across 53 countries, involving more than 575,000 students from kindergarten to Grade 12, found that such programmes produce small but consistent improvements across a wide range of outcomes, from social-emotional skills, attitudes, behaviour to peer relationships, school climate, and academic achievement (Cipriano et al., 2023). Explicit lessons in recognising how online environments shape attention and emotion, naming feelings, and practising self-regulation strategies (including planned screen-free periods), could help children develop agency over technology rather than being steered by it.

Qatar's own institutions illustrate how this can be operationalised. Qatar's National Physical Activity Guidelines recommend under two hours of recreational screen time per day for those aged 5–17, a threshold met by fewer than half of young people (Aspetar Orthopaedic and Sports Medicine Hospital, 2018). Additionally, some schools, including Qatar Foundation's pre-university schools, have banned smartphones (Al-Khalifa, 2025), and the Doha International Family Institute has published recommendations for parental guidance and offline social activities to counter adolescents' technology overuse (DIFI, 2024). France and Canada illustrate a complementary, regulatory route, through national school phone bans and legislation on children's access to social media (Box 10).

Box 10. Regulating exposure: France and Canada

In **France**, policy has shifted towards cognitive protection since the Enfants et Écrans commission report (Commission sur l'impact des écrans sur les enfants, 2024): smartphone bans, already enforced in primary and lower-secondary schools since 2018, were extended to upper-secondary schools from September 2026 (Gouvernement français, 2026). However, the same law's ban on social media for under-15s was struck down by the Constitutional Council (Conseil constitutionnel, 2026).

In **Canada**, the proposed Safe Social Media Act (Bill C-34), introduced in June 2026, would create a Digital Safety Commission, require regulated social media services to bar account ownership by children under 16 (subject to an exemption process), and impose safety duties on AI chatbot services (Canadian Heritage, 2026). The bill was still before the House of Commons in October 2026; provincial cellphone bans reflect the same governance pressures.

→ *Full assessments: Appendix A (section A.4) and Appendix B (section B.2).*

Three pitfalls should be avoided. First, placing responsibility for wellbeing on children rather than prioritising safety by design and regulation. As with tobacco prevention, focusing on individual behaviour ("just use less technology") overlooks the responsibility of companies and regulators to reduce risks at the source. The second would be to only rely on bans and sanctions without also teaching children the digital skills they need to navigate technology safely and responsibly. The third is to add wellbeing lessons without protecting the time and outdoor space children need to put them into practice.

Funders and governments can support "wellbeing-by-design" standards for schools and EdTech, which regulators can adopt; fund outdoor, nature-based, and play infrastructure alongside digital infrastructure; resource teachers with educational material for students on sleep, attention, and emotion regulation; and support longitudinal research on the cognitive and wellbeing effects of high screen exposure.

Table 4.2. Recommendations by stakeholder

Priority	Recommendations for wellbeing
Schools and teachers	Protect daily outdoor time; teach sleep hygiene, emotional awareness, and self-regulation; plan screen-free periods
Governments and ministries	Fund outdoor, nature-based and play infrastructure alongside digital infrastructure; build healthy digital habits and align school and home measures
Regulators	Adopt wellbeing-by-design standards for schools and EdTech
AI Dev & EdTech Providers	Apply wellbeing-by-design: avoid engagement-maximising features, false claims of humanhood and simulated intimacy for minors; connect young users to human support in a crisis; enforce age-appropriate access
Funders and partners	Back longitudinal research on high screen exposure; provide teachers with educational resources and training on sleep, attention, and emotion regulation

4.3.
Strengthening measurement and longitudinal research on DL/AI Literacy

Few systems track how DL and AI literacy programmes are implemented or their long-term outcomes, and existing assessment instruments tend to emphasise technical skills over critical and ethical dimensions (Sparks et al., 2024; Suri et al., 2025). This measurement deficit is not merely an academic concern; without robust evidence on what works, governments risk investing in programmes that are popular but ineffective, or defunding ones that are effective but poorly documented.

Some countries, such as Estonia through its ProgeTiger programme, have built long-running national programmes that could support longitudinal follow-up of student outcomes. Emerging global assessments, including PISA 2029 MAIL, will provide complementary benchmarks, but they depend on countries having robust national data and classroom practices in place. Some AI providers have begun developing their own learning-outcome measures (e.g., OpenAI, 2026). Such efforts can add data, but evidence produced

or controlled by the provider of the product being evaluated cannot replace independent and publicly governed evaluation. Independent academic evaluation, even when commissioned by the provider, is a first step in that direction. Google's Be Internet Awesome curriculum was evaluated by university researchers in a randomised trial and results were mixed (Jones et al., 2024). Regulators can enable this by requiring providers of AI services widely used by children to give researchers access to relevant data, as the EU Digital Services Act does for very large platforms (European Parliament & Council of the European Union, 2022, Art. 40).

A practical corollary is that effective systems institutionalise continuous feedback from the people that DL is meant to serve. Regular structured surveys of caregivers, teachers, and students, rather than one-off evaluations, allow ministries and partners to detect emerging risks early, adapt content quickly, and keep programmes aligned with classroom realities. This feedback should also track implementation barriers and whether programmes are delivered as intended, since outcomes alone cannot reveal whether a programme is ineffective or poorly implemented. This agility matters because one of the most consistent challenges across contexts is that technology, especially GenAI, evolves faster than learning content and digital competencies of teachers, students, and caregivers. Common pitfalls include ignoring cultural context in assessment design, by assuming that Western frameworks apply universally, and failing to adapt programmes to student and educator feedback or to emerging risks such as AI misinformation.

Closing the measurement deficit should be a shared priority for public research funders, philanthropic investors, and multilateral bodies. Priority investments include longitudinal studies that follow DL and AI-literacy outcomes over 5–10 years across diverse national contexts, measuring cognitive development, emotional dimensions, wellbeing and safety, together with evaluations of the curricula, teaching and assessments themselves. This ensures that they cover what they claim, suit the ages they target and measure what matters.
Funders can support public-sector and NGO-led measurement consortia, co-finance independent evaluations applying learning-outcomes frameworks in diverse K–12 settings, and require child-rights and data-protection safeguards as conditions of support. In parallel, investments should help ministries, NGOs, and schools align AI-literacy curricula and classroom activities with MAIL competencies while building teacher capacity to teach and assess these skills.

To make these priorities operational, Table 4.3.1 proposes a minimum set of indicators that ministries could track over time. It combines quantitative measures of learning, implementation, equity and wellbeing with qualitative measures of how students, teachers and parents experience AI in schools. All indicators should be broken down by gender, socioeconomic background, and location so that equity can be monitored.

Table 4.3.1 A minimum indicator set for DL and AI literacy systems

Domain	Indicator	Possible source	Frequency
Student AI literacy	Share of students at each AILit proficiency level (basic, intermediate, advanced), by domain, distinguishing technical, functional and ethical knowledge	National assessment aligned with the AILit Framework; PISA 2029 MAIL for 15-year-olds	Every 3 years
Critical engagement	Ability to evaluate the credibility of digital and AI-generated content	Assessment tasks; PISA 2029 MAIL	Every 3 years

Cognitive Independence	Performance on comparable tasks completed with and without AI support; ability to explain and check AI-assisted work	Paired tasks in national assessments; oral or process-based assessment (Section 2.3.3)	Every 3 years
Agency and Empowerment	Share of students who report using digital and AI tools to create, solve problems or take part in community or civic activities, and who feel able to decide when and how to use AI	Student survey; PISA 2029 MAIL (creating, participating and collaborating)	Every 3 years
Teacher readiness	Share of teachers who report having the technical, pedagogical and ethical knowledge to incorporate and discuss AI when pedagogically appropriate.	National teacher survey; training records	Annual
Implementation	Hours of DL and AI-literacy instruction per stage; share of programmes lasting more than two months (see Section 2.3.1)	Curriculum and programme monitoring	Annual
Equity of access	Device and connectivity ratios by stage and territory (primary vs secondary; rural vs urban)	School administrative data	Annual
Home–school alignment	Share of parents who report receiving guidance from the school on children's digital and AI use	Parent survey	Annual
Wellbeing	Recreational screen time, sleep, physical activity, sense of belonging and students' self-reported ability to disconnect when they choose	School-based health and wellbeing surveys	Every 2 years
Online safety	Reported online harms, by type and age group	Anonymised helpline and platform-reporting data	Continuous
Experience of AI in school	How students, teachers and parents describe their use of AI and its effects on learning, relationships and wellbeing	Focus groups and qualitative survey items in a sample of schools	Every 2 years

Impact of AI on learning	Comparison of student learning outcomes by student AI literacy level, critical engagement, teacher readiness, and implementation time.	Triangulation of national assessments, teacher surveys, and curriculum monitoring.	Every 3 years

Table 4.3.2. Recommendations by stakeholder

Priority	Recommendations for Research and assessment
Schools and teachers	Build capacity to teach and assess AI-literacy skills; use formats that make reasoning visible (oral defences, team inquiry, process rubrics); feed classroom evidence back to ministries
Governments and ministries	Align curricula with MAIL competences; survey caregivers, teachers, and students regularly; track indicators set in Table 4.3.1, broken down by gender, socioeconomic background and location; Fund 5–10-year longitudinal studies and independent evaluations
Regulators	Protect children's data in assessment and research; expect providers to cooperate with independent evaluation of privacy and efficacy (Box 12)
AI Dev & EdTech Providers	Cooperate with independent longitudinal evaluation; submit products to independent third-party audits of their behaviour with children, across repeated interactions and product updates, rather than relying on self-reporting; give vetted researchers access to relevant data; back efficacy claims with independent evidence
Funders and partners	Fund 5–10-year longitudinal studies and independent evaluations; require child-rights and data-protection safeguards, and independent evidence of efficacy, as conditions of support

4.4. The Last Mile: Families, Communities and NGOs

Section 3.3 discussed that NGOs and community organisations often provide the relational last mile between national strategies and children's lived experience. This section turns to the families and communities they serve.

