

## TOWARDS A WORKFORCE WITH AI SKILLS? RESPONSES IN EDUCATION IN POLAND

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**Purpose:** The paper aims to review understanding of the terms “AI skills” and “AI literacy” in EU documents and educational frameworks, and the current state of these skills in the European workforce. To assess the present state of preparation in Poland, educational policies on and projects involving AI are analyzed.

**Design/methodology/approach:** Review of EU legislation, policy, and data from official sources on AI skills and AI literacy. Content analysis of educational policy documents, drafts and proposals. For Poland: diachronic content analysis of legislation on AI, changes in educational policy, responses in 2025 in education and projects. Summary and critical analysis of findings. Recommendations.

**Findings:** AI literacy is a complex conglomerate of skills. Education for AI literacy needs to combine knowledge, skills-getting and practical application in context. Educators need additional pedagogical skills to support this process. Poland is developing innovative localized responses to implement EU legislation which have potential for wider application.

**Research limitations/implications:** Framework documents related to both primary and secondary education, which may lead to lack of clear focus. Separate reviews of each educational level would be advised as more policy and framework documents become available. Tertiary level is omitted, although by implication many of the school-level suggestions could be adapted and applied.

**Practical implications:** Schools (and universities) are advised to establish clear policies on ethical AI use, curricula and materials for digital and AI skills training. Interdisciplinary discussion and cooperation are needed to determine responsibilities for conduct of training.

**Social implications:** Preparing young people for ethical use of AI is a requisite to maintain the analytic and critical thinking skills needed to identify bias, inaccuracy, false information and manipulation. Without such skills the pillars of democracy are endangered. Skills for working with AI are a necessity for employment.

**Originality/value:** Offers a concise, critical interdisciplinary review of AI literacy, and the training needs of young people in this area, from European and Polish perspectives, for policy makers and educators. The contents could also inform those in tertiary education responsible for liaising with businesses and industry, or researchers seeking clarification on AI literacy and training.

**Keywords:** AI literacy, AI skills training, European policy on AI, AI in Polish education.

**Category of the paper:** general review.

## 1. Introduction

According to the AI Continent Action Plan (European Commission, 2025a), the European Union (EU) aims to “become a global leader in Artificial Intelligence (AI), a leading AI continent” (p. 1). Drawing on its single market with an AI regulation policy (European Union, 2024) in place, a well-developed research context, with developing technologies and a buoyant number of AI startups, the continent offers strong potential. AI is understood here as “software developed with [machine learning, logic and knowledge based, or statistical approaches which] can for a given set of human-defined objectives, generate outputs such as content, predications, recommendations or decisions influencing the environment it interacts with” (European Commission, 2022, p. 10).

The Action Plan outlines five priority areas needed to ensure its successful implementation: an AI computing infrastructure; a source of quality data for innovation; strategic development of AI applications for use in the public sector, private enterprise and industry; monitoring to ensure ethical adherence to AI regulations and to build public confidence in AI safety; and strong, equitable human resources with the appropriate skills to support and promote these developments. To create this workforce ready to work with AI the EU aims to offer initial education and training, development and extension of skills of existing workers and also for the general populace. There is a clear need. A 2024 survey of working adults in the EU (Cedefop, 2025) showed 40-60% had low understanding of the functioning of AI, or of its possible impact.

The plans for development of AI specific skills should, however, be viewed in the context of the overall state of skills among the adult population of Europe. The latest State of the Digital Decade Report (European Commission, 2025b) reveals that 55.6% of adults have basic digital skills, considered to include daily use of online services, for example, to access public institutions, healthcare and shopping. Use of such skills is uneven across sections of societies, with lower uptake among older adults, and those who are out of work, leaving them vulnerable to exclusion. The level of skills falls well below the target of 80% by 2030.

Development will take the form of “upskilling and reskilling” (European Commission, 2025c, p. 9) with goals to encourage more adults to participate in further training. The target is that by 2030 this will encompass 60% of the adult population, while the current level (2024) stands at 39.5%. The aim is not only to build skills, but also to raise awareness, ensure AI literacy and understanding of the role of AI in society through interactive communication. Human capital is viewed as the strength of the EU and so education and training for a future workforce ready to work with AI is a priority.

