



European
Commission



Education about AI

Briefing report No. 4

by the European Digital Education Hub's squad on artificial intelligence in education

**EUROPEAN
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Introduction

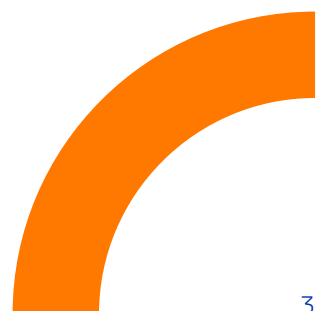
Artificial intelligence education is a highly active field, with new resources and tools arising continuously. In previous briefing reports, you may have read about teaching for, with, and about AI, supporting teachers, and identifying the necessary competences for them to become fluent in emerging technologies. With all these dynamic changes, this briefing report aims to highlight the importance of integrating AI literacy into both existing and new curricula. Our focus will be on providing valuable ideas and concrete examples for effectively incorporating AI education.

In the Eurydice report "[Informatics education at school in Europe](#)", artificial intelligence is mentioned in the "Awareness and Empowerment" area (one of ten areas analysed) in the context of awareness of the impact of emerging technologies. The report points out that while the "Awareness and Empowerment" area is an integral part of informatics, it is often covered in other subjects such as social sciences. As it is linked to transversal competencies like critical thinking and responsibility, it can be taught in all subjects. In addition, AI is mentioned in the context of continuous professional development for teachers and curriculum reforms, with the intention of including artificial intelligence literacy and data literacy ([European Commission / EACEA / Eurydice, 2022](#)).

The report [AI Watch National Strategies on Artificial Intelligence: A European Perspective](#) mentions that some Member States have national AI strategies with dedicated sections on AI skills, mostly focused on higher education, but some also address secondary, primary or pre-school levels.

According to the comprehensive 2022 UNESCO report "[K-12 AI curricula: a mapping of government-endorsed AI curricula](#)" only a limited number of government-endorsed AI curricula had been developed and implemented by 2021 when mapping was conducted. The UNESCO report emphasises that further research is needed to determine the extent to which K–12 curriculum reform will include the development and implementation of AI curricula.

This is why the current document proposes some examples of different countries' approaches on education about AI. As you will see below, some countries have chosen to develop new curricula, while others integrated AI into their existing ones.





Country Use-Cases

Belgium

Education in Belgium is managed, controlled and financed by one of the 3 linguistic communities: Flemish, French and German-speaking. Each community's education system operates as a distinct federal region based on the language of that community. The Federation Wallonia & Brussels focuses on French, the Flemish Community on Dutch, and the German-Speaking Community on German. One notable aspect of this organisation is the high degree of independence of each community, which leads to different approaches regarding the integration of AI into curricula.

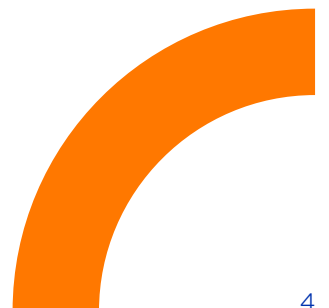
Regarding digital education, the most recent report from the [EU Education and Training Monitor](#) highlights the following:

- The Flemish Community is actively involved in curricular reform, digital equipment, strengthening media literacy, and creating innovative learning environments ([Vlaamse Regering 2019, Strategisch Plan Geletterdheid 2017-2024](#)). Each school is encouraged to have a digital strategy. Digital competences, based on the DigComp framework, are gradually being integrated into the new primary and secondary curricula as cross-curricular attainment goals.

- The French Community is in the process of drafting curricula for pupils up to 15 years old and teacher training programs, based on an adaptation of the DigComp framework (Digital education at school in Europe [Eurydice, 2019](#)). However, planned reforms of initial teacher training and curricula are facing delays and will be rolled out gradually. Measures to improve students' digital competences are not yet in place.