As Section 2.1.2 argued, school-based gains are easily undone without home–school alignment. Denmark's Safer Internet Centre, whose guide for parents and carers of 7–12-year-olds covers screen time, cyberbullying, privacy, and hidden advertising (Better Internet for Kids, 2022), and Australia's eSafety Commissioner, which provides translated family guides and First Nations resources in Aboriginal and Torres Strait Islander languages (eSafety Commissioner, 2022), illustrate how such resources can reach families in their own languages. Chile's BiblioRedes programme, which offers free internet access and digital-literacy training through the national network of public libraries, represents a structural model for extending reach (Peroni et al., 2016).

A common pitfall is creating resources in only dominant languages, which excludes non-native speakers.

Funders should treat family and community engagement as core infrastructure. Investments could include accessible "Family Digital Literacy" resources (e.g., video tutorials, multilingual guides, radio and community workshops) developed with UNICEF, UNESCO and local civil-society partners; in-person programmes with organisations such as everyone.AI to help parents and caregivers understand the risks and opportunities of AI for children; community hubs in public spaces such as libraries, youth centres and community organisations to extend reach beyond formal schooling. These investments should build on existing resources rather than duplicate them. UNESCO's family guide, developed with CLEMI and Réseau Canopé, gives parents practical guidance on screen time, social media and AI, and cyberviolence, without expecting them to be experts in digital technology (UNESCO & Réseau Canopé/CLEMI, 2026). As the guide is available in English, French and Spanish, funders can add value by supporting its adaptation into other languages and local contexts. Local community organisations, broadcasters, and NGOs are best placed to deliver trusted, culturally grounded family engagement.

Table 4.4. Recommendations by stakeholder

Priority	Recommendations for the last mile: families, communities and NGOs
Schools and teachers	Offer parent workshops, accessible guidance, and two-way communication with families; work with local NGOs and community services
Governments and ministries	Treat family engagement as core infrastructure; produce resources in all locally relevant languages; make funding for delivery organisations multi-year and recurrent, whether national, regional or local
Regulators	Ensure that children's AI products give families clear information on data use and evidence in support of efficacy claims
AI Dev & EdTech Providers	Give families clear, accessible information on data use, safety features and the evidence behind efficacy claims; localise content genuinely rather than merely translate it
Funders and partners	Provide multi-year, flexible funding that reaches delivery organisations; build their capacity to evaluate impact and co-design with youth, parents and educators; fund family DL resources and community hubs with trusted local partners

4.5. The Last Mile: Families, Communities and NGOs

Fragmented digital systems create data silos, inefficiencies, and inequities. The OECD (2023b) finds that interoperability between learning management systems and student information systems remains limited in many countries, which constrains real-time feedback and personalised learning. Furthermore, UNESCO (2023b) reports that one in four primary schools globally still lacks electricity, and that only 40% of primary schools are connected to the internet.

Effective models exist within this report's case studies: France's GAR enforces interoperability standards such as the Learning Tool Interoperability (LTI) and the Security Assertion Markup Language (SAML) while pseudonymising students' data (Box 2), and Egypt's EKB uses single sign-on and LTI standards to integrate third-party tools (Appendix C.1).

Pitfalls to avoid include operating without a central coordinating body and over-reliance on the private sector without public oversight.

Funders should support system-wide interoperability rather than platform-specific adoption. Priorities include: promoting open standards (such as 1EdTech) across education platforms; supporting local and open-source platforms and safeguards where possible; financing privacy-preserving national data repositories and offline/hybrid delivery infrastructure in high-need contexts, with particular attention to Africa and Latin America; and ensuring that public oversight accompanies private-sector participation so that infrastructure investment does not create vendor lock-in or normalise pervasive surveillance of children.

Table 4.5. Recommendations by stakeholder

Priority	Recommendations for Interoperability and infrastructure
Schools and teachers	Prefer tools that meet the requirements in Box 12; report technical and usability problems to the coordinating body
Governments and ministries	Designate a coordinating body; promote open standards and favour local and open-source platforms where possible
Regulators	Ensure public oversight of private-sector participation; prevent vendor lock-in and pervasive surveillance of children
AI Dev & EdTech Providers	Adopt open standards and avoid lock-in; protect students' data by design, without using it to train models or build commercial profiles
Funders and partners	Support system-wide interoperability rather than platform-specific adoption; finance privacy-preserving data repositories

4.6. Flagship project: A Universal Learning & AI Literacy Toolkit

Existing AI-literacy offerings are fragmented, from short MOOCs to stand-alone courses such as Elements of AI (Finnish Center for Artificial Intelligence, 2023), and vary widely in content, from technical skills to ethics. None provides a shared, certifying benchmark recognised by education systems and public administrations that could be portable into employment. A large-scale programme of AI fundamentals, built from free, openly licensed and locally adaptable materials and leading to a common public certification. This could give learners of all ages a shared baseline of skills and critical understanding. Its primary purpose is civic: preparing people to live in a world shaped by AI. Although it extends beyond the K–12 scope of this report, the proposal is included because teachers and parents are among its target learners, and school-age learners would form part of the certified population.

Public certifications such as France's Pix, which is free for the education sector and assessed against a national competence framework (Box 11), suggest that structured programmes with clear certification outcomes can support participation, employer recognition, and policy alignment, particularly when they are vendor-neutral and embedded in existing education and training systems. The objective would be to train and certify students, teachers, professionals, and citizens over a few years, with content spanning practical use, critical thinking, ethics, and rights. To remain adaptable to local realities, the certification would assess a common core of competences, while the openly licensed learning materials and their delivery would be adapted by local partners to their languages, curricula and contexts.

Pitfalls to avoid include creating a de facto proprietary standard dominated by a single company, rather than a vendor-neutral certification aligned with public-interest frameworks (e.g., UNESCO's GenAI guidance and the OECD's PISA 2029 MAIL framework; OECD, 2025a; UNESCO, 2023a); designing content that focuses only on tool use (e.g., "prompt engineering") without addressing cognitive offloading, bias, democratic impacts orchild rights; charging learners for the exam, which would turn the certificate into a new source of inequality; and designing learning materials centrally, without room for local adaptation.

Box 11. A certification channel to build on: France's Pix

France already has a national certification channel for digital competence: Pix, assessed against the CRCN (Box 7), is mandatory at the end of lower- and upper-secondary education and free for the education sector, partly financed by paid services for employers (Box 9). Its teacher version, Pix+ Édu, also shows the limits of voluntary certification (Box 4). Both points are relevant to the design of an international AI Fundamentals Programme that could be piloted in France.

→ *Full assessment: Appendix A (sections A.3, A.4 and A.6).*

The flagship recommendation is to support the co-design and launch of an international AI Fundamentals Programme as a multi-stakeholder, public-interest consortium and avoid a single-vendor initiative. In a first pilot country (e.g., France), this could combine: catalytic grant funding from philanthropic or multilateral sources; institutional leadership from relevant ministries (Education, Higher Education, Labour, Economy) to embed certification in school, university, and adult-training pathways; accredited pedagogical and delivery partners (e.g., national training bodies or accredited online-learning providers) to develop a modular curriculum with adaptive pathways, whose length would be set and tested during the pilot, together with local partners who adapt the learning materials to their languages and contexts; in-kind technology support from industry only where it meets interoperability, privacy, and vendor-neutrality requirements; and independent governance and evaluation through alliances such as iRAISE, the Paris Peace Forum, and everyone.AI to ensure alignment with children's rights, ethical AI principles, and rigorous impact measurement.

Table 4.6. Recommendations by stakeholder

Priority	Recommendations for Universal Learning & AI Literacy Toolkit
Schools and teachers	Integrate the programme and its certification into existing school pathways; encourage teachers to take it themselves
Governments and ministries	Lead a public-interest consortium; keep materials and certification free for learners; allow local adaptation of materials around a common certified core; embed certification in school, university and adult-training pathways

Regulators	Keep materials and certification vendor-neutral and aligned with public-interest frameworks (e.g., UNESCO guidance, MAIL)
AI Dev & EdTech Providers	Contribute in-kind support only under interoperability, privacy and vendor-neutrality conditions; keep products and branding out of programme and certification content
Funders and partners	Provide catalytic grant funding; accept industry in-kind support only if interoperability, privacy, and vendor-neutrality requirements are met

Although this report is addressed primarily to governments, schools and regulators, many of the recommendations in Sections 4.1 to 4.6 also set conditions for the companies that supply tools to education systems. Box 12 brings them together.