## 2. Understanding the concepts of AI skills and AI literacy

Legally, AI skills are defined as “the skills, knowledge and understanding that allows providers, deployers and affected persons...to make informed deployment of AI systems, as well as gain awareness about the opportunities and risks of AI and possible harm it can cause” (EU, 2024, AI Act, Article 3(56)). The AI Act defines an AI system as “a machine-based system that is designed to operate with varying levels of autonomy and that may exhibit adaptiveness after deployment, and that, for explicit or implicit objectives, infers, from the input it receives, how to generate outputs such as predictions, content, recommendations, or decisions that can influence physical or virtual environment” (Article 3(1)). It is, however, difficult to regard AI skills in isolation, firstly, as they cannot be implemented without fluency in more general foundational skills, such as literacy, numeracy and problem-solving (OECD, 2025), where literacy refers to the ability to read and write with understanding, communicate proficiently and engage actively in society. Numeracy is viewed as having basic arithmetic skills, and problem-solving as being able to meet everyday challenges with adaptability and flexibility. Secondly, as declared during the 3rd Working Conference on Artificial Intelligence and Education (Council of Europe, 10 October, 2025), AI literacy leads on from existing work on digital, and media literacies. Indeed, the European Digital Competence Framework, DigComp 3.0 (Cosgrove, Caccia, 2025), the first version of which was published in 2013, has been expanded to include AI competence. Aimed at a range of users in work and educational contexts, it complies with policy documents such as the Digital Decade Policy Programme 2030 (European Union, 2022), the Union of Skills (European Commission, 2025c), and the AI Continent Action Plan (European Commission, 2025a).

### 2.1. Building on foundational skills

Traditional concepts of reading and writing are often associated with print and paper resources. However, digital media differ due to the more dynamic nature of the form. While a printed page may offer information in frames and illustrations to accompany the main text, these are static, and it is the reader who must adjust to view them, by moving closer, or turning the page to the light. By contrast, digital forms are more flexible and can be adjusted by the viewer to meet their needs. Yet making such adjustments requires knowledge, and learning how to do so requires skills, especially as different electronic devices operate in various ways. Thus, as shown in this simple example, digital literacy adds additional layers of knowledge and skills to basic literacy. Digital media, above all, increasingly adds voice and film elements as integral, or optional parts of a text. Accessible digital formats offer the individual reader/viewer the freedom to choose accommodations to meet specific learning needs, suit the context in which the text is being accessed, or simply match the recipient’s momentary desire.

In terms of support for understanding, while printed texts may offer glossaries or other explanatory notes, the target and content of these are determined by the creator or editor of the text. In contrast, digital texts, with associated computer and internet support, allow the reader agentically to select any word or fragment of text they choose, highlight it, copy and find relevant explanation instantaneously. With appropriate settings, this support may also be voice-operated. In the digital context, therefore, the reader needs to learn how to interact with a text, just as in the past the reader might have reached for a dictionary, thesaurus or encyclopedia for help, if they had been shown how these could augment their understanding. The DigComp 3.0 framework therefore addresses three aspects of digital competence: knowledge, skills and attitudes. Learning how to interact with digital media requires positive attitudes, such as having the will to do so, the curiosity to find answers to what is not clear, and perseverance to experiment and try different approaches until a solution is found. Each of these entails knowledge of what to look for, where, and the skills of how to search, select and evaluate the appropriateness of the possible outcomes. Digital literacy is consequently a conglomeration of competencies, enacted through different digital practices. Most often these are socially situated, as the individual reader chooses information with intent to meet a particular purpose (Darvin & Hefner, 2022).

## **2.2. Building on digital skills**

The DigComp 3.0 framework (Cosgrove & Caccia, 2025) is divided into five themes with a total of 21 competencies, described at four levels of proficiency. The aim is to build digital competence, defined as “...the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking.” (European Commission, 2019, p.10). It is important to note that the framework assumes the learner already possesses the foundational skills needed to process written, audio and visual information, and in addition has access to digital devices, the internet and necessary applications and software. Thus, the digital competences build on general literacy. The five thematic areas covered in DigComp 3.0 are:

1. Information search, evaluation, management
2. Communication and collaboration
3. Content creation
4. Safety, well-being and responsible use
5. Problem identification and solving

(Cosgrove & Caccia, 2025, p.17)

The aim here is not to give a comprehensive introduction to DigComp 3.0, but to offer an insight into how AI competencies have been incorporated within the expanded framework. Care

has been taken to place AI literacy in a wider social context than the educational institution, given that AI is already infused in daily life and will become increasingly more present. Effective participation in society and economic activity depend on competent use of AI technologies (Holmes, 2025).

Within the DigComp 3.0 framework, the range of contexts of AI application is nuanced between competences that are AI explicit, e.g. “Competence 1.1 Browsing, searching and filtering information”) 1.1.02: Identify the main features of commonly-used AI-driven and traditional search tools.” (Cosgrove & Caccia, 2025, p. 29), (all of the examples given here and below are from the Basic level, lowest of four levels), or those that implicitly include AI. These AI-implicit competencies are subdivided into four types:

1. Where the user has to decide whether to use an AI system as opposed to another digital option (e.g. CS1.1.04: “Use digital search tools to implement, refine or update basic information searches” (Cosgrove & Caccia, 2025, p. 29).

2. Where the user makes a choice whether or not to make use of an AI function offered within a digital technology (e.g. Competence 2.4 Collaborating through digital technologies. CS2.4.01 “Participate in collaborative groups via digital collaboration tools, recognizing their benefits and limitations” (Cosgrove & Caccia, 2025, p.35) (e.g. When online conferencing the participant can elect to use an AI assistant to summarize the proceedings).

