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ARTICLE

# Artificial Intelligence in Education (AIED): Towards More Effective Regulation

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## Abstract

This paper critically assesses the effectiveness of the EU AI Act in regulating artificial intelligence in higher education (AIED), with a focus on how it interacts with existing education regulation. It examines the growing use of high-risk AI systems – such as those used in admissions, assessment, academic progression, and exam proctoring – and identifies key regulatory frictions that arise when AI regulation and education regulation pursue overlapping but potentially conflicting aims. Central to this analysis is the concept of human oversight: while the AI Act frames oversight as a safeguard for accountability and fundamental rights, education regulation emphasises the professional autonomy of teachers and their role in maintaining pedagogical integrity. Yet, the regulatory role of teachers in AI-mediated environments remains unclear. Applying Mousmouti's effectiveness test, the paper evaluates the AI Act along four dimensions – purpose, coherence, results, and structural integration with the broader legal framework – and argues that legal effectiveness in this context requires a more precise alignment between AI and education regulation.

**Keywords:** AI Act; AIED; education regulation; effectiveness; GDPR

## I. Introduction

The rapid integration of artificial intelligence (AI) into education is transforming traditional learning environments creating an urgent need for the development of effective regulatory frameworks that ensure the responsible use of AI, protect students' rights, and support the evolving roles of educators and institutions.[1] Yet, the research exploring the legal frictions between AI regulation and education regulation, particularly in how these regulatory fields intersect and clash as AI becomes more deeply embedded in educational settings is practically non-existent.[2] While frictions between AI regulation and

[1] See, e.g., S Latham, "Are You Ready for the AI University? Everything is About to Change" The Chronicle of Higher Education (8 April 2025) available at <https://www.chronicle.com/article/are-you-ready-for-the-ai-university> (last accessed 17 July 2025); for a more critical perspective that challenges dominant narratives of AI in education see E Sporrong, "Anticipation: Understanding the Role of Anticipation in Configuring Visions of Education' in A Buch, Y Lindberg and T Cerratto Pargman (eds), *Framing Futures in Postdigital Education. Postdigital Science and Education* (Cham, Springer 2024) pp 195–208.

[2] *But* see, e.g., I Molenaar, D Baten, I Bárd and M Stevens, "Artificial Intelligence and Education Different Perceptions and Ethical Directions" in NA Smuha (ed), *The Cambridge Handbook of the Law, Ethics and Policy of Artificial Intelligence* (Cambridge University Press 2025) pp 261–82; Miglė Laukytė, 'Artificial Intelligence in Education: Interests of and Benefits for Children, Teachers and Schools' In: Edita Gruodytė and Aušrinė Pasvenskienė (eds.) Human Right to Education in the Age of Innovations and Smart Technologies (Peter Lang, 2024) 17–35.

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education regulation are not inherently problematic, they become critical when they hinder fundamental rights such as educational equality, access to education, and the pursuit of high-quality education which are all essential to EU's participatory democracy.[3] This gap highlights the critical need to study these regulatory frameworks to ensure that the deployment of AI in education (AIED) aligns in a way that fosters positive and effective regulatory outcomes.

In response to this gap, the main aim of this paper is to critically assess the effectiveness of AIED regulation under the AI Act,[4] with particular attention to how it interacts with existing education regulation. It focuses on higher education (HE),[5] a relevant setting for this research given the increasing use of high-risk AI systems – such as those used in admissions, assessment of learning outcomes, academic level determinations, and exam proctoring – in response to the rising demand for scalable, data-driven solutions.[6] Furthermore, this paper focuses on legal requirements that appertain to human oversight, a central element in both AI regulation and education regulation: AI regulation mandates human oversight to ensure accountability, transparency, and the protection of fundamental rights, while education regulation emphasises the empowerment of teachers in guiding and maintaining the integrity of the educational environment. In many ways, the role of the teacher remains the most central yet unresolved issue in this context, as it is still unclear how their professional responsibilities and authority will be aligned with the growing use of AIED from a regulatory perspective.[7]

