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AI LITERACY AND PROMPTING: INTERNATIONAL EXPERIENCE

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Abstract
This article provides a comparative analytical examination of international experience in developing artificial intelligence (AI) literacy and prompting skills in general secondary education. The study draws on the joint AI Literacy Framework (AILit) published by the European Union and OECD in May 2025, the UNESCO AI Competency Framework (2024), the US AI4K12 initiative, national AI policies in Chinese, South Korean, Singaporean, and Finnish school education, as well as findings from more than 70 empirical studies published during 2024–2026 on the ACM, Frontiers in Education, and ScienceDirect platforms. The article substantiates prompting as a standalone component of contemporary digital literacy; analyses models for integrating it into national education systems; and offers practical recommendations for Uzbekistan.

Keywords: AI literacy; prompting; international experience; K–12 education; digital literacy; cognitive development; AI education policy; computer science education; Uzbekistan.

Introduction

At the 2025–2026 juncture, when artificial intelligence technologies are rapidly transforming all sectors of society—including education—the concept of “AI literacy” has moved to the centre of global educational discourse. According to the PISA assessment framework announced by the OECD in February 2026, “Media and AI Literacy” will be included in the 2029 PISA survey for the first time—a formal acknowledgement of AI literacy as a fundamental educational competency [1].

The World Economic Forum’s Future of Jobs Report (2025) forecasts that 40 percent of skills demanded in the global labour market will change within five

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years. The ability to work effectively with AI—and in particular to write accurate prompts (requests) to AI systems—is becoming critically important [2]. Yet this skill is interpreted differently across international education systems, taught using different methodological approaches, and regulated within different policy frameworks.

In the Uzbekistan context, while the 2023 State Educational Standard (SES) for informatics introduced an AI literacy component, concrete prompting pedagogy methodology has not yet been developed [3]. A systematic analysis of international experience serves to fill this gap.

Aim of the article: To conduct a comparative analysis of the experience of leading countries and international organisations in integrating AI literacy and prompting skills into school education, and on this basis to develop practical recommendations for Uzbekistan.

Research objectives:

comparative analysis of international AI literacy frameworks (EU/OECD AILit, UNESCO, AI4K12, DigComp);

examination of national experience in leading countries (USA, China, South Korea, Singapore, Finland, UK);

identification of best practices in prompting skills pedagogy;

proposal of an integration model for the Uzbekistan education system.

2. THEORETICAL BASIS: CONCEPTUALISING AI LITERACY

2.1. AI literacy: definitions and evolution

Long and Magerko (2020), who were the first to systematically ground the concept of "AI literacy" in the scholarly domain, defined it as "the ability to critically evaluate AI technologies and use them effectively" [4]. This definition expanded significantly over the following five years: by 2025 AI literacy is regarded as a broad concept encompassing not only technical knowledge but also multi-faceted competencies such as ethical reasoning, critical evaluation, creative problem-solving, and civic awareness.

The AI Literacy Framework (AILit) jointly developed and published by the European Commission and the OECD in May 2025 represents the most recent and most comprehensive international consensus in this field. The framework defines AI literacy as: "A set of technical knowledge, durable skills, and future-

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oriented attitudes necessary to thrive in an AI-influenced world" [5]. It identifies four core competency domains:

Engage — understanding AI systems and interacting with them;

Create — producing artefacts and ideas with the help of AI tools;

Manage — regulating AI use in a safe and responsible manner;

Design — understanding AI systems and developing concepts for new ones.

UNESCO published a separate AI Competency Framework for Students in 2024 [6]. This framework likewise reflects the same four key directions—understanding, use, evaluation, and creation—but places special emphasis on ethics and safety. The 2026 PISA framework plans, for the first time, to measure Media and AI Literacy at an international scale [1].