3. Entail insight into the functioning of an AI system (e.g. CS1.1.03: “Recognise that digital search results or outputs can contain information that may not be relevant, and that they depend on the digital search tool used and the way that an individual specifies the search” (Cosgrove & Caccia, 2025, p. 29).

4. Entail understanding of the possible impact of a given AI system on people, and the environment (e.g. Competence 1.2 Evaluating information. CS1. 2.06. “Make a basic assessment of the reliability and credibility of digital information sources and content” (Cosgrove & Caccia, 2025, p. 30).

It could also be argued that AI literacy competencies could be differently grouped, for example, as pertaining to technological aspects of the systems and tools, practical aspects of effective use, and human aspects, relating to the impact of AI on humanity and the functioning of democratic societies (Holmes, 2025). In short, it can be implied from DigComp 3.0 that AI competencies are complex and being able to make informed decisions about their use involves knowledge and other skills. This points to the need for documents dedicated exclusively to AI competencies with information about what they entail.

### **2.3. Frameworks for AI competencies**

Recognizing the need for specific definition of AI competencies, guidance in their teaching, and insight into skills required by teachers, UNESCO published two separate AI competency frameworks for educators (2024a) and for students (2024b). For reasons of space, only the student framework will be analysed here. AI literacy is viewed as “the set of foundational

values, ethical principles, knowledge and understanding that can ensure the proper and effective use of AI by students” (UNESCO, 2024b, p. 4). Student here is understood as being of school age, from kindergarten to grade 12.

### 2.3.1. UNESCO AI Competency Framework for Students

The AI competency framework for students (UNESCO, 2024b) arranges competencies in four foundational areas: “Human-centred mindset, Ethics of AI, AI techniques and applications, and AI system design” (p. 4) (see Table 1). AI is therefore placed within a human context, focused on maintaining human rights and accountability, used for the common good (UNESCO, 2022, 2023).

**Table 1.**

*AI Competency Framework for Students (UNESCO, 2025b): Areas*

AI Competency Framework for Students: Areas
Human-centred mindset
Ethics of AI
AI techniques and application
AI system design

Source: Text: UNESCO, 2025b, p. 4. Table: own work.

For education, the emphasis is on ensuring human agency, respect, equity and inclusion, in sustainable ways. The importance of providing affordances for deep learning through human interaction, as opposed to rote, superficial tasks is highlighted, with implicit understanding that teaching and learning take place with AI support, but are not governed by it. In keeping with this, the framework aims to “help students acquire the values, knowledge and skills necessary to examine and understand AI critically from a holistic perspective, including its ethical, social and technical dimensions” (Giannini, 2024). The approach is that “AI competencies are ultimately a set of interdisciplinary, general abilities and value orientations that extend beyond particular AI domains or tools” (UNESCO 2024b, p. 18).

The document is presented as an international “reference framework” (UNESCO, 2024b, p. 12) targeted for those responsible for preparing policy, curricula, or programs for students, or to provide information for experienced educators. The AI Competency Framework for Students (AI CFS) (UNESCO, 2024b) aims to encourage critical considerations of the nature, use and impact of AI and so the purposes it could, should or should not be used for. Students become aware of the inherent risks or threats of AI in order to be able to make measured judgements in the future. Building on the four foundational areas described above, are twelve interconnected blocks of competences, developing through a progression of three levels: understand, apply and create, thus allowing the building of a spiral syllabus, where the same competency can be re-visited but with a new focus. This provides opportunities for review and consolidation before new aspects, which extend the level of skill and awareness, are added. For example, the aspect “Human-centred mindset” includes three blocks: “Human agency” (Understand), “Human Accountability” (Apply) and “Citizenship in the era of AI” (Create) (p. 19), (see Table 2). Each of these is fully described in the framework.

**Table 2.***AI Competency Framework for Students (UNESCO, 2025b): Example of levels*

Human-centred mindset	
Human agency	Understand
Human accountability	Apply
Citizenship in the era of AI	Create

Source: adapted from UNESCO, 2025b, Table 1, p. 19.

The authors acknowledge that not all students will reach the “Create” level at school for reasons of time, possibility, or interest, yet the Understand and Apply levels are proposed as mandatory. The way each of the competences are projected to develop is clearly explained in the document for each of the three levels (understand, apply, create). AI CFS offers a set of competency descriptors, a set of goals for the proposed curriculum, possible didactic approaches to implement the competencies and contexts in which the learning may take place. This allows for the framework to be used to create programs for formal education, but also for informal learning beyond school, in the home or community. To ensure inclusion, the learning environments include use of offline materials in paper form, or recordings, not only those needing internet and a digital device. The suggested outlines are designed to inspire educators to create varied, interesting content with clear pedagogical aims. Alternatively, it is proposed that the document could be used as a starting point for critical evaluation of existing policy, awareness-raising of the ethical issues underlying AI use, or development of understanding of AI competences. Companion documents (UNESCO, 2022b, 2024c) provide case studies showing how AI competencies could be taught in schools as a separate subject, across the curriculum through a number of subjects, added into associated subject programmes, such as ICT, or as an additional subject in extracurricular activities. Samples are also included in the AI CFS document.