Although AI competences are briefly mentioned in the new curricula, there is little detail provided regarding what should be taught to students. A few Belgian organisations, mostly from the non-formal education sector, are starting to implement drafts of AI curricula aimed at the primary and secondary schools. The most notable initiatives are:

- At the federal level: [The AI4Inclusive Education](#) consortium, funded by the Digital Belgium Skills Fund
- In the Flemish Community: [Dwengo, Amaj!](#), and the [Sint-Lievescollege \(Prof. Robbe Wulgaert\)](#)
- In the French Community: [Namur University Scholl-IT](#), [Edu-Lab](#)





Ireland

The Department of Education in Ireland published the [Digital Strategy for Schools in 2022](#). It serves as a roadmap for schools to develop an overall direction for school management and in utilising digital technology in educational settings at both primary and post-primary levels. It aligns with the aims and objectives of the European Digital Education Plan and is built on three main pillars or axes.

Pillar 1: Supporting the embedding of digital technologies in teaching, learning and assessment

Pillar 2: Digital Technology Infrastructure

Pillar 3: Looking to the future: policy, research and digital leadership

It is within Pillar 3 that specific mention is made of artificial intelligence. Building on an earlier document, the [National Strategy on Artificial Intelligence \(AI\) titled 'AI-Here for Good'](#), there is a specific mention of the need to ensure that the strategy aims to build an understanding of how data and AI may be applied in an educational context.

Using the Digital Strategy document as a basis, some curriculum work has been done in the past year to develop pupils' understanding of AI. A specific module called '[AI in my Life](#)' has been developed by Dublin City University (DCU) and offered to all upper secondary schools in 2023. This module follows a [pilot](#) program involving approximately 8,000 secondary school pupils from 100 schools in 2022. The module, which covers about 20 hours, focuses on topics such as learning about AI and how it works, exploring ethical and privacy implications, and evaluating the role of AI in their lives and society. It also explores future career paths in AI.





Italy

Since the pandemic and the lockdown, which necessitated distance learning, Italy has introduced several reforms and funding to promote digital skills and literacy among teachers and learners. The latest action plan is [4.0 Schools \(2022\)](#). While the Next Generation Classrooms initiative generally focuses on teaching/learning spaces and methods to improve metacognitive (critical thinking, creative thinking, learning to learn and self-regulation) and non-cognitive skills (empathy, self-efficacy, responsibility and collaboration), the Next Generation Labs specifically addresses the training of specialised digital skills from secondary school onwards. These labs cover topics such as robotics and automation, cybersecurity or data processing. The labs are designed to be fluid learning environments where different experiences can be lived, personal skills can be developed in collaboration with peers, teamwork can be learned, and specific job-oriented digital skills can be acquired across different economic sectors, allowing the management of flexible curricula oriented towards new jobs that require more advanced digital skills.

In the Italian education system, the curriculum is based on guidelines that provide schools with a

framework they must comply with when defining their own curriculum. To this end the guidelines describe the general and specific learning objectives, compulsory subjects, and timetables. Freedom of teaching is a principle outlined in the Italian Constitution (Article 33). The choice and use of teaching methods and materials must be consistent with the school curriculum included in the Three-year Educational Offer Plan (Piano triennale dell'offerta formativa – PTOF), which, in turn, must be consistent with the general and educational objectives of the national guidelines for the curriculum (Indicazioni nazionali per il curriculum). The document "[National Indications and New Scenarios](#)," referenced in Ministerial Note No. 3645 of March 1, 2018, provides schools with new guidelines for updating school curricula to computational thinking and the development of digital skills. While safeguarding the freedom in teaching, the National Guidelines for the curriculum suggest some basic methodological approaches, such as, taking advantage of pupils' experiences and knowledge, promoting exploration and discovery activities, encouraging cooperative learning, developing awareness of one's own learning method, carrying out in-lab learning, etc. The most common teaching methods used are frontal teaching,





exercises, and individual/group work. Schools generally have facilities such as a gymnasium, a library and ICT, science, and multimedia laboratories. Almost all classrooms (99%) are equipped with interactive whiteboards (IWB). Teachers at all grades can choose the textbooks and other teaching materials for their classes. Textbooks can be in digital or mixed versions (either paper or paper and digital versions), all including integrative digital content, and must align with the curriculum and the school's Three-year Educational Offer Plan (PTOF). In addition, for specific subjects, schools can create their own digital teaching tools which students can use as textbooks (law 128/2013).