2.2. Prompting — the operational layer of AI literacy

Prompting—the process of writing precise, purposeful, results-oriented text requests to AI models—occupies a central position in the "Create" domain of the AILit framework. According to Zadorozhnyy (2025), prompt literacy is a multifaceted set of capabilities needed to engage in dynamic and iterative dialogue with GenAI systems [7]. Prompting comprises the following components:

Lexical precision: use of correct and unambiguous terminology in requests;

Context and format: specifying audience, style, and expected output format;

Structural logic: writing multi-step, conditional, and iterative requests;

Ethical reasoning: evaluating request content from a responsibility and safety perspective.

The article "Prompt Engineering as a 21st-Century Literacy" (AI Education Studies, 2025) conceptualises prompt engineering as a broad literacy intrinsically linked to critical thinking, creative problem-solving, and ethical awareness [8]. This approach demonstrates that prompting is not a simple technical skill but a general educational competency that should be integrated across all school subjects.

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3. COMPARATIVE ANALYSIS OF INTERNATIONAL AI LITERACY FRAMEWORKS

3.1. Principal international frameworks

At the international level, several key frameworks systematically ground AI literacy and can be viewed as mutually complementary approaches.

The EU/OECD AILit Framework (2025) is the most comprehensive and broadly consulted international document to date. It synthesises the DigComp (digital competence), media literacy, and AI education frameworks. The "Create" competency in the framework is directly linked to prompting: "co-creating artefacts with large language models" is presented as a core component of that competency [5].

The US AI4K12 Initiative (2019–2026) has advanced the "Five Big Ideas in AI" concept for K–12 education: perception, representation, learning, natural interaction, and societal impact. The "natural interaction" domain is directly connected to prompting skills, whereby writing clear and purposeful requests to AI systems is a practical expression of algorithmic thinking [9].

The UNESCO AI Competency Framework for Students (2024) identifies five core competency areas: understanding, use, creation, evaluation, and collaboration. The framework is especially adapted for developing countries, paying particular attention to equity and inclusivity in education [6].

Table 1. Comparative analysis of international AI literacy frameworks

Criterion	EU/OECD AILit (2025)	US AI4K12 (2026)	UNESCO (2024)	DigComp 2.2 (EU)
Target audience	K–12 (primary and secondary)	K–12 (all grades)	All education levels	Adults + students
Role of prompting	Central element in "Create" domain	Core skill in "Interaction" domain	Within "Create" and "Collaborate" domains	Partially in "Digital content creation"
Ethics component	Present across all four domains	Separate "Social Impact" domain	Dedicated competency level	"Safety" domain present
PISA alignment	Basis for 2029 PISA	Not directly aligned	Partially aligned	Partially aligned
Key strength	Broad international consensus, recency	Specifically for K–12, extensive pedagogical resources	Global coverage, equity focus	Well-developed for adults and workforce

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4. NATIONAL EXPERIENCE OF LEADING COUNTRIES

4.1. United States: AI4K12 and the "Prompt Literacy" initiative

In the USA, a decentralised, multi-actor approach is used to integrate AI literacy into school education. At the federal level, the AI4K12 initiative (CSTA and AAAI jointly) developed the "Five Big Ideas" concept, creating a methodological foundation for all states [9]. According to RAND research (2025), 54 percent of K–12 students already use AI tools for school tasks, yet they have not been formally taught prompting skills [10].

The "Prompty" tool presented at the 2024 AAAI Conference—an AI literacy programme specially designed for secondary school students—merits attention as a practical model of prompting instruction. In a study by Dennison et al. (2024) involving 40 students, students who used the Prompty tool showed significant gains in the skills of critically evaluating AI outputs, rewriting requests, and understanding AI limitations [11].

California formed an "AI in Education" working group in 2026 to develop a strategy for introducing learning with AI and learning about AI in a balanced manner in K–12 education. The state's action plan emphasises aligning skills such as creative thinking, flexibility, and lifelong learning with AI literacy [12].

4.2. China: Compulsory AI education and a centralised approach

From September 2025, China introduced compulsory AI literacy education for students at all levels from first grade through university, requiring at least 8 hours of AI literacy instruction per school year [13]. This constitutes one of the broadest and most systematic AI education policies globally.