Advice on curriculum design is offered, with specific examples. For implementation, the need for good internet access, digital devices, suitable software and appropriate applications is emphasized, in addition to provision of continuing support for teacher education on AI, including up-skilling, as needed. Guidelines for developing criterion-referenced descriptors for assessment are offered and suggestions made for scenarios and tasks for assessment purposes, with examples given for illustration. It is stressed that the AI CFS is envisaged as a flexible starting point on which policy makers and designers in many contexts can work to create curricula for their situations, reviewing and adapting them as AI technologies develop.

### 2.3.2. EU-OECD AI Literacy Framework

According to EU legislation, as of February 2025 enterprises producing, using or dealing with AI systems, were required to ensure access to training in necessary AI literacy skills to employees, together with all those in contact with the systems (EU, 2024, Article 4, AI Act), yet AI literacy is not clearly understood. Also unclear is how to educate for it and integrate it into existing school subject curricula. A 2022 UNESCO study reported that only 15 of 190 countries participating in a survey had produced, or were developing, curricula for AI skills

in schools. Young people are already engaging with AI tools and expressing concerns about equity of access, fairness and inclusion in education as a result of its use (Vodafone Foundation, 2024). The fact that AI is designed to interact in human-like ways is dangerously misleading and may mean that the actual capabilities of the systems may be misinterpreted by the unaware, necessitating awareness-raising in this respect (Holmes, 2025). Some AI literacy training available has been created by commercial entities seeking to promote specific AI systems or applications and is not without bias (UNESCO, 2024a). In response, the European Commission, in cooperation with the OECD, published a draft version of the AI Literacy Framework (AI Lit Framework) (May, 2025) for consultation and feedback. The document (OECD, 2025) is compatible with other EU policy, namely the Digital Education Action Plan 2012-2027 (European Commission, 2020), the Ethics Guidelines for Trustworthy AI (High-Level Expert Group on Artificial Intelligence, 2019), the Ethical guidelines on the use of Artificial intelligence and data for educators (European Commission, 2022) and the 2022 version of DigComp (2.2), recently succeeded by DigComp 3.0 (see above).

AI literacy in the Draft Framework is seen as “the technical knowledge, durable skills, and future-ready attitudes required to thrive in a world influenced by AI. It enables learners to engage, create with, manage, and design AI, while critically evaluating its benefits, risks, and ethical implications” (OECD, 2025, p. 6). Echoing concerns from the UNESCO AI CFS, the OECD document holds that “AI literacy must be grounded in trusted information, a focus on ethics, and a commitment to social good” (p. 6.). However, the onus in this framework appears to be placed on the teacher, who is expected to create the conditions for learning about AI, having first developed their own competencies, within their own subject, if that is appropriate. It is also acknowledged that learning about AI takes place across both primary and secondary education, as well as in informal contexts outside school. The AI Lit Framework is addressed in the first place to teachers, then to teacher educators, those in leadership positions, including policy makers, and designers of educational materials.

DigComp, the AI CFS and the AI Competency Framework for Teachers (UNESCO, 2024a), are acknowledged as providing important input for the AI Lit framework, as is work by Mills et al. (2024) and the AI4K12 Initiative (2022). Drawing on work that has gone before, the draft OECD AI Lit Framework draws out three themes underlying AI literacy: (1) Knowledge of the workings of AI and Machine Learning, (2) Key human skills needed for effective AI collaboration, and (3) Influences of AI at individual, societal and environmental levels. Much of what is used to justify these themes echoes the UNESCO framework (2024b), although some additional detail is offered. In theme (1), the data gathering processes used to train AI and possible biases caused by statistical modelling are highlighted. The body of work from computer science done on the “Big Five Ideas about AI” (Touretzky et al., 2019) is referenced, which proposes that children need to understand how AI works before being able to be aware of its inherent problems. Theme (2) draws on ideas from media literacy, computational thinking and algorithmic literacy. The rationale for Theme (3) cites the

UNESCO framework (2024b), DigComp 2.2 and EU policy documents discussed earlier in this paper. Concerns are raised about the negative environmental impact of AI, draining energy and water resources, and questions are asked about autonomy and ownership arising from the data gathering processes used to train the AI. Granted, this is a draft document, yet it appears to be strongly derivative, offering little beyond the UNESCO (2024b) framework.