The paper proceeds in four parts. It begins by classifying how AIED is deployed in HE from both a technological and legal perspective. Second, it provides a broad overview of the legal standards governing the deployment of AIED in HE, with a focus on how human oversight is framed within both AI regulation and education regulation at the European Union level. Third, this paper applies the "effectiveness test," a conceptual model developed by Mousmouti to evalulate the effectiveness of the AI Act based on four key dimensions: its purpose, the coherence and feasibility of the substantive content it provides, the anticipated and actual results it produces, and its structural integration within the broader legal framework.[8] The paper concludes with a discussion about how the regulation of AIED in HE could be made more effective.

[3] Charter of Fundamental Rights of the European Union, 2012 O.J. C 326/391, Article 14.

[4] Regulation (EU) 2024/1689 of the European Parliament and of the Council of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828 (AI Act)(2024) OJ L 1689 (AI Act).

[5] See World Declaration on Higher Education for the 21st Century (adopted 9 October 1998) para. 2. (explaining, higher education encompasses all types of education (academic, professional, technical, artistic, pedagogical, long-distance learning, etc.) provided by universities, technological institutes, teacher training colleges, etc., which are normally intended for students having completed a secondary education, and whose educational objective is the acquisition of a title, a grade, certificate, or diploma of higher education.).

[6] M Bond, H Khosravi et al., "A Meta Systematic Review of Artificial Intelligence in Higher Education: A Call for Increased Ethics, Collaboration, and Rigour" (2024) 21 International Journal of Educational Technology in Higher Education 1; H Crompton and D Burke, "Artificial Intelligence in Higher Education: The State of the Field" (2023) 20 International Journal of Educational Technology in Higher Education 22; R Power, "Innovative Use Cases For AI In Higher Education" *Forbes* (4 February 2024) available at <https://www.forbes.com/sites/forbes-personal-shopper/article/best-hypoallergenic-mattresses/?> (last accessed 5 April 2025).

[7] J Koh, M Cowling, J Meena and KN Sim, "The Human Teacher, the AI Teacher and the AIed-Teacher Relationship" (2023) 23 Journal of Higher Education Theory and Practice 200, 206.

[8] M Mousmouti, "Making Legislative Effectiveness an Operational Concept: Unfolding the Effectiveness Test as a Conceptual Tool for Lawmaking" (2018) 9 European Journal of Risk Regulation 445.

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## II. AIED

Artificial Intelligence in Education (AIED) has been a research field for decades, with its roots tracing back nearly a century to Sidney Pressey's development of the first mechanised multiple-choice machine – an early attempt to automate feedback and ease teachers' grading burden.[9] Since then, AIED has evolved in parallel with broader developments in AI, moving through three key phases.[10] Early systems were rule-based, relying on expert-designed logic to deliver fixed instructional responses – like intelligent tutoring systems that followed pre-set scripts.[11] The advent of machine learning introduced a new generation of systems capable of learning from educational data to personalise feedback, predict student performance, and dynamically adapt content.[12] Most recently, the emergence of generative AI has brought powerful foundational models into education, enabling tools that can generate explanations, create learning materials, or simulate human-like dialogue, raising both opportunities and challenges for teaching, learning, and assessment.[13]

Another common way to categorise AIED is by grouping it into three broad areas: learning with AI, using AI to learn about learning, and learning about AI, also known as AI literacy.[14] Learning with AI involves "the use of AI-driven tools in teaching and learning" and can be further divided into learner-supporting AI, teacher-supporting AI and institution-supporting AI.[15] Using AI to learn about learning includes collecting and analysing digital traces – data generated through learners' interactions with educational technologies, such as clicks, responses, and emotional states.[16] Learning about AI, also known as AI literacy has two dimensions.[17] First, it involves teaching learners and educators of all ages about AI technologies, including machine learning, natural language processing, and their foundations in coding and statistics.[18] Second, it involves helping citizens understand the broader societal impacts of AI, such as ethical concerns, bias, surveillance, and job disruption.[19]