Under this policy, primary school students receive gamified coding and AI familiarisation activities; secondary school students study machine learning, algorithmic ethics, and robotics; and higher education covers LLM-based work and AI project management. China has also developed and distributed the world's first dedicated AI textbook for K–12 [14].

Scholars such as Zhu Songchun (Beijing Institute for General Artificial Intelligence) have critically engaged with China's AI policy, stressing the importance of balancing pace with quality. Nevertheless, the centralised approach is attracting global educational attention for enabling wide-scale rapid implementation [13].

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4.3. South Korea: Strategic AI education policy

South Korea launched a national AI education programme in 2020 with the goal of fully integrating AI lessons into the curriculum at all grade levels by 2025 [15]. The Ministry of Education, through its KERIS (Korea Education and Research Information Service) division, developed extensive teacher training programmes. A distinctive feature of the Korean model is its widespread deployment of personalised AI tutoring systems in state schools. The aim is to improve the quality of public education and narrow the gap with expensive private tutoring services. These systems allow students to practise prompting skills—i.e., how to communicate with AI—in real time [16].

As of 2025, South Korea's research activity in AI education is also high: it ranks second in the Scopus database for articles on AI in K–12 education, after China (67 publications). This activity enables evidence-based pedagogical approaches to be applied in practice [17].

4.4. Singapore: National AI Literacy Initiative

The Singapore government announced a national programme to expand AI literacy among students and teachers: by 2026 all teachers at every education level will receive specialised AI education training [15]. Singapore's approach emphasises a balanced teaching of technical skills alongside "life skills"—critical thinking, collaboration, and creativity.

The ITE (Institute of Technical Education) expanded curriculum also ensures that at least 70 percent of study time is devoted to practical activities: working with AI tools, solving problems through prompting, and evaluating outputs are the main exercise types [18]. A strength of Singapore's system is its industry partnerships and the rapid responsiveness of education to labour market demands.

4.5. Finland: Human-centred AI education

Finland stands out for its distinctive approach to AI literacy: rather than technical skills, the priorities are critical thinking, responsible use, and civic consciousness—"human-centred AI literacy." A study published in Frontiers in Education in 2025 presented a co-designing methodology for developing human-centred AI literacy-oriented lesson plans for Finnish secondary school classrooms [19].

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The Finnish curriculum (2016, updated 2025) is based on the concept of transversal competences: digital literacy, algorithmic thinking, and information-handling skills are developed across all subject areas. AI literacy is being organically integrated into the curriculum as a new component of this concept. In 2025, Finland expanded hours for the mother tongue, mathematics, and natural sciences in its curriculum, with AI being used as an auxiliary learning tool [20].

4.6. United Kingdom: Flexible guidelines for GenAI

The UK Department for Education (DfE) continuously updates its teacher-facing guidelines on the use of generative AI in 2025. These documents regulate the use of AI tools in schools while also focusing on enabling teachers themselves to work effectively with AI [22].

A study presented at the ACM ICER 2025 Conference ("AI Literacy in K-12 and Higher Education in the Wake of Generative AI") analysed 124 empirical studies on AI literacy in UK schools. The study found that with the emergence of GenAI the concept of AI literacy expanded significantly: from a user perspective, prompting and critical evaluation skills became particularly relevant [21].

Table 2. Comparative analysis of national AI education policies

Country	Year	Approach	Target group	Role of prompting	Teacher preparation
USA	2019–2026	Decentralized (federal/state)	K–12 (all)	Interaction domain in AI4K12 framework	Voluntary, through resource centers
China	2025 (mandatory)	Centralized, top-down	Grade 1 through university	LLM-based work as separate higher-ed module	Mandatory, national program
South Korea	2020–2025	Strategic, phased	K–12 (all grades)	Practical via AI tutor systems	"AI education core teacher" program
Singapore	2024–2026	National initiative-based	All education levels	Via AI tools in practical activities	All teachers trained by 2026
Finland	2025 (updated)	Transversal competency model	K–12 (all)	Integration through critical thinking	Bridge teachers (tutor-teachers)
UK	2023–2025	Flexible guidance	Secondary and higher education	Dedicated section in GenAI guidelines	Continuously updated guidelines
Uzbekistan	2023 (SES)	Inclusion in informatics curriculum	K–12 (informatics)	No specific methodology developed yet	No specialized prompting pedagogy training