Box 12. What this means for EdTech and AI providers

Taken together, the report's recommendations amount to nine requirements for EdTech and AI providers:

Human oversight. AI can assist with content generation, but the relational, ethical, and evaluative responsibilities of teachers remain non-delegable; France's framework prohibits fully automated high-stakes decisions such as grading and orientation (Section 2.1.1; Appendix A.3).

Co-design with educators. Tools designed with teachers and learning science experts, or at least shaped through structured consultation with them, before and during deployment. Top-down rollouts without teacher and expert input tend to produce compliance rather than adoption (Section 2.2.2; Section 4.1).

Data protection by design. Privacy-preserving architectures that do not normalise pervasive surveillance of children, as with France's GAR, which pseudonymises student data before sharing it with EdTech providers (Box 2).

Open standards and vendor neutrality. Interoperability through open standards, public oversight of private-sector participation, and in-kind contributions accepted only where they meet open, privacy-preserving, and non-discriminatory criteria (Sections 4.1, 4.5 and 4.6).

Wellbeing by design. "Wellbeing-by-design" standards for schools and EdTech, so that the capacity to disconnect becomes a learning outcome (Section 4.2).

Age-appropriate access. Several systems separate learning about AI from students' direct use of GenAI and set an age threshold for the latter, typically between 12 and 14 (Introduction).

Genuine localisation. Content adapted to local languages, curricula, and cultural contexts rather than merely translated (Section 2.2.3; Box 8).

Regulatory compliance. The EU AI Act has prohibited AI systems that infer emotions in educational institutions since February 2025 (except for medical or safety reasons), and classifies AI used for admission, assessment of learning outcomes, placement, and exam proctoring as high-risk, requiring providers to complete a conformity assessment before market placement; under the 2026 AI Omnibus (European Parliament & Council of the European Union, 2026), these high-risk obligations apply from 2 December 2027 (Appendix A.1).

Independent evaluation. Cooperation with universities and governments on longitudinal evaluation of learning and wellbeing outcomes, not only short-term performance (Section 4.3).

→ *See also Chapter II and Appendices A and D.*

5 Limitations

The report has three main limitations: evidence and causality, participants, and generalisability of findings. First, for evidence and causality, much of the quantitative evidence is correlational and draws from cross-sectional studies and meta-analyses of associations. Those studies show that digital literacy and outcomes tend to move together, such as for achievement, online safety, and wellbeing, but do not establish causation. Reverse causation and confounding factors (e.g., socioeconomic status, school quality, home environment) are plausible and rarely fully controlled. The consistency and direction of the evidence are nonetheless sufficient to guide investment, and this is precisely why Chapter IV calls for the longitudinal and quasi-experimental research needed to test these relationships directly. Second, children, adolescents and parents were not consulted directly, so their perspectives entered only through the officials, NGOs and experts we consulted and through the survey literature. General Comment No. 25 asks States to involve children and give due weight to their views when developing policies on the digital environment (UN Committee on the Rights of the Child, 2021), and future editions should include them. Third, the four countries cover different regions and governance models but do not allow findings to be generalised as the report does not include low-income countries, and no Asian or South American education system, so findings may transfer less readily to systems with very different resources or institutions.

CONCLUSION: HUMAN-CENTRED AI LITERACY IN SCHOOLS

By adopting a mixed-methods approach, this report integrates insights from scientific research, policy documents, interviews and consultations with government officials, NGOs and experts, and in-depth case studies to tackle how DL and AI literacy can be holistically approached. Across the report, three converging insights emerge.

First, DL and AI literacy need to be considered as core education infrastructure. If countries treat them as peripheral or purely technical, they risk leaving a generation of young people dependent on opaque systems they cannot question or fully understand, at the expense of cognitive autonomy, mental health, and democratic participation.

Second, infrastructure and content alone are not sufficient. The four case studies (France, Canada, Egypt, and Qatar) suggest that outcomes depend as much on human factors as on policy design. These factors encompass teacher confidence, parental mediation, youth trust, and the ability of NGOs and communities to translate abstract frameworks into safe, meaningful practice.

Third, GenAI makes the relational dimension of teaching even more important. Students can now find information and have it explained to them at any time, but they still need adults who help them focus, persevere and judge what they are told. Because AI can rapidly generate plausible answers and emotional simulations, the distinctive value of teachers, caregivers, and mentors lies in modelling critical thinking, ethical judgement, and emotionally attuned support, so that young people become subjects who reason for themselves and answer for their actions. Effective DL programmes must therefore be designed to teach children how to use digital tools

while protecting the non-digital experiences that remain essential to their development.

For governments and funders, the most impactful investments will therefore focus on strengthening the people and relationships around young people, rather than funding technology in isolation. The six priorities set out in the Executive Summary translate this into concrete commitments. While our empirical focus has been on schools and K–12 learners, the case studies show that caregivers and other adults remain central to children's digital trajectories. As AI evolves rapidly, adults' own DL and AI literacy, especially in domains such as digital citizenship, data rights, and mental health, are essential if they are to guide, protect, and co-learn with children. Extending the comparative country assessments presented in Appendices A–D to other education systems would strengthen the evidence on which these investments rest.

Looking ahead, governments and education partners should therefore see investments in youth-centred DL/AI literacy and adult/lifelong DL as mutually reinforcing. Empowering teachers, parents, and community leaders to understand and question AI systems is a precondition for creating learning environments where children can experiment, make mistakes, and build robust critical-thinking skills. The purpose of education is not to produce a predetermined type of individual, and its success can never be guaranteed; it can only be made more likely by the people and institutions that surround each child (Biesta, 2013). Every intervention must be anchored in the principle that digital tools must augment human relationships so that education systems can become AI-ready in ways that are resilient, intergenerational, and aligned with children's rights. A strategic objective is to ensure that humans always lead the design of AI systems, so that these systems are embedded in accountable community processes that sustain shared reality, collective problem solving, and democratic agency.

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APPENDIX A. FRANCE: CENTRALISED, SOVEREIGN, AND PROTECTION-ORIENTED

A.1. Demographic and connectivity context

France's pre-university system is large and well-established, serving roughly 11.6 million students in primary and secondary schools with about 851,500 teachers (2025–26), for a system-wide student-teacher ratio of around 14:1 (DEPP, 2026; Ministère de l'Éducation nationale, 2026b). State funding is substantial in absolute terms, with roughly US$68 billion devoted to school education (excluding pensions, about 2.2% of GDP; Sénat, 2025), although dedicated digital investment flows mainly through time-limited national plans such as France 2030 and the Territoires Numériques Éducatifs rather than recurrent budget lines. Pupil numbers are projected to fall by about 670,000 between 2025 and 2029 (some 455,000 in primary and 212,000 in secondary) and by 1.7 million by 2035 (Sénat, 2025; Ministère de l'Éducation nationale, 2026b). This demographic decline makes digital continuity and hybrid provision increasingly strategic for maintaining equity in depopulating rural areas.

France's infrastructure is relatively mature but uneven. Upper-secondary schools are the best equipped, with about 66 (general and technological) to 95 (vocational) terminals per 100 pupils in the public sector in 2024–25, compared with about 43 in lower-secondary and 18 in elementary schools (Charpentier, 2026); primary schools lag significantly behind, with ageing desktops and limited technical support. National fibre coverage is high, but many schools face an in-building connectivity bottleneck: internal Wi-Fi and cabling cannot reliably support full-class connectivity, especially in older buildings. The GAR (Gestionnaire d'Accès aux Ressources) functions as a sovereign data-protection gateway, pseudonymising student data before it is shared with EdTech providers and enforcing interoperability standards such as LTI and SAML. This strong stance on data sovereignty is reinforced by the EU AI Act (European Parliament & Council of the European Union, 2024), which has prohibited AI systems that infer emotions in educational institutions since February 2025 (except for medical or safety reasons) and classifies certain AI systems used in education (for admission, evaluating learning outcomes, determining the appropriate level of education, or proctoring tests) as high-risk, requiring providers to complete a conformity assessment before placing them on the market, although the "Digital Omnibus on AI" (Regulation (EU) 2026/1744) has pushed the application date of these high-risk obligations back to 2 December 2027 (European Parliament & Council of the European Union, 2026). From a child's perspective, the GAR means that her browsing on a school platform does not feed a commercial profile; she is pseudonymised, not marketed to. Whether this protection extends to the growing number of GenAI tools she encounters outside school hours remains an open question.

A.2. Governance structure

France has one of the most centralised digital education architectures in Europe. Pedagogy, curricula, and national platforms are governed by the Ministry of National Education (MEN), while infrastructure and devices are funded by a multi-layered set of local authorities: municipalities for primary schools, départements for lower-secondary schools, and régions for upper-secondary schools. This division produces what French officials describe as a *millefeuille* of governance. The State ("brain") defines the Cadre de Références des Compétences Numériques (CRCN), the Pix certification system, and national guidance on AI use in schools, while local authorities ("walls and wires") purchase devices, cabling, and local platforms at very

different scales depending on fiscal capacity. National investment plans, such as France 2030 and the Territoires Numériques Éducatifs (TNE), pilots are used as temporary mechanisms to inject innovation funding, but do not always translate into sustainable and recurrent budgets.