[Civic education](#) was introduced **for all school grades** in 2020/2021 and the lesson time could be used to teach transdisciplinary topics like in this case AI skills, focusing on ethical, societal and political aspects of AI. Students can learn AI ethics, discussion topics like privacy, data security, and bias. They can understand the influence of AI on politics and democracy, such as its potential role in misinformation campaigns. The social impact of AI, such as employment and inequality, and the intersection of AI and law could be discussion points to foster students' understanding of how AI impacts daily life.



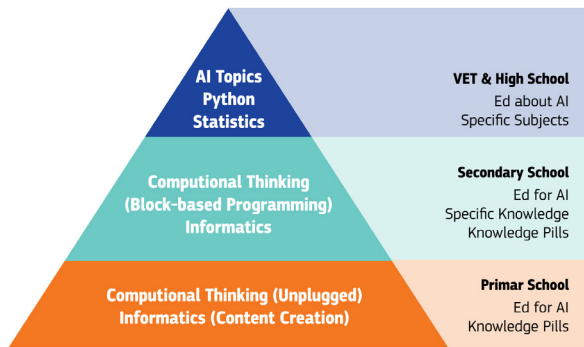


Spain

The new education law in Spain (LOMLOE) includes contents of AI in different levels, from primary school to high school, mainly related with technology subjects.

But the strategy is open, and other fields and subjects from humanities also include AI topics.

The following graphic provides an overview of the roadmap for integrating AI into curricula across different education levels.



As can be observed, at the lower levels (upper primary school, 10-12 years old), the focus is on developing computational thinking and basic digital skills, such as computer usage. AI concepts are not specifically taught at this level, but teachers can incorporate activities related to technical thinking in general. Moving on to secondary school, at the lower levels (12-14 years old), the aim is to build upon the primary school strategy by introducing

block-based programming alongside basic training in mathematics, logic, and informatics. At the upper secondary school level (14-16 years old), teachers can use specific AI resources within their subjects or even create dedicated AI courses. However, the approach should be geared towards “teaching for AI”, where students do not require advanced programming skills or background knowledge. Lastly, in high school and vocational education, the emphasis shifts to a “teaching about AI” approach, which is more technical in nature. Students are expected to program AI-based solutions and learn about science of data and machine learning.

Below, you will find a specific example of an AI curriculum implemented in the Galician region, following national guidelines. The curriculum highlights the AI skills and knowledge incorporated into the mentioned subjects:

Digitisation (4th level – 15 years old)

Block 3. Computational thinking:

- CA3.1. Understand the foundation of artificial intelligence algorithms, valuing the importance of making ethical use of information processing in the development of applications.
- Introduction to artificial intelligence. Creating practical applications of AI.





Block 5. Critical digital citizenship:

- Ethics in the use of data and digital tools: artificial intelligence, algorithmic and ideological biases, technological sovereignty and sustainable digitisation.

Education in civic and ethical Values (3rd level – 14 years old)

Block 2. Society, justice, and democracy

- The challenge of artificial intelligence.

Technology (4th level – 15 years old)

Block 4. Programming, automation, and robotics

- CA4.2. Use, with a critical and ethical sense, computer applications and digital control and simulation technologies, such as the Internet of Things, big data and/or artificial intelligence.
- Introduction to artificial intelligence and big data: practical applications. Shared spaces and virtual disks.

Technology and Digitiation (2nd level – 13 years old)

Block 4. Programming, control, and robotics

- CA4.2 Program simple applications for different devices (computers, mobile devices, and others) using programming elements appropriately and applying editing tools and artificial intelligence modules that add functionality.
- Introduction to artificial intelligence.

Philosophy (1st high school – 16 years old)

Block 2. Knowledge and reality

- The mind-body problem from the modern age to artificial intelligence.