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5. BEST INTERNATIONAL PRACTICES FOR TEACHING PROMPTING SKILLS

5.1. Project-Based Learning (PBL) and prompting

The Project-Based Learning (PBL) approach recommended in "Prompt Engineering as a 21st-Century Literacy" (2025) is one of the methods with the strongest empirical basis for prompting instruction [8]. Within PBL, the student uses an AI tool in the context of solving a real problem: across research, idea-generation, revision, and completion stages, the student writes various prompts and practically measures their effectiveness.

A project presented at AAAI 2025 by Li et al. showed that when a PBL toolkit developed for K–12 students was used, students made significant progress in overcoming key barriers to AI literacy—incorrect expectations, insufficient critical evaluation capability, and failure to understand ethical issues [23].

5.2. Learning through tangible AI tools

The "Prompt Machine" study by Mori and Sugimoto (ACM DIS, 2025), conducted with 33 students aged 10–14, identified the pedagogical potential of learning prompting through a tangible GenAI tool [24]. The tangible interface creates a comfortable environment for students to collaboratively explore AI capabilities, write effective requests within school subject domains, and discuss AI limitations. The study placed particular emphasis on the teacher's facilitation role.

A similar approach is working effectively in European schools: a European Commission survey of 7,000 students across 7 countries showed that while students make extensive use of AI in everyday life, many lack sufficient knowledge of its limitations and mechanisms [5]. Working with tangible interfaces is emerging as an effective tool for closing this knowledge gap.

5.3. Conversational AI literacy and the "scaffolding" methodology

Van Brummelen et al. (AAAI, 2021–2026) developed a conversational AI literacy programme for K–12 students ("Teaching Tech to Talk"). This programme begins teaching students the foundations of prompting through dialogue with LLM-based chatbots: conditional instructions, format requirements, and iterative rewriting [21].

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The "scaffolding" methodology based on Vygotsky's Zone of Proximal Development (ZPD) is widely applied in prompting instruction. A 2025 meta-analysis (PMC, Scaffolding Metacognition in STEM) showed that AI tools can effectively support students' metacognitive development through adaptive guidance, real-time monitoring, and strategic cognitive prompts [25].

5.4. Ethical reasoning and critical evaluation

The problem raised in "Adults Lose Skills to AI. Children Never Build Them" (Psychology Today, 2026): turning AI into a primary thinking tool for a student whose independent reasoning has not yet formed may have long-term negative effects on cognitive development [26]. This issue determines the necessity of placing special emphasis on the ethical dimension of prompting instruction in all international frameworks and national policies.

In the AILit framework (2025) the "Engage" competency encompasses critically evaluating AI outputs, identifying algorithmic bias, and maintaining responsible attitudes towards AI-generated content [5]. In prompting instruction this competency must be developed simultaneously with writing requests—i.e., in the form of proactively and critically viewing and ethically evaluating the likely outcomes of a request.

6. DISCUSSION: CONCLUSIONS FROM INTERNATIONAL EXPERIENCE AND RECOMMENDATIONS FOR UZBEKISTAN

6.1. General patterns from international experience

A comparative analysis of leading countries' experience allows several general patterns to be identified.

First, prompting is no longer regarded as a separate technical skill but as a multi-dimensional competency intrinsically linked to digital citizenship, critical thinking, and creative problem-solving. This approach is consistently reflected in the AILit, AI4K12, and UNESCO frameworks.

Second, it is necessary to redefine the teacher's role in prompting instruction: the teacher must shift from transmitter of knowledge to facilitator and model of critical thinking. Singapore's and Korea's experience shows that teacher preparation is one of the most critical factors for prompting pedagogy [15].