This model enables strong normative coherence, as every student is assessed against the same competencies, but it creates deep territorial inequalities in the actual conditions for digital learning, especially in primary schools and rural areas. This tension is intensifying due to a demographic slump (see A.1) that creates mechanical pressures to close classes in rural areas. Digital continuity tools and hybrid learning are therefore becoming strategically vital for maintaining educational equity in depopulating territories.

A.3. Curriculum

France has moved from ad hoc "computer classes" to a legally binding digital-skills framework. The CRCN, aligned with DigComp, specifies 16 competencies across five domains (information/data, communication, content creation, protection, technical environment), and certification via Pix is mandatory at the end of lower-secondary and upper-secondary education. In upper-secondary, Sciences Numériques et Technologie (SNT) is compulsory for all Grade 10 students in the general and technological track, providing a common foundation in digital citizenship, the data economy, and societal impacts of technology. Before Grade 10, digital literacy has no dedicated slot in the timetable and relies on cross-curricular integration, and Pix results carry no weight in national examinations. Numérique et Sciences Informatiques (NSI) offers a deeper competence-based curriculum, but currently suffers from teacher shortages and persistent gender gaps (DEPP, 2026).

With the rise of GenAI, France has complemented these structures with an AI usage framework that explicitly re-centres human judgement. The 2025 *Cadre d'usage de l'IA en éducation* (Ministère de l'Éducation nationale, de l'Enseignement supérieur et de la Recherche [MENESR], 2025) requires that any AI-supported decision with a significant impact on assessment or pupils' orientation be subject to human supervision and prior validation by the competent authority, and that AI be used as a co-pilot under teacher oversight, not as a replacement for pedagogical expertise. This aligns with iRAISE's position that emotionally attuned, relational feedback cannot be outsourced to machines. The framework allows pupils to use generative AI in class, under teacher supervision, only from Grade 8 (4e), with more autonomous use at upper-secondary level (MENESR, 2025). From September 2027, all Grade 10 students will receive one hour a week of AI teaching within SNT (Ministère de l'Éducation nationale, 2026a), and a teacher-specific version of the State's sovereign AI assistant is under development and is expected to be rolled out progressively during 2026–27 (Académie de Bordeaux, 2026).

A.4. Remaining challenges

Interviews with French Ministry of Education delegates highlight four main challenges.

First, territorial inequality in primary schools persists: rural municipalities struggle to maintain equipment, leading to obsolete or non-functional devices and widening gaps in early digital exposure. For a primary-school student in rural France, this inequality is not abstract; it means that the digital tools available to a peer in Lyon or Paris may simply not exist in her classroom, narrowing her early opportunities to develop the critical and creative skills that the CRCN framework promises to all children equally.

Second, teacher usage of AI technology remains a bottleneck: French teachers are among the least likely to use AI as fewer than 20% of lower secondary teachers in France and Japan reported having used AI in their work in the previous 12 months, compared with 36% on average across OECD countries (OECD, 2026b). The Pix+ Édu certification illustrates this difficulty: launched in January 2022 as an experiment (Tice-Éducation, 2022), it was offered to all teachers via a national email campaign sent to about 900,000 recipients in October 2023, yet within about six weeks, just over 20,000 had completed its initial self-positioning

module, representing approximately 2% of those contacted (Julien, 2023). After a full school year during which the certification was suspended for redesign, it was relaunched in November 2025 and is now offered on a voluntary basis to teachers aiming for the advanced or expert level (GIP Pix, 2025; Ministère de l'Éducation nationale, 2026c).

Third, mental-health and attention risks have risen to the top of the policy agenda: following the Enfants et Écrans commission report (Commission sur l'impact des écrans sur les enfants, 2024), policy has shifted towards cognitive protection, with smartphone bans extended from primary and lower-secondary schools to upper-secondary schools from September 2026 (Gouvernement français, 2026) and an emphasis on "sanctuary" learning spaces. The same law's ban on social media for under-15s was struck down by the Constitutional Council (Conseil constitutionnel, 2026). Teachers and NGOs such as e-Enfance warn that screen time and cyber-harassment are rising faster than support systems. It is worth asking whether the hours a child now spends navigating algorithmically curated content are displacing the unstructured play, face-to-face conversation, and sustained reading that developmental science consistently associates with cognitive and emotional growth.

Fourth, the sustainability of pilots funded via France 2030 (e.g., the MIA Seconde AI remediation tool, developed by EvidenceB in partnership with Docaposte; Éduscol, 2026) remains uncertain, as these projects risk falling off a "funding cliff" after 2027 if no recurrent budget line is created.

A.5. Priority NGO partners

A.5.1. Internet Sans Crainte / CLEMI and media-education networks

Internet Sans Crainte, a national digital-citizenship programme operated by the EdTech company Tralalere, coordinates awareness campaigns and pedagogical resources on digital citizenship and online risks, often in partnership with CLEMI (the national centre for media and information education) and the European Better Internet for Kids network. These actors train teachers, librarians, and youth workers to lead workshops on misinformation, digital footprints, and respectful online communication. Investment could support co-developing AI-focused media-literacy modules aligned with PISA 2029 MAIL (e.g., deepfake detection, algorithmic curation) and embedding them into Pix and CRCN pathways, as well as funding impact evaluations that measure changes in students' critical-thinking and wellbeing indicators over time.

A.5.2. e-Enfance / 3018

e-Enfance operates the national 3018 helpline for cyber-harassment and online violence (e-Enfance/3018, 2026). Since November 2024 it has been France's first "trusted flagger" under the EU Digital Services Act, so platforms must handle its notices with priority; yet its first transparency report shows that more than half of the content it flagged on several major platforms remained online (e-Enfance/3018, 2026). The organisation's reach illustrates both its value and its constraints: demand has surged with increased smartphone use and social-media-driven harassment, yet capacity and aftercare pathways remain limited. A critical gap exists in connecting distressed youth to real-world psychological care, as child and adolescent psychiatric services are saturated, with long waits for a first appointment (Cour des comptes, 2023). Scaling AI-assisted triage to prioritise high-risk cases and building structured referral pathways to local mental-health services would address the weakest link in France's otherwise robust protection architecture.

A.5.3. Emmaüs Connect and allied digital-inclusion NGOs

Emmaüs Connect (Emmaüs Connect, 2025), family organisations such as Unaf, and local digital-mediation networks provide on-the-ground digital mediation for adults and families in disadvantaged neighbourhoods, helping them navigate administrative portals, school platforms, and basic online safety. France presents a "mediation fracture": parents most in need of support are least likely to access purely digital resources. What is missing is a structured bridge between school-based DL and the home environment. "Family digital-literacy hubs" in rural and peri-urban areas, combining refurbished

devices, connectivity support, and guided workshops on AI-enabled tools used in schools, could close this gap by ensuring that parents understand enough about the digital ecosystem to reinforce, rather than inadvertently undermine, what their children learn in class.

A.6. Outcome in a snapshot

France offers a highly structured testbed for AI Literacy that already centres human oversight and youth safety. Clear national standards (CRCN), mandatory Pix certification, dedicated SNT/NSI courses, and a strong GAR data-protection layer anchor DL and AI Literacy in the core curriculum. The Pix model also provides a notable sustainability example: while free for the education sector, it finances itself by selling "Pix Pro" services to companies, creating a B2B cross-subsidy that helps fund R&D alongside public funding. The centralised framework creates a common language and expectations for students, teachers, and EdTech providers, while the AI usage framework reinforces human oversight. Government objectives centre on protecting mental health and attention, building sovereign AI tools, and reducing territorial inequalities, especially in primary and rural schools.
The most acute need, from iRAISE's perspective, is investment in human infrastructure: teacher competence, parental mediation, and psychological support.

APPENDIX B. CANADA: DECENTRALISED, INNOVATIVE, BUT FRAGMENTED

B.1. Demographic and connectivity context

Canada's school system is mid-sized and well-resourced, with roughly 5.5 million students in public elementary and secondary schools in 2023/2024, served by just over 422,000 educators, or about 13 students per educator (Statistics Canada, 2025a). Public school-board expenditure was about CAD 79 billion (≈ USD 58 billion, ≈ 2.8% of GDP) in 2022/23 (Statistics Canada, 2025b), but because education is an exclusively provincial responsibility there is no national digital-literacy budget line; federal digital investment is indirect and channelled through time-limited programmes such as CanCode (CAD 190 million allocated between 2017–18 and 2023–24, renewed in the April 2026 Spring Economic Update) (Actua, 2026; Innovation, Science and Economic Development Canada [ISED], 2024).
Canada's infrastructure indicators are relatively strong. In 2024, 96.4% of Canadian households had access to Internet service at speeds of at least 50/10 Mbps, the federal target for high-quality service, although coverage fell to 69.6% of

households in the three territories and 65.7% on First Nations reserves (Canadian Radio-television and Telecommunications Commission [CRTC], 2026). In PISA 2025, Canadian schools reported at least one computer per student, above the OECD average of around nine computers per ten students (OECD, n.d., 2026b). Yet Canada was one of four OECD countries where the share of students in schools whose principals reported shortages of digital resources rose between 2022 and 2025, by 8 to 17 percentage points across these countries; Canada's PISA 2025 data should be read with caution, as the country did not meet all PISA participation standards (OECD, 2026b). However, interviews and provincial reports highlight persistent inequities. School-board autonomy over LMS and data systems complicates interoperability and makes it difficult to track learner pathways or evaluate programmes across jurisdictions. Rural and northern communities, especially Indigenous communities, still lack reliable, affordable high-speed internet, which in many areas remains a greater barrier than access to devices and is being addressed through separate federal programmes such as the Universal Broadband Fund. Digital-safety and media-literacy resources are plentiful but not always localised to cultural and linguistic contexts (e.g., Francophone minority communities, newcomer families).