The principles on which the OECD framework are based are stated as being “Interdisciplinary, Foundational, Illustrative, Global, Practical and Durable” (OECD, 2025, p. 12). “Illustrative” refers to the “scenarios and exemplars to be included” (p. 12), “global” refers to the reach of the views incorporated, which may possibly refer to opinions to be gathered from the feedback process, and “durable” refers to the claim that the framework highlights “knowledge and skills that will remain relevant as AI evolves” (p. 12) without further elaboration. Brief outlines of “Learning Personas” (p. 12) are offered, illustrating young people of 10, 13, 15 and 18 using AI in practical ways.

Competencies are arranged into four areas: “Engaging with AI, Creating with AI, Managing AI, and Designing AI” (OECD, 2025, p. 15). At the “Engaging” level, focus is on recognition of AI in use and evaluation of outputs with a view to developing critical awareness. At the “Creating” level the student interacts with AI to produce content and critically evaluate it. At the “Managing” level focus is on use of AI for enhancement of human functionality, exploring the various roles AI can take. The student is expected to evaluate not only the quality of the output, but also “whether AI’s role aligns with their goals and values” (p.15). At the “Designing” level learners do practical tasks “to examine how data, design choices, and model behavior influence the fairness, usefulness and impact of AI systems” (p. 15), apparently applying concepts from Design Thinking. Like DigComp 3.0, the framework builds competencies on knowledge, skills and attitudes, and ethics are also incorporated. “Knowledge” incorporates understanding the characteristics of AI, how it mirrors human decisions and views, its potential to change and enhance human activity, its scope and limitations, and how it can affect social and civic activity. “Skills” incorporate general soft skills of critical thinking, communication, collaboration, creativity and problem-solving, echoing the World Economic Forum Future of Jobs report (2025), but adds “computational thinking” (p. 18), which is viewed as the ability to analyse a problem to give instructions, and “self and social awareness” (p. 18). “Attitudes” include being responsible with empathy and demonstrating flexibility, curiosity and inventiveness.

The framework offers a total of 19 Knowledge statements for each of the thematic areas., e.g. “K1.4. AI systems operate differently depending on their purpose, whether to create, predict, recommend, or respond” (p. 19). “Competence” in this framework is defined as “a learning expectation that reflects technical knowledge, durable skills and future- ready attitudes” (p. 25), incidentally repeating its wording of the definition of AI literacy. The Skills are currently presented as imperatives, e.g. “Critical Thinking: Evaluate AI-generated content for accuracy, fairness and bias to make informed and ethical decisions” (p. 21) followed by

How can I / How do I...? questions addressed to the user. Some elaboration is offered but in extremely general terms. The Attitudes are amplified by descriptors, some of which are prescriptive, e.g. “They [i.e. students] believe everyone has the right to understand how AI affects them and to make informed decisions about its use” or “They consider learning to be an ongoing process and enjoy experimenting, believing that meaningful discoveries can happen through exploration” (p. 23). The “competences” are presented in the four areas (Engaging with AI etc.) and are also in the form of imperative statements (Recognise, Evaluate, Examine etc.), e.g. “Recognise AI’s roles and influence in different contexts” (p. 27(1)). Each has accompanying Knowledge statements and Attitudes given. The competence statement is followed by descriptors in the imperative form stating what learners do and two scenarios, one at the primary and the other at the secondary school level. Of concern is the suggestion of prescription, “although skills and attitudes have broad applicability, the framework highlights combinations that best support each competence” (p. 25). A possible explanation of this is that the (supposedly) secondary purpose of the framework (OECD, 2025, p. 2) is to “contribute to the PISA [Program for International Student Assessment] 2029 Media and Artificial Literacy Assessment” (p. 2). Schleicher (May 21, 2025), however, overtly states that the AI Lit Framework “will also provide the foundation for the first assessment of AI literacy” (section Integrating AI Literacy, para. 1). Indeed, the format of the Framework is more reminiscent of a test specifications document than a reference framework, deviating from the more usual operational aims in the form of “can do” statements for planned learner achievement and instead appearing to take an authoritarian, prescriptive stance, as shown, even towards what students are expected to believe. It is to be hoped that this changes in the final version.

The draft framework ends with an outline of the feedback and consultation process. The final version of the document, which will “reflect international input” (OECD, 2025, p. 39) is planned for 2026, together with a “limited set of AI literacy exemplars” (p. 39). The final section invites the reader to use a large language model chatbot (AI) by clicking a hyperlinked button which leads to an external (TeachAI) website. This gives a description of the prompts given to the bot. However, no information is overtly given about privacy or use of data. It is only returning to the main site, searching the page, finding and opening the Privacy Policy that it can be found that any data from interaction with the chatbot, “will be collected, processed and stored in the United States” (TeachAI 2025, About TeachAI para. 2). It could be claimed that there would appear to be a mismatch between claims about the importance of ethics in the Framework and this example of application, which is unfortunate for a document of this stature.