Third, prompting is most effective when developed not confined to the informatics domain but through all subject areas. Finland's transversal

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competency approach and China's cross-subject AI instruction model confirm this point.

Fourth, a Delphi study (2026) identified three core components of AI literacy on which consensus was reached among international experts: understanding and evaluating AI systems; recognising and using AI in everyday life; and developing AI solutions to solve real problems [1]. Prompting intersects with all three components.

6.2. Integration recommendations for Uzbekistan

The Uzbekistan education system (SES 2023) can draw on its existing foundations and adapt international experience in the following directions.

Primary education (grades 1–4, ages 7–11): Based on the US AI4K12 "Exploration" stage and Finland's playful approach—"Magic sentence" templates, voice requests, chatbot dialogue games. Goal: eliminate fear of communicating with AI and master the structure of a request.

Basic education (grades 5–8, ages 11–14): Based on South Korea's AI tutoring experience and Singapore's practical activity model—cross-subject prompting projects, paired request exchanges, ethical discussions. Goal: develop contextual-analytical and strategic-algorithmic prompting skills.

Secondary education (grades 9–11, ages 14–17): Based on the US "Prompty" tool and UK GenAI guidelines—prompts portfolio, PBL approach, critical evaluation of AI outputs, ethics module. Goal: develop professional-vocational prompting skills as preparation for a future career.

Recommendations for teacher preparation:

A "Prompting Pedagogy" continuing professional development course for informatics teachers in Uzbekistan's general secondary schools should be developed and introduced during 2026–2027—a model similar to Singapore's 2026 programme;

Creation of specialised methodological guidance accounting for Uzbek-language prompting features—word order, lexical precision, terminology;

Preparation of an adapted document covering the Uzbek educational context in developing a national AI literacy framework, based on EU/OECD AILit (2025) and UNESCO AI Competency Framework (2024);

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Development of a K–12-level AI education policy document in collaboration with the Ministry of Higher and Secondary Specialised Education of the Republic of Uzbekistan.

6.3. Research limitations and future directions

The main limitation of this study is that the analysis relies primarily on open sources and international documents; empirical validation in Uzbek conditions has not been conducted. The following directions are recommended for future research:

Development and testing of a prompting skills assessment tool that accounts for the features of the Uzbek language;

Conducting pilot lessons in Uzbek schools to study the adaptation of international models to local conditions;

Creating a prompting pedagogy course for teachers and evaluating its effectiveness;

Investigating the effect of variables such as gender, socioeconomic status, and access to digital devices on the development of prompting skills.

7. CONCLUSION

This article has provided a comparative analytical examination of the experience of leading countries and international organisation frameworks in integrating AI literacy and prompting skills into school education. The following key conclusions have been formulated:

EU/OECD AILit (2025), UNESCO AI Competency Framework (2024), and the US AI4K12 initiative represent the international consensus in the field of AI literacy: prompting occupies a central position in the “Create” and “Interaction” domains of these frameworks. The 2029 PISA survey is the formal expression of international recognition in this direction.

The experience of China (2025, compulsory from grade 1), South Korea (2020–2025, strategic phased), Singapore (teacher preparation by 2026), Finland (transversal competency), and the UK (flexible guidelines) presents different effective models of prompting instruction in varied socio-cultural and educational system contexts.

The best international practices rest on three general patterns: developing prompting across subject boundaries (interdisciplinary); transitioning the teacher

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to a facilitator role; and developing ethical reasoning and critical evaluation skills simultaneously with prompting.

Based on international experience, a three-stage integration model (primary, basic, secondary education), a teacher preparation programme, and the development of a national AI literacy framework are recommended for Uzbekistan. The algorithmic thinking component of SES 2023 serves as a ready foundation for this purpose.

International experience confirms that AI literacy and prompting pedagogy will remain a strategic priority not only for the informatics domain but for the entire education system. Coordinated action in the areas of policy, methodology, and teacher preparation is needed for Uzbekistan to actively participate in these global changes.

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