B.2. Governance structure

Canada combines strong technical capacity with a highly decentralised education system. Under Section 93 of the *Constitution Act, 1867*, education is an exclusive provincial responsibility, and the territories exercise equivalent powers delegated by federal statute; as a result, there is no federal Ministry of Education and no national school board. Nothing in this division of powers, however, prevents the federal government from adopting a non-binding national digital media literacy strategy. Federal action on AI literacy has just begun: Canada's National Artificial Intelligence Strategy, "AI for All", announced in June 2026, commits to expanding Canadians' access to AI education and training (ISED, 2026a), and in September 2026 ISED launched a CAD 13 million National AI Literacy Initiative with the Alberta Machine Intelligence Institute (Amii), aimed at post-secondary students, K–12 educators and the general public rather than at school pupils directly (ISED, 2026b). The federal role in K–12 is therefore indirect and primarily led by investment: through ISED, it funds digital-skills and innovation programmes such as CanCode (B.1), supports connectivity in rural and northern regions, and, through public-safety and democratic-integrity frameworks, contributes to cyber-resilience and online-safety measures including the Digital Citizen Contribution Program (Canadian Heritage, n.d.) and the proposed Safe Social Media Act (Bill C-34). Introduced in June 2026, it follows the earlier Online Harms Act (Bill C-63, 2024), which died on the Order Paper when Parliament was prorogued in January 2025. The new bill would create a Digital Safety Commission, bar social media accounts for children under 16, and impose safety duties on AI chatbot services (Canadian Heritage, 2026). Unlike federal private-sector privacy law (PIPEDA), which gives way in provinces that have adopted substantially similar legislation, the bill would establish a single federal regime, enforced by a national regulator, that provincial or territorial legislation would not displace. Regulating online services is thus one of the few levers through which the federal government can act directly and uniformly on children's digital environments, including outside school. This distinction between federal investment leadership and provincial curricular authority is central to understanding the Canadian model. At the same time, this architecture has produced an emergent national footprint structured around two complementary policy lenses: economic competitiveness/workforce readiness and safety/democratic resilience. These lenses should be understood as parallel rather than substitutive dimensions of Canada's response to digital transformation, while developments such as the proposed Safe Social Media Act and provincial cellphone bans reflect broader governance pressures more than a direct reallocation of digital-literacy investment. This federated model has two consequences. On one hand, it enables bottom-up innovation: provinces like Québec and British Columbia have developed ambitious digital-action plans and GenAI guidelines, and frameworks such

as Québec's Digital Competency Framework (12 dimensions, cross-curricular) and British Columbia's Applied Design, Skills and Technologies (ADST) curriculum illustrate a shift towards competency-based approaches. On the other hand, it creates a strategic vacuum at the national level: there is no coherent view of students' or teachers' digital-literacy levels, nor a unified framework for AI Literacy and youth safety.

B.3. Curriculum

Provincial ministries set expectations, but much of the pan-Canadian content, training, and classroom material for digital literacy comes from national NGOs funded through time-limited federal programmes, alongside provincial and school-board resources. Civil-society organisations therefore play a central role in translating the provincial vision into practice. CanCode-funded programmes, delivered by 28 not-for-profit organisations, report a broad reach (7.6 million student and 405,599 teacher participations between 2017 and 2024), but participations are not unique individuals, and the intensity and impact of this reach are not measured (ISED, 2024). MediaSmarts itself notes that although teachers consider digital literacy skills important, this is not yet reflected in Canadian classrooms (MediaSmarts, n.d.). MediaSmarts' "Use, Understand & Engage" digital media literacy framework, which is mapped to curriculum outcomes in every province and territory, offers a shared vocabulary for technical fluency, critical thinking, and active digital participation (MediaSmarts, 2024).

Interviewees stressed that teachers' confidence in AI and digital-media topics remains low and that Canada has a persistent "blind spot" on outcomes: there is no coordinated national assessment of youth or teacher digital or AI-literacy levels, despite pockets of high-quality practice. Provincial ministries set expectations, but much of the pan-Canadian content, training, and classroom material for digital literacy comes from national NGOs funded through time-limited federal programmes, alongside provincial and school-board resources. Civil-society organisations therefore play a central role in translating the provincial vision into practice. CanCode-funded programmes, delivered by 28 not-for-profit organisations, report a broad reach (7.6 million student and 405,599 teacher participations between 2017 and 2024), but participations are not unique individuals, and the intensity and impact of this reach are not measured (ISED, 2024). MediaSmarts itself notes that although teachers consider digital literacy skills important, this is not yet reflected in Canadian classrooms (MediaSmarts, n.d.). MediaSmarts' "Use, Understand & Engage" digital media literacy framework, which is mapped to curriculum outcomes in every province and territory, offers a shared vocabulary for technical fluency, critical thinking, and active digital participation (MediaSmarts, 2024).

B.4. Remaining challenges

Key structural challenges emerging from the Canadian case study include a national DL/AI Literacy strategy that is only now emerging (the National AI Literacy Initiative launched in September 2026 is still being rolled out and reaches K–12 educators rather than pupils directly; until it matures, NGOs and provinces largely work in parallel and promising practices are not systematically scaled; ISED, 2026b); data fragmentation (boards choosing their own LMS and analytics tools means Canada lacks a unified picture of where youth are struggling); and precarious funding for NGOs and delivery infrastructure (Actua, MediaSmarts, and other national organisations rely on time-limited federal grants such as CanCode, corporate sponsorships, and provincial projects, which limits long-term planning, workforce stability, and rigorous impact evaluation). The 2024 evaluation of CanCode illustrates this dependence: 63% of surveyed recipient organisations said their training might have become fee-based without federal funding, and 38% that it might not have been

offered at all. It also found that inconsistent data collection and double counting across organisations prevented a reliable picture of the programme's reach (ISED, 2024).

At the same time, Canada benefits from trusted national NGOs and local youth-serving organisations. From the perspective of practitioners such as Actua's leadership, the real imperative is sustained federal investment in digital skills development and delivery infrastructure, not a retreat from direct programme funding in favour of ecosystem coordination alone. In their view, programmes like CanCode work because they create a bridge between federal priorities and the formal education system, allowing national organisations to support students and educators while provincial systems gradually build capacity. The 2024 evaluation supports part of this view: CanCode exceeded its participation targets, and 98% of surveyed teachers agreed that it had developed their own and their students' knowledge and confidence, but it could not confirm longer-term impact (ISED, 2024). Moving forward, such investment needs to evolve to include a broader focus on AI literacy, and to sit alongside sustained investment in pre-service and in-service teacher education through faculties of education.

B.5. Priority NGO partners

B.5.1. MediaSmarts

MediaSmarts is Canada's leading digital media literacy NGO, combining a rich resource library with regular national research on youth digital habits. Its "research-to-resource" model, in which national surveys of young people (e.g., Young Canadians in a Wireless World) inform the development of classroom materials, professional-development modules, and parent guides, ensures that outputs are empirically grounded, not purely intuitive. The most pressing gap in MediaSmarts' ecosystem is the absence of a national baseline on AI Literacy: no coordinated survey currently measures what Canadian youth, teachers, or parents understand about algorithmic systems. Addressing this "blind spot", while expanding partnerships with Indigenous and Francophone organisations to co-create culturally responsive resources, would give Canada the evidence base it currently lacks to target interventions effectively.

B.5.2. Actua

Actua operates at the intersection of STEM skills, equity, and youth engagement. Working through a network of more than 40 universities and colleges, Actua reports reaching about 375,000 young people in 600 communities each year (Actua, 2024). The model relies on in-person camps, clubs, and school visits where youth build projects alongside trained mentors, an approach that cannot be replicated by online platforms alone. The renewal of CanCode in April 2026 (Actua, 2026) preserves the human capacity built since CanCode's launch in 2017. Multi-year funding stability would further protect train-the-trainer programmes that build AI-literacy capacity beyond coding and STEM, including its critical, ethical and civic dimensions, among teachers and community facilitators.

B.5.3. Additional NGO partners (e.g., Boys and Girls Clubs, YWCA/YMCA)

Several youth-serving organisations such as Boys and Girls Clubs of Canada, YWCA/YMCA, and Indigenous friendship centres already collaborate with MediaSmarts and Actua to deliver programmes where they have physical presence but limited specialist content. They are key to reaching youth who may be disengaged from formal schooling.