This section has aimed to provide an overview of EU legislation and policy on AI and to introduce two important frameworks proposed to support the work of policy makers, curriculum and program designers and educators in planning support for education and training in AI competencies. The following section turns to Poland, to provide a case study of policy and educational applications for support of AI competencies.

### 3. Policies and education for AI in practice: a case study of Poland

According to the Spotlight on Jobs and Skills Poland (Cedefop, 2025b), while the Polish workforce is in general well-educated and qualified (European Skills Index 2024 in Cedefop, 2025b) there is room for growth in activation and development of skills. By contrast, digital skills are below the EU average for the “above basic” level, and two thirds of young adults (aged 25-34) lack even basic digital skills. The goal is for basic digital skills to reach 70% by 2030. There is a low take up of training opportunities by those in the workforce (9% in 2023) with very low levels of women (1% in comparison to the EU, 17%) or those over 50 (6%, EU, 11%). ICT specialists comprise only 4.3% of the workforce, one of the lowest percentages in the EU (Cedefop, 2025).

The Policy for Development of Artificial Intelligence for Poland from 2020 (Polish Government, 2020), hereafter AI Policy 2020, acknowledged the need to raise digital competencies in Polish society and to create flexible forms of reskilling and upskilling to allow this to take place. The priority aims were to create a context for AI to support economic growth and social well-being, followed by having a populace with above basic skills in the use of AI for personal and professional purposes and a well-run state administration using AI.

In the priorities set within the Program for Development of Digital Competences (2023) (Program Rozwoju Kompetencji Cyfrowych) targets are that by 2030 Poland will achieve the EU target level for adult digital skills. Considerable investment has been made in improving overall access to fast digital infrastructure, and updating of hardware and internet access in schools. Children of school age from pre-school to the end of secondary education and young people in university are seen as a priority area for digital upskilling, which includes use of AI, (for more information, see Morańska, 2024). Compliant with this, priorities for educational policy for the academic years 2024-2025 and 2025-2026 included development of skills for safe use of the internet, critical analytical skills with regard to information from online sources and appropriate use of digital and AI technology by teachers (Polish Government, 21.05.2025).

#### 3.1. Diachronic overview: Polish education policy and schools during 2025

In May 2025 the Digital Education Section of the Committee on Informatics (DESCI, 2025), Polish Academy of Sciences (PAN), published *AI in Polish Schools. White Book*, (hereafter the *White Book*) calling for deep-seated change in attitudes and approaches to AI in education, bringing it out of isolation as a sub-section of computer studies and the domain of ICT teachers into wide-scale practical application by all educators across the curriculum. Citing the necessity to acknowledge the major changes in society caused by rapid development of AI technologies and the need for constructive adaptation to its disruption, the group made a series of recommendations.

In July 2025 announcement was made by the Ministry of National Education of a planned curriculum change for schools (Polish government, 09.07.25), to be called “Reform26: Compass for tomorrow”, which (in the spirit of the *White Book* recommendations) included threading use of new technologies across all subjects, rather than limiting them to ICT. This initiative also included upskilling of educators and enhancement of school digital infrastructure. A new subject, Media Literacy, was planned to start in grade 4 primary from September 2026 (The proposed changes, part of a wider reform package, were vetoed by the Polish President on 18.12.2025, on the grounds of the proposed speed of implementation of the changes, and inadequate social consultation on the proposal. No overt objection was made, however, to the digital and AI skills concept).

NASK [Naukowa i Akademicka Sieć Komputerowa. Research and Academic Computer Network] is a national research institution under the jurisdiction of the Ministry for Digitalization, founded in 2023. Tasked with the development of digital infrastructure and telecommunications, it focuses on cybersecurity, AI development, and education for safe and responsible use of new technologies. In order to obtain empirical information about the school situation following the launch of ChatGPT (2022), a questionnaire study was carried out in December 2023 among a representative sample of 995 primary school teachers of grades 4-8 (learners aged between 9 and 15 years), and interviews with 20 teachers declared as active users of generative AI. Findings (Pyżalski ed., 2025), revealed considerable anxiety and doubt among teachers with regard to the impact of generative AI on teaching and learning in school. Issues such as cognitive debt (Kosmyrna et al., 2025) and classroom management challenges were among those most frequently raised. Responses overall were, however, extremely varied. Teachers underlined the need for clear policy on AI use in school and by learners to avoid reduction of critical thinking. Learner difficulty in recognizing online information as fake was also highlighted. The authors stress that practical and sensible application of generative AI can be constructive, provided it is accompanied by understanding of its capabilities and discernment of when and how it can or should not be used.