It is important to emphasise that, beyond pedagogical domains, AI systems are increasingly being deployed in the operational aspects of education, even though the boundaries between the two often overlap.[20] For example, universities and other educational institutions are turning to AI to streamline administrative functions such as

[9] W Holmes and I Tuomi, "State of the Art and Practice in AI in Education" (2022) 57 Futures of Artificial Intelligence in Education 542, 543–4; see also A Watters, *Teaching Machines: The History of Personalized Learning* (MIT Press 2021).

[10] B Williamson, A Molnar and F Boninger, "Time for a Pause: Without Effective Public Oversight, AI in Schools Will Do More Harm than Good" (*National Education Policy Center*, 2024) pp 1–42, 8 available at <http://nepc.colorado.edu/publication/ai> (last accessed 5 April 2025).

[11] Ibid.

[12] Ibid.

[13] Ibid.

[14] W Holmes, J Persson, I-A Chounta, B Wasson and V Dimitrova, "Artifical Intelligence and Education: A Critical View Through the Lens of Human Rights, Democracy and the Rule of Law" (2022) Council of Europe 1–114 available at <https://rm.coe.int/prems-092922-gbr-2517-ai-and-education-txt-16x24-web/1680a956e3> (last accessed 5 April 2025).

[15] Ibid. at 19.

[16] Ibid.; A Pardo, J Jovanovic, S Dawson, D Gašević and N Mirriahi "Using Learning Analytics to Scale the Provision of Personalised Feedback" (2017) 50 British Journal of Educational Technology 128–38.

[17] Holmes et al., (n 14) 1–114, 19.

[18] Ibid.

[19] Ibid.

[20] See further PP Gao, A Nagel and H Biedermann, "Categorization of Educational Technologies as Related to Pedagogical Practices" in K Tirri and A Toom (eds), *Pedagogy in Basic and Higher Education* (London, IntechOpen 2020) pp 1–15, 2–3 (distinguishing between pedagogical technologies and operational technologies yet also recognising that there are overlaps between the two groups).

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admissions, scheduling, and resource allocation, potentially reshaping how educational opportunities are distributed and managed.[21] Likewise, dedicated external agencies may use AI-driven tools to assess institutional performance or accredit programs.[22] These developments show that AI is not just confined to the classroom, but it also shapes the broader institutional environment in which teachers work and students learn.

From a legal perspective, AIED may be classified as prohibited, high-risk, limited-risk or minimal risk under the AI Act. Prohibited AIED includes AI systems that infer emotions of a natural person in the area of educational institutions, including both public and private institutions.[23] These are defined as systems that infer emotions or intentions from biometric data[24] – such as facial expressions, voice, or body language – and are banned in schools and universities due to serious concerns about their scientific validity, cultural bias, and potential infringement on fundamental rights, including privacy, dignity, and freedom of thought.[25] Recital 44 of the AI Act explicitly warns of the discriminatory and unreliable nature of such technologies, especially when applied to vulnerable populations like students. Applications using emotion recognition to support language learning[26], assess students' attention or interest[27], or evaluate applicants during admissions tests[28] – are likely to be captured by the ban on emotion recognition in educational settings.[29] Limited exceptions exist for medical and safety applications, such as to support students with autism or to enhance accessibility for blind or deaf learners.[30]

AI systems that are not prohibited may still fall within the high-risk category if they serve critical educational functions. This includes systems used for admissions decisions, determining academic placement, evaluating learning outcomes, or conducting exam proctoring – each of which can significantly affect a student's educational trajectory.[31] High-risk classification is based on the potential impact of these systems on individuals' rights and opportunities, particularly their ability to secure a livelihood.[32] In contrast, *limited-risk* AIED refers to systems that interact with learners or educators but do not make or substantially influence consequential decisions. For example, an AI-powered chatbot

[21] A Ullrich, G Vladova, F Eigelshoven and A Renz, "Data Mining of Scientific Research on Artificial Intelligence in Teaching and Administration in Higher Education Institutions: A Bibliometrics Analysis and Recommendation for Future Research" (2022) 2 Discover Artificial Intelligence 16.