B.6. Outcome in a snapshot

Canada's strengths lie in its strong provincial/territorial initiatives backed by national NGOs providing high-quality resources and professional development with broad reported reach, and a growing focus on Indigenous and equity-seeking communities. These organisations can move quickly, test innovative formats, and adapt content to diverse linguistic and cultural contexts, even in remote regions. Government objectives centre on modernising curricula for GenAI, closing rural and Indigenous gaps, and building a more coherent national picture of youth DL/AI-literacy levels without undermining provincial autonomy. The National AI Literacy Initiative launched in September 2026 provides a first national vehicle for

this agenda, though it is too recent to assess (ISED, 2026b). The most urgent needs are stable, multi-year funding for NGOs, together with sustained funding for pre-service and in-service teacher education in DL and AI literacy through faculties of education; shared indicators to assess the DL knowledge of the Canadian population, addressing the "blind spot"; communities of practice that allow provinces and school boards to compare outcomes; and evaluation capacity to measure the depth and impact of programmes, not only their reach.

APPENDIX C. EGYPT: RAPID SCALE UNDER DEMOGRAPHIC PRESSURE

C.1. Demographic and connectivity context

Egypt faces a challenge of scale: its pre-university system serves more than 28 million students (28.5 million in 2023/24, including Al-Azhar) and just over one million teachers, in a context of continued population growth (about 1.4–1.7% a year, down from around 2% in the late 2010s) and constrained public finances (CAPMAS, 2024). Traditional expansion of school buildings and staff cannot keep pace, pushing the state towards digitally mediated solutions. Classes are correspondingly large (43–55 pupils on average in public schools), with a system-wide student–teacher ratio of about 25:1 and around 31:1 in primary school (CAPMAS, 2024; Human Rights Watch, 2025). Public spending on education at all levels was budgeted at about 1.7% of GDP in 2024/25, the lowest level in five years and far below the constitutional floor of 6% of GDP, including 4% for pre-university education (Human Rights Watch, 2025).

Egypt's digital-literacy strategy is built around a hardware-content nexus. The Egyptian Knowledge Bank (EKB) acts as a national learning platform and content hub, ensuring that students can access high-quality, Arabic-language content. By 2021 the government had provided some two million tablets to secondary students and teachers (UNICEF, 2021), with further cohorts equipped since, moving towards a 1:1 device ratio in the general and technical secondary tracks. At school level, about 84% of primary, 87% of lower-secondary and 83% of upper-secondary schools had computers for teaching in 2023 (Our World in Data, 2025), although this indicator does not show how many devices are available per student. By late 2018, around 2,500 public general secondary schools had been connected to fibre to support tablet-based learning and assessment (Reda, 2018; Zayed, 2025), and the network has since been extended, although universal school connectivity remains a work in progress, particularly in rural areas (Zayed, 2025). Student logins are linked to national identifiers, enabling detailed tracking of engagement and performance via an Education Management Information System (EMIS). For a secondary-school student in Upper Egypt, this architecture means that, for the first time, she can access the same curated content as her peers in Cairo, using the same device, and sit the same standardized national exam. Yet it also means that her every interaction is logged from the age of fifteen, raising long-term questions about data protection, algorithmic bias, and student autonomy that the current governance framework has only begun to address.

The EKB relies on curated, nationally hosted content: contracts with international publishers (Britannica, Discovery Education, among others) to host verified content ensure that digital literacy is built upon a

foundation of high-quality, culturally adapted information rather than unverified open-web sources. The system's technical architecture incorporates federated identity management (single sign-on tied to National ID), Learning Tools Interoperability (LTI) standards for seamless integration of third-party tools, and sovereign hosting in national data centres to ensure data privacy and reduce reliance on external international traffic.

C.2. Governance structure

Responsibility for DL is shared across the Ministry of Education and Technical Education (MOETE), which owns curriculum reform, assessment, and teacher professional development through the Education 2.0 strategy; the Ministry of Communications and Information Technology (MCIT), which leads the "Digital Egypt" agenda, manages connectivity and national data centres, and runs community-based programmes such as Digital Egypt Cubs, Digilians, and the Digital Citizenship and Internet Safety initiative; and other ministries and international partners (e.g., Ministry of Military Production, World Bank, UNICEF) involved in hardware procurement and financing. This "whole-of-government" model, coordinated at the cabinet level, allows for fast top-down deployment but also concentrates risk: technical failures or connectivity disruptions can affect entire cohorts during high-stakes exams.

C.3. Curriculum

The Education 2.0 curriculum, documented by UNICEF (2021), is a skills-based reform anchored in digital learning. Early grades (KG to Grade 3) integrate technology into inquiry-based multidisciplinary subjects, with technology serving as a tool for inquiry mediated primarily by teachers using smart boards. Upper primary grades (4–6) introduce ICT as a standalone subject focused on operational fluency, including typing, hardware identification, and the "five rules" of internet safety. Preparatory grades (7–9) shift to computational thinking and logic, introducing coding concepts and algorithms. Secondary grades (10–12) use the tablet as a main learning medium, and some school-based secondary exams have been delivered on tablets, although the decisive Grade 12 examination remains paper-based.

In parallel, the MCIT's Digital Citizenship and Internet Safety initiative, developed with UNICEF Egypt and the National Council for Childhood and Motherhood (NCCM) and relaunched in 2026 (Egyptian Gazette, 2026; Paris Peace Forum, n.d.), extends this work beyond schools through awareness campaigns, train-the-trainer and peer-learning sessions for parents, educators, and librarians, and the Wa3i.net platform, which localises digital-citizenship content in Arabic and offers dedicated guidance for parents and caregivers. By 2026, the initiative had reached about 7,000 people in nine governorates.

AI Literacy is emerging through Future Techs, Digital Egypt Cubs, the presidential Digilians training-grant programme (delivered with some 30 ICT companies, including Google, Microsoft, and IBM), and reference to international frameworks such as the PISA 2029 MAIL domain. However, these programmes still primarily target high-achieving or already-connected youth. The 2025 Supreme Council of Universities guidelines on AI in higher education and scientific research (Al-Fanar Media, 2025) represent a promising governance step, though their adaptation to K–12 remains nascent.

C.4. Remaining challenges

Despite impressive infrastructure gains, interviews with MCIT officials and analysis of evaluation reports point to substantial challenges. Equity between stages and regions remains a concern: primary schools and remote rural areas, particularly villages not yet reached by the presidential Haya Karima ('Decent Life') rural-development initiative launched in 2019 (Haya Karima Foundation, 2019), remain under-equipped and reliant on teacher-led, offline methods. Teacher readiness and techno-stress are widespread: hundreds of thousands of teachers are enrolled in digital-integration CPD, yet many report anxiety about technical failures during exams and revert to traditional pedagogy (Middle East Eye, 2019; Zahran, 2023). The cascade training model, which uses a "train-the-trainer" approach, often suffers from "transmission loss" in remote areas.

Parental resistance and parallel tutoring markets constitute a distinctive obstacle. Many parents who

succeeded in the old, rote-learning exam system do not trust tablet-based learning or online exams, and prefer printed materials and private lessons. A large private tutoring sector, now so dominant that it is displacing public schooling, has strong incentives to keep families dependent on exam-focused, off-platform preparation, making it a key obstacle to reform (Moreno Olmedilla, 2022; Zahran, 2023). This dynamic illustrates a form of displacement in reverse: rather than digital activity crowding out offline learning, an entrenched offline economy actively resists the digital transition, trapping children between two competing systems and leaving them without the coherent, sustained learning environment that either model could provide on its own. This cultural resistance, the report's Egyptian interviewees emphasised, may represent the single greatest threat to the sustainability of digital literacy in Egypt.

Data-governance capacity is also still developing. While EMIS enables sophisticated monitoring, systematic algorithmic-bias auditing and child-rights-based data-governance frameworks are nascent. The 2025 AI guidelines for higher education could serve as a model for K–12, but adaptation will require investment.

C.5. Priority NGO partners

C.5.1. Qatar Scouts & Guides Association (Arab Region)

Working in partnership with MCIT and regional scouting movements, the Association plays a growing role in delivering online-safety and digital-citizenship workshops across Arab countries, including Egypt. Scouts act as trusted peer educators in their local communities, especially in rural and low-income areas where formal digital-literacy programmes are limited. The peer-education model is particularly well suited to contexts where institutional trust is low and parental resistance to digital reform is high: a young scout explaining data privacy to neighbours carries a different kind of credibility than a government leaflet. Co-creating AI-aware digital-safety tracks, designed to teach adolescents to recognise manipulation and misinformation, would extend this trusted channel to the most pressing emerging risks.

C.5.2. Arab Council for Childhood and Development (ACCD)

Headquartered in Cairo, the ACCD works on child rights, early childhood development, and policy advocacy. It has published regional research on Arab children's readiness for the digital era (ACCD, 2024). A notable gap in the current evidence base is the near-absence of longitudinal research on how AI-mediated platforms affect Arabic-speaking children's cognitive development, wellbeing, and rights. The ACCD is well positioned to anchor such research, while simultaneously co-developing parent and caregiver toolkits in Arabic that demystify AI and promote balanced screen time, and strengthening advocacy for child-centred AI governance across the Arab region in line with the UN Convention on the Rights of the Child.

C.5.3. National Council for Childhood and Motherhood (NCCM)

Egypt's statutory child-rights body and a core partner in MCIT and UNICEF's Digital Citizenship and Internet Safety initiative, the NCCM brings child-protection expertise, helpline infrastructure, and a nationwide network of social workers to the digital-literacy agenda. Its institutional reach makes it a natural anchor for three priorities: expanding trainings for teachers, librarians, social workers, and youth leaders to include AI risks and algorithmic manipulation; strengthening the Wa3i portal and associated parental toolkit with age-segmented Arabic resources; and leveraging anonymised data from EMIS and NCCM helplines to generate policy-relevant insights on online harms and to target prevention campaigns more precisely at the school and community level.