In September 2025 a new program, “Digital Student 2024-2029” (Cyfrowy uczeń), to give funding to local authorities to support development of digital skills for pre-school, primary and secondary schools, was announced (Polish government, 18.09.2025). This will include development of new technologies, including AI, in school; teaching approaches and use of digital resources; training and upskilling of teachers; new science and AI laboratories; and hardware for learners, teachers and schools. The program is open not only to schools but also to other institutions offering extra-curricular activities, care and psychological support for young people and those with special needs. In 2025 funding was open only at the pre-school level and focused on support for specific learning needs. Teaching materials offered within the program are designed, for example, for speech and language therapy, and early literacy training.

In November 2025 revision was made to the AI Policy 2020 in response to the rapid and dynamic development of AI, with a new document called the Policy for Development of Artificial Intelligence for Poland to 2030 (Polish Government, 17.11.2025). The emphasis is placed firmly on ensuring human-centred and trustworthy AI development in a cybersecure environment, which will benefit economic growth, but also support social well-being for all. Clear and concrete aims are laid out. Implementation of the EU policies Apply AI Strategy (2025), which highlights specific sectors of industry for AI application, and Apply AI in Science (2025), which promotes and supports research on AI and implementation of outcomes, are highlighted. In this context, attention is also given to the newly developed Polish Large Language Model (PLLuM), an initiative of the Human-centric Innovative Vision for European AI consortium (HIVE), which is currently being piloted in local administration offices (Polish, a highly inflected language, offers potential for greater precision in prompts to AI than English). As in the AI 2020 policy, the need for a highly skilled workforce is acknowledged, but this has now been brought to the fore as a fundamental requirement for AI development, alongside efficient infrastructure.

Relevant to skills-development among educators and young people, Projekt Zbadai (Explore AI), a 3-year educational project initiated by the Copernicus Science Centre (CSC), Warsaw and funded by the Ministry of National Education, launched in December 2025. It aims to support the Digital Student program, (which will initially focus on updating school digital infrastructure), by building teacher skills and curiosity about AI and confidence in its use. The plan is that teachers will then be able to enthuse their students (Copernicus Science Centre, 2025). One part of the project will comprise a 5-module e-learning course for educators which introduces the workings of AI systems, prompt design, use of AI in data analysis and production of multimedia content, practical application of AI in education, and associated legal and ethical aspects (based on Witczak, 2026, own translation).

A central part of the project Explore AI is to be experimental, with the cooperation of 100 primary and 100 secondary schools throughout Poland, 930 educators and 13, 000 students (Copernicus Science Centre, 2025). For one semester, in each of the schools, a group of 2 teachers and at least 15 students will carry out one of 8 interdisciplinary projects created by researchers and experts from the CSC, a choice of 4 projects at each level. Teachers and students together will formulate research questions and test them during the cross-curricular exploratory projects, using AI to support in developing their understanding of the world. In this way the project aims not only to build AI skills but also independence in critical and analytic thinking through teamwork. The experts will provide support at all stages. The project teams will collect, analyze, interpret and present data and produce reports. At the same time, materials produced and projects carried out are to be shared on a dedicated online platform. The final product is to be a publication with recommendations for conducting school-based research projects. This could be used to cascade the approach into a wider network of schools for further implementation (Copernicus Science Centre, 2025).

This overview is, for reasons of space, selective, but aims to capture the dynamism of the changes underway during this phase of the AI transformation.

#### 4. Discussion

Poland has well-developed digital infrastructure and is investing substantially in modernizing schools. However, both in the workplace and in educational institutions it would seem that there is still much to do in order to meet EU digital and AI skill targets. There does not yet appear to be a widely-established culture of continuing and lifelong learning in the adult population and this is a major drawback at a time of rapid technological change. In contrast to a top-down approach, where central policy decides and promotes, sustained change in education across the world has been found to start with innovation from individual teachers, or small groups of enthusiasts (e.g. <https://superbelfrzy.edu.pl/>). Communities of practice may build through contact and cooperation in face-to-face development workshops, projects, teacher organizations, online networking and dedicated special interest groups on social media. Long-term change is maintained by a supportive climate and empathetic school leadership (e.g. Fullan, 2002). Indeed, change at the level of the school is recognized as supporting digitalization (see Petterson, 2021 for a review).

While centralized definitions, goals, and even legislation, can act as levers for change, guidelines and frameworks need to be carefully adapted to fit local contexts and participants. The brief description of AI-related events of 2025 in Poland, attempted to offer a glimpse of this localization process taking place. Teacher responses reported here, although from the end of 2023 and so in this time of rapid change perhaps already no longer representative, offer indicators for future research directions.