Technology and Engineering II (2nd high school – 17 years old)

Block 5. Programming, automation, and control

- Artificial intelligence, big data, distributed databases and cyber security.

The following are the specific AI subjects that will start in year 2023/24. The first one follows the “Education for AI” approach, while the second one follows the “Education about AI” one:

AI for society (4º ESO – 15 years old)

- B1. What is artificial intelligence?
- B2. Impact of AI
- B3. Areas of AI
- B4. AI technologies

AI technologies (1º bach – 16 years old)

- B1. Fundamentals of Python programming for AI
- B2. The intelligent agent
- B3. Computer vision projects and impact
- B4. Natural language projects and impact
- B5. Supervised learning projects and impact





Ukraine

To include modern topics such as AI in education, it is not always necessary to rewrite the entire curriculum or study program, which can be a lengthy process. By having a broadly defined curriculum, it becomes possible to update the content to include AI while keeping the learning outcomes of the current program intact. For instance, in a standard high-school informatics course, the module originally named “Informational Technologies in Society” covered information technologies and systems in modern society, future professions, aspects of cybersecurity, e-government systems, and more. The learning outcomes were formulated quite broadly and flexibly:

- Explain the role of modern information and communication technologies in society and human life.
- Understand the general principles of work and areas of application of artificial intelligence systems, the Internet of Things, and smart technologies.
- Independently learn and adapt to new technologies.
- Recognise the communicative role of IT and the evolving trends of the digital society, as well as the impact of information technologies on people’s lives.
- Make informed decisions about future careers by consciously applying IT knowledge.

- Respect rights and freedoms, including freedom of speech, online privacy, copyright and intellectual property, personal data, etc.

A working group comprising school and university teachers, along with IT professionals, was able to suggest AI-oriented content that could be covered in approximately 10 hours of class time. The content is designed to provide a general introduction to the topic of AI, rather than focusing on specific technologies or in-depth understanding.

The lessons in the “[Artificial Intelligence](#)” cycle are based on the educational series “[Artificial intelligence for schoolchildren](#)” developed by the Ministry of Digital Transformation. Most of the suggested lessons are practice-based and introduce various AI tools.

1. Information technologies and systems in modern society
2. Artificial intelligence
3. Technologies and tools of data analysis
4. Social aspects of large-scale data analysis
5. Digital citizenship and electronic governance
6. Information security
7. Practical problems and career opportunities





Conclusion and Recommendations

Examples presented in this briefing report show us that there is no right or wrong path towards education about AI; it is simply a matter of analysing the cultural, technical, social, and educational context of the country and deciding which approach is optimal. By taking a more critical approach to AI integration into curricula, different countries might even develop new and creative ways of implementing it into education.

Different countries have made different decisions regarding AI integration into curricula. Some decided to create new curricula to teach about AI, others to integrate it into existent curricula. It is thus important to have a critical approach when thinking about integrating AI into curriculum, take into consideration the local context but also look at the solutions found by other countries.

While approaches may vary, there is a growing consensus on the importance of introducing AI concepts to students at different educational levels, ensuring that they are equipped with the necessary skills and knowledge to thrive in a world increasingly influenced by AI and related technologies.





Recommendations by the Squad

- To ensure a comprehensive and unbiased approach to learning, it is essential that AI curricula are not tied to specific technologies or brands.
- With the aim of facilitating the development of the European Education Area, it would be beneficial if Member States shared good practice examples, thereby ensuring that students entering tertiary education possess comparable levels of competence about AI.
- Integrating AI into curricula requires both resource development and teacher training.
- The evidence-based approach would enhance the content and effectiveness of AI curriculum.
- Education about AI is needed, but freely embracing education with AI needs to be done with some caution.



Members of the EDEH squad on artificial intelligence in education who dedicated time for this briefing report: Cristina Obae, Jessica Niewint-Gori, Francisco Bellas, Oksana Pasichnyk, Gordana Janakievaska, Anne Gilleran, Yann-Aël Le Borgne, Riina Vuorikari, Madhumalti Sharma and Lidija Kralj