C.6. Outcome in a snapshot

Egypt demonstrates that large-scale digital infrastructure, including the EKB and large-scale tablet provision for secondary-school students, can be deployed rapidly under a strong presidential mandate and centralised governance. The Education 2.0 competency-based curriculum and the Digital Citizenship & Internet Safety initiative with UNICEF and NCCM represent meaningful steps. During COVID-19, the pre-existing EKB and secondary-school tablets helped Egypt maintain

some continuity of learning and assessment during school closures, which validated the massive investment. However, Egypt's experience also shows that digital infrastructure alone cannot guarantee safe, meaningful learning. Without sustained investment in teacher agency, parental understanding, and independent evaluation of cognitive and mental-health outcomes, digital tools risk amplifying existing inequalities or entrenching surveillance-heavy models of schooling. The most pressing needs are parental and community DL/AI-literacy programmes, locally relevant gamified content for primary grades, stronger teacher-training infrastructure (especially pre-service), and tools for algorithmic auditing and child-rights-based data governance.

APPENDIX D. QATAR: HIGH-RESOURCE, CENTRALLY COORDINATED, AND CONFRONTING THE WELLBEING FRONTIER

D.1. Demographic and connectivity context

Qatar provides a useful reference for what digital literacy looks like under conditions of near-maximal resourcing. In 2026–27, its pre-university system serves about 419,000 students in 649 public and private schools and kindergartens, taught by some 17,700 teachers in government schools and kindergartens and 25,400 teaching and administrative staff in private ones (Tribune News Network, 2026). Student–teacher ratios in public schools are low, around 10:1 (an indicative figure, since private-school staff counts include administrative staff), which creates favourable conditions for intensive, personalised digital integration. Education receives roughly 10% of government expenditure, with the 2026 budget at about QR 21.8 billion (US$6.0 billion) (Qatar News Agency, 2025b), and dedicated programmes such as the Digital Agenda 2030 and TASMU add substantial digital-specific investment. The country's small size and wealth have effectively eliminated the physical digital divide: fibre networks cover 100% of the population and 5G 99% (Qatar News Agency, 2026), every government school is connected to high-speed fibre, and the Ministry of Education and Higher Education (MOEHE) supplies devices to state-school students. Content is delivered through the centralised "Qatar Education System" learning-management platform, complemented by a National AI-Powered Learning Platform (launched December 2025; Qatar News Agency, 2025a), while Law No. 13 of 2016 on Personal Data Privacy Protection (PDPPL; Qatar, 2016, arts. 16–17) classifies children's data as sensitive and mandates privacy-by-design. In short, Qatar shows what is achievable when funding, human resources, and connectivity are abundant, and, by the same token, that these inputs are necessary but not sufficient for healthy outcomes.

D.2. Governance structure

Qatar offers a distinctive high-income, highly centralised model in which abundant fiscal resources and strong inter-ministerial coordination have been used to build a world-class digital-learning ecosystem in a remarkably short time. Digital literacy is anchored in the Qatar National Vision 2030 and the Third National Development Strategy (NDS3, 2024–2030), and operationalised through the MOEHE Strategy 2024–2030 ("Igniting the Flame of Learning"),

which treats 21st-century skills and digital citizenship as core pillars (Ministry of Education and Higher Education [MOEHE], 2024).

What stands out in the Qatari case is the quality of coordination between ministries. The MOEHE leads curricula and the training of teachers and students; the Ministry of Communications and Information Technology (MCIT) oversees national digital infrastructure, the Digital Agenda 2030, and inclusion and safety platforms such as SafeSpace; the National Cyber Security Agency (NCSA) designs the cybersecurity curriculum and trains educators; and the Ministry of Social Development and Family co-delivers child-protection initiatives. Coordination is structural rather than ad hoc, facilitated through high-level bodies such as the Smart Government and Digital Excellence Committee and joint NCSA–MOEHE working groups. This architecture lets the system pivot quickly, as it did in rapidly integrating generative AI into national guidelines through joint MOEHE–MCIT workshops, and it illustrates a principle relevant to every country in this report: because digital and AI literacy cut across education, ICT, health, child protection, and culture, a clear coordinating authority, most often the education ministry, is decisive for coherent policy.

D.3. Curriculum

The primary delivery mechanism is the Computing and Information Technology (CIT) curriculum, introduced in 2018 and taught as a separate subject from Grade 1 to Grade 12 (MOEHE, 2018). It is explicitly organised as a spiral curriculum in which concepts recur with increasing depth: pupils implement simple algorithms in a Logo environment in the early primary grades, move to block-based programming from Grade 4, and progress to text-based programming from Grade 9, alongside data modelling and relational databases (MOEHE, 2018).

The curriculum is organised into five domains (computing systems and networks; problem solving and decision making; collaboration and productivity; research and innovation; and technology and society), whose sub-domains include computational thinking, robotics and programming, digital ethics and citizenship, and e-safety; artificial intelligence is covered in Grades 11–12 under Emerging and Applied Technologies (MOEHE, 2018). For 2026–27, MOEHE is offering secondary students self-learning courses in artificial intelligence and data science through its official platforms, leading to accredited digital certificates. It has also introduced a unified Grade 10 science course and, within the Life and Career Skills subject taught across primary, preparatory and secondary stages, an Information Literacy Programme on searching for, evaluating and using information (The Peninsula, 2026).

Qatar follows a hybrid pedagogical model that combines standalone CIT instruction, cross-curricular integration, and a dedicated school e-project coordinator role, reinforced by robotics and AI competitions on the AI & Robotics Platform (AI.MOE.QA), the annual Digital Designer Competition, and School Digital Innovation Clubs. The country has committed to the PISA 2029 Media and AI Literacy (MAIL) assessment, and technical delivery is partly externalised to global partners; a five-year agreement signed with Scale AI in February 2025 (Reuters, 2025) supports AI-powered learning platforms and analytics across the government sector.

A defining feature of the Qatari model is the treatment of cybersecurity as both a national-security and an educational priority. Through the NCSA's "Educational Cybersecurity Curricula" initiative, developed in systematic coordination with the MOEHE (National Cyber Security Agency [NCSA], 2025), the system aims to build a "human firewall" from the school level up, raising a generation able to recognise and resist phishing, malware, and social engineering. By 2025 the curriculum had been implemented in 433 schools (public, private, community, and special-needs schools) and accessed by more than 583,000 students worldwide via an open platform, with Kuwait announcing plans to adopt it and the programme winning a WSIS Prize (NCSA, 2025; The Peninsula, 2025). This cybersecurity-first framing is among Qatar's most exportable contributions to the field.

Qatar's approach to the teaching workforce is designed to keep pace with technological change.

It launched a professional licensing programme for teachers and school leaders in October 2025, which assesses educators against the National Professional Standards (Doha News, 2025). According to the Ministry of Education and Higher Education's written response to our consultation, teaching candidates are assessed separately on their computer skills and on their pedagogical use of technology, digital competency is a core requirement for licence renewal, and teachers are supported with turnkey resources such as cybersecurity guidebooks and AI "Teacher Copilot" lesson-planning tools (MOEHE, 2026).

D.4. Remaining challenges

Despite, and partly because of, its success in expanding access, Qatar faces what might be called a "digital paradox". The most striking challenge is a wellbeing gap: a 2022 survey of 377 students aged 11–17 in 16 Qatari schools (a convenience sample, 77% girls) found self-reported daily internet use, combining essential and non-essential use, of about 6.7 hours among 11–13-year-olds and 7.5 hours among 14–17-year-olds, roughly 4.5 hours of it non-essential; 26% and 37% respectively met the study's criterion for internet addiction (Chemnad et al., 2025). These levels are broadly comparable to those in other high-income countries rather than exceptional in absolute terms (e.g., Common Sense Media, 2026; European Commission, 2026), although measures differ across studies; the distinctive feature is that near-universal access has been achieved, so the challenge has shifted from expanding access to safeguarding wellbeing. Early policy focused heavily on access and infrastructure rather than cognitive sustainability; Qatar's Primary Health Care Corporation has warned that health risks rise above two hours of recreational screen time a day for those aged 5–17 (Primary Health Care Corporation, 2022), and many schools have adopted mobile-phone limits.

A second persistent challenge is the "Arabic content lag": high-quality technical and AI materials remain scarcer in Arabic than in English, and existing, largely Western AI models often lack the linguistic nuance and cultural or religious sensitivity required locally, imposing a heavy translation-and-adaptation workload on schools and teachers.

Further challenges include standardising digital-literacy requirements across very diverse curricula (national, American, British, IB, Indian, Philippine), disparities in teacher digital fluency across nationalities, administrative friction from learning-management and e-reporting systems, and an agility gap whereby formal curriculum cycles lag the pace of AI development.