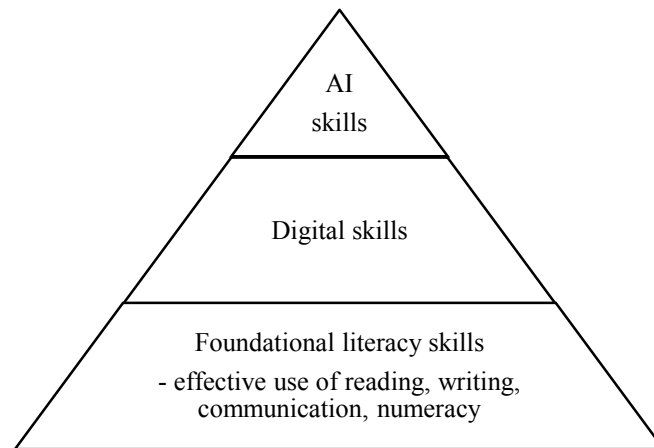
Of key importance is understanding the process of transition to incorporation of AI use in educational institutions and workplaces, and study of the factors which promote or inhibit safe and responsible AI adoption (Mustafa et al., 2024). Any change process is complex, and uptake of a new digital tool is characterized by early adopters, resisters and those challenged or rendered helpless by the situation. For this reason, education and training in AI literacy, digital skills and critical/analytic thinking needs to follow principles of universal design, allowing accessibility for all, regardless of their levels of knowledge, skill or attitude. This creates a challenge for course creators and educators. It is unlikely that transmission-focused courses, already frequently found online, will enable uptake and application of new skills. A different, interactive and supported approach is needed, which by design, includes practical application as part of its content. Hence, the Polish Project Zbadai (Explore AI) is of interest. Combining various approaches and bringing together researchers, methodology experts and practicing teachers in project-based learning in school, this provides affordances for uptake of skills at

many levels and in various modes, key characteristics of universal design. In addition, the teacher themselves is pushed into the role of reflective practitioner, observing and analyzing the process, while at the same time taking an active guiding role. This model framework can serve as a blueprint for parallel application in different contexts. It offers potential for local grassroots actions which can bring together different stakeholders and actors, engage industry and institutions working with a common purpose and for mutual benefit.

From a research perspective, the complex, layered nature of AI literacy, with many skills co-engaged simultaneously, makes operationalization of *responsible and aware AI use* challenging. It could well be that, as with digital skills, (see the International Computer Driving License) a form of “driving licence” is needed, entailing demonstration of both knowledge and evidence-based practice. Educators in turn not only need developed practical skills in AI application, but also pedagogical skills to support others in the skill-getting process. Here again the Zbadai (Explore AI) project is promising, potentially offering insights on the pedagogical competencies entailed in facilitating AI literacy. These are complex research studies, requiring interdisciplinary teams. To add another layer, AI itself, at least in the form of data mining, would facilitate analysis of the large quantities of data involved. However, the research design would clearly also need to include human verification processes to validate the results.

## 5. Conclusion

In conclusion, analysis of documents from different European bodies and world organizations on aspects of AI literacy, has helped provide a picture of the multifaceted nature of the competencies needed for the individual wishing to use AI constructively, sensibly and ethically. AI skills have been found to be the top level of a pyramid structure (see Figure 1). The base of the pyramid is made up of foundation skills of reading with understanding, writing, communicating, and basic numerical skills. On to this are laid the second level of digital skills, which involve being able to carry out the base level foundational skills with use of a computer and other digital devices, safely, ethically and responsibly. The top tier, AI skills, involves use of all the skills included in the lower layers, understanding how their application can be assisted by AI and how human skills may be augmented by AI use. A key requisite to application of AI is understanding how it works, the possible threats this may entail, and how these can be addressed in responsible use for the benefit of an inclusive human-centred society. All the layers of the pyramid together make up what is known as AI literacy (Figure 1).



**Figure 1.** The AI literacy Pyramid.

Source: own work.

As a result, it is not surprising that employers have had difficulty offering the reskilling and upskilling courses required by the AI Act. The skills set is complex and extensive. Logically, for a workforce prepared to work with AI, this means that most of the skills needed in the workplace should already be in place by the end of compulsory education. As has been seen in the Poland case study, digital skills- the important second tier of the pyramid- are lacking in young adults. This points to the urgent need for provision of practical and relevant training, in areas outlined in DigComp 3.0, for secondary and university students. In addition, short courses, perhaps in the form of micro-credentials, are called for to upskill existing workers. In order to have the number of providers with the relevant knowledge, attitudes and skills and pedagogical expertise, given the shortage of ICT specialists, those with related expertise should be considered. Tertiary institutions have potential in these respects.

Providing an overview of legal, administrative and educational documents joined by a common theme has allowed a nuanced interpretation of the knowledge, skills and attitudes involved in AI literacy. Of these, perhaps the most important are self-knowledge, perseverance, curiosity and optimism. In the end, principled AI use is a question of personal integrity which involves understanding one's own beliefs and priorities. The process of learning in a rapidly changing world requires the courage and determination to continue, despite difficulty, uncertainty and moments of failure. Opening up to the change process is helped by being curious about what is happening and positive that ultimately there will be a satisfactory outcome, even if it is only momentary. In short, the process of exploring this plethora of information offers material for reflection, stimulus for further inquiry and, potentially, ideas for interdisciplinary projects.

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