D.5. Priority NGO partners

D.5.1. Qatar Scouts and Guides Association

The Mada Center, a non-profit operating under the MCIT mandate, anchors Qatar's digital-inclusion and accessibility ecosystem, providing assistive

D.5.2. Mada Center (assistive technology and digital inclusion)

As elsewhere in the Arab region (see Appendix C.5.1 on Egypt for the scouting model's general role), Qatar's scouting movement serves as a trusted, peer-to-peer channel for digital citizenship. Its distinctive contribution could be tight alignment with national cybersecurity institutions: working alongside the NCSA and MOEHE, the Association could help translate the national "human firewall" agenda into adolescent-facing practice and is well placed to co-design AI-aware safety tracks, teaching young people to recognise manipulation, deepfakes, and misinformation, and to extend that reach to families and lower-income communities. technologies and accessible content so that students with disabilities can engage with the CIT curriculum, and contributing to Qatar ranking first globally on the DARE Index for digital accessibility (G3ict, 2020). It also engages parents of children with disabilities in their child's digital-literacy learning through specialised video feedback and messaging-based reinforcement. Multi-year support would let Mada scale its standards for accessible, Arabic-language AI tools and share them regionally.

D.5.3. Doha International Family Institute (DIFI) and family-focused actors

DIFI exemplifies the role of research-and-family institutions in embedding digital literacy in the home. It conducts family-policy research (Doha International Family Institute [DIFI], 2024) and could provide research-based guidance to caregivers on balanced screen use, which would directly operationalise the principle that caregivers are strategic partners and that home–school alignment underpins youth safety and wellbeing. DIFI also contributes to the national evidence base on screens and AI. The clearest opportunity is to support longitudinal, locally grounded research on cognitive sustainability and digital wellbeing, producing "wellbeing-by-design" benchmarks for child-safe AI that are relevant to the Gulf and exportable to other contexts.

D.5.4. Qatar Foundation, WISE, and Education Above All

Qatar's philanthropic and research institutions extend the ecosystem beyond government. Qatar Foundation serves as the nation's research-and-development laboratory for education, piloting progressive methodologies through its Education City schools and convening global expertise via the World Innovation Summit for Education (WISE), while Education Above All advances equitable access to learning. These bodies are well placed to incubate Arabic-native, pedagogy-focused AI tools and to host independent evaluation, and could act as regional conveners linking ministries, NGOs, and funders, much as alliances such as iRAISE seek to do internationally.

D.6. Outcome in a snapshot

Qatar demonstrates that, with sustained state funding, specialised agencies, and tight inter-ministerial coordination, a country can eliminate the physical digital divide, embed a spiral CIT curriculum from Grade 1 to Grade 12, and build an internationally recognised, values-based cybersecurity "human firewall" at remarkable speed. Government objectives are now shifting from the "digitalisation of schools" (hardware and access) to the "intelligence of schools" (personalisation, ethics, and wellbeing). From iRAISE's perspective, the most pressing needs are longitudinal research on the cognitive and wellbeing impacts of high screen exposure on Gulf-region youth; "wellbeing-by-design" standards and a genuine capacity for children to disconnect; locally produced, culturally grounded Arabic AI and educational content; and mentorship pathways that bring legacy educators along rather than leaving expensive infrastructure underused. Qatar's central lesson for this report is that abundant resources solve the access problem but make the human, cognitive, and cultural dimensions of digital literacy more, not less, decisive.

APPENDIX E. SURVEY ON NATIONAL APPROACHES TO DIGITAL LITERACY FOR YOUTH SAFETY AND WELLBEING

Objective of the survey: To identify best practices in implementing national digital literacy programs for the safety and well-being of young people and to produce operational recommendations to help governments develop or strengthen their own strategies.

Introductory Questions:

- How many students do you have in K-12 classes? And how many teachers for these classes?
- What is the national budget allocated to the ministry of education in absolute value and in % of GDP?

Digital Literacy Programs

- What is the percentage of the global educational budget allocated to this program? Is this a permanent fund or is it relying on specific short-lived subsidies? Within this budget, do you have the split between curriculum, research, hardware, software, training...? And do you have a specific allocation for content update?
- Who oversees the design of the program? (ministry of education, other ministries included and/or researchers/other private/public actors). Who owns the rights? Who was included: teachers, students, parents, schools, academics...?
- Who oversees the implementation of the program? (ministry of education and/or other private/public actors) Is the program mandatory for all schools or does it rely on the voluntary participation of schools? Are there any associated research programs?
- What are the KPIs that are measuring the success of your DL program: academic achievement, well-being, teachers' training coverage, digital device coverage, critical thinking abilities, problem-solving skills...? Do you track long-term outcomes (more than 5 years)? Could you share with us your current stage?
- Have you planned any survey for some feedback from schools, teachers, students...?
- Are you working with any private or public actors (NGOs)? If yes, who are the most important ones and on which topic specifically and why did you decide to externalise this activity?

Digital Tools, Devices & Connectivity:

- What Digital Software/Apps/Tools are used in schools? Does DL training cover them? What tools and programs are under development or coming to the schools?
- What is your current coverage in terms of devices? What are your objectives? What is your computer per student ratio? Percentage of schools equipped correctly based on your objectives.
- What is your broadband coverage? How do you address remote areas?

Infrastructure and Data Management:

- Who oversees the educational data (public or private actor)?
- How do you guarantee the protection of the data? Do you rely on public or private actors?
- Are you able to track student data in the long term?
- Are you working with any EdTech tools edited by private companies?
- How do you control for algorithmic bias of these tools?
- Can you tell us more about the interoperability of your systems between the state level system and the learning management systems (LMSs)? Do you use any open standards (e.g., 1EdTech's LTI...)?
- Who oversees choosing their LMS: schools, municipalities, states...? Does the ministry of education provide a list of choices?

- If data flows from the bottom to your state level system, is the data flowing also from the top to the bottom helping teachers and students to improve/update their competencies/skills? If yes, could you give us some concrete examples?
- Are you able to implement personalized learning/recommendations thanks to your data management system?

Teachers onboarding

- What is the role of the teachers within your DL strategy?
- What are the current prerequisites in terms of digital knowledge to become a teacher?
- How do you ensure in-service training in terms of technological knowledge, pedagogical use of technology...? Do you have any certificate associated with it?
- How would you qualify their interest in such topics?
- How are they supposed to address DL with students? Are they provided with any turnkey tool to help them?
- How much do you rely on them to update your DL strategy?

Parents & Communities

- Are parents or communities (libraries...) part of your DL strategy?
- If yes, could you explain on which topic: design, implementation, children safety...?
- If yes, how do you ensure they get the proper training and their knowledge is frequently updated? Do they get any material, resources...?
- How do you guarantee that DL teaching at home is in line with DL teaching at school?
- How do you address isolated households, households with limited access to knowledge or official language?

Curriculum

- How was the DL curriculum designed and who was included (teachers, parents, students, mental health experts, child psychiatrists...)?
- Is the teaching of DL spread within the different subjects (mathematics, sciences, language...)? Or is it a standalone subject?
- What are the topics addressed: digital safety, misinformation, ethical use, data management, computational and AI literacy...?
- If this is widespread among subjects, who guarantees that these topics are addressed? Is there any assessment for the students to make sure learnings are acquired?
- How do you guarantee a feedback loop with students/teachers' recommendation?
- Are there specific objectives by age?

AI Integration

- Do you already have a plan to integrate AI literacy within your global DL literacy?
- If yes, could you explain to us how it will integrate in your current DL literacy? Are you going to educate on the theory, the use, the behavior...?
- Have you integrated or are you planning to integrate an AI tool within classrooms? If yes, what GenAI system is it? Is it a custom educational AI or a general-purpose AI? If it is a custom AI who is helping to design such a tool and who is paying for it?
- If you are using a genAI system in education, do you have measures to guarantee child safety, ethical use, emotional and cognitive reliance, critical thinking... associated with the use of this new technology? Do you have any alert escalation system?
- If you are using a genAI system in education, were academics included in the discussion and/or did you refer to scientific studies on the impact of AI, social media, or screens on cognitive and socio-emotional development?
- Would you consider teachers reluctant or driving forces in an implementation of a genAI system in education?
- Do you plan to implement the PISA 2029 Media & AI Literacy (MAIL) assessment?
- What is your main concern regarding AI implementation at schools?

Final Questions:

Experience feedback:

- Are you part of international networks around DL? If yes, what support did you receive?
- What were your key learnings from the past work around DL?
- In your opinion, what are the key success factors for a good DL policy design and implementation?
- What is your biggest challenge today? What do you worry about in relation to DL?
- What was your biggest mistake?
- Are you happy with your current metrics to evaluate your DL performance? Any modifications you would like to add or remove?

Questions about plans and futur:

- Looking at your roadmap for the next 1–3 years, how is your ministry planning to evolve DL? Are there specific legislative frameworks or pilot programs for AI in education currently being drafted or coming soon?
- As you look toward the future of the teaching profession, how is your ministry redefining the role of the teacher in a digitally integrated classroom? Are there upcoming reforms in initial teacher training curricula to prepare the next generation of educators for this hybrid reality?
- Finally, could you cite three areas critically lacking investments (research, teacher training, parent training, system improvements, local projects to scale up at the national level...)? Can you provide examples which additional funding could support and result in a long-term and wide positive impact?

Aside from funding, what technical expertise or tool from tech experts would be most useful to unlock your national strategy?