[22] See C Tastimur, M Karakose and E Akin, "Improvement of Relative Accreditation Methods on Data Mining and Artificial Intelligence for Higher Education" in 2016 15th International Conference on Information Technology Based Higher Education and Training (ITHET), Istanbul, Turkey, (2016) pp 1–7; C Chedrawi and P Howayeck, "Artificial Intelligence a Disruptive Innovation in Higher Education Accreditation Programs: Expert Systems and AACSB" in Y Baghdadi A Harfouche (eds), *ICT for a Better Life and a Better World*. Lecture Notes in Information Systems and Organisation, vol 30 (Cham, Springer 2019) pp 115–129.

[23] AI Act, Article 5(1)(f); Brussels, 4.2.2025 C(2025) 884 final ANNEX to the Communication to the Commission Approval of the content of the draft Communication from the Commission – Commission Guidelines on prohibited artificial intelligence practices established by Regulation (EU) 2024/1689 (AI Act)(Prohibited Practices Guidelines), 86 available at <https://digital-strategy.ec.europa.eu/en/library/commission-publishes-guidelines-prohibited-artificial-intelligence-ai-practices-defined-ai-act>.

[24] AI Act, Article 3(39).

[25] Prohibited Practices Guidelines at 77.

[26] Ibid. at 82.

[27] Ibid. at 87.

[28] Ibid. at 83.

[29] Ibid. at 76–91.

[30] Ibid. at 88.

[31] AI Act, Annex III, Recital 56.

[32] AI Act, Recital 56.

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used to respond to student inquiries will likely be considered limited-risk. These systems are subject to transparency obligations under Article 50 and fall under broader provisions on AI literacy and responsible deployment.[33]

Finally, minimal-risk AIED refers to tools that pose negligible risks to fundamental rights, health, or safety – such as spell-checkers or systems used to assign classrooms. While these tools are not subject to specific obligations under the AI Act, their use – particularly when scaled or embedded within more complex educational platforms – raises broader concerns around ethical deployment, and, as Pagallo notes, even so-called "low-risk" systems may generate significant environmental harms that fall outside the legal risk classification.[34] This highlights the extent to which current legal categories may fail to capture the wider societal and ecological consequences of AIED deployment.

## III. Regulating AIED

Currently, the legal framework surrounding AIED is still evolving, with many aspects of its implementation and regulation remaining unclear, especially regarding its impact on the relational dynamics between teachers and students and the potential effects on educators' roles, responsibilities, and autonomy. As noted at the outset, this paper concentrates on the legal requirements that address human oversight in both AI regulation and education regulation at the EU level, rather than attempting to cover all regulatory dimensions of AIED. This methodological focus is grounded in the view that oversight provisions offer a critical entry point into understanding the effectiveness of regulation. Koh et al. put it succinctly: "the big elephant in the room" in discussions about AIED is the question of what, exactly, remains the role of the teacher?[35]

### *1. AI regulation*

Article 22 of the GDPR lays the foundation for human control of AIED where the technology involves the use of personal data.[36] Under Article 22 GDPR, data subjects have the right not to be subject to solely automated decisions involving the processing of personal data that result in legal or similarly significant effects. To invoke Article 22(1), three cumulative conditions must be satisfied: (1) there must be an individual decision; (2) it must be based exclusively on automated processing; and (3) it must have legal consequences or similarly significant impacts on the data subject. Article 22(2) allows for fully automated decision-making or profiling in specific situations, such as when it is permitted by Member State law. Where fully automated decision making is permitted under an exception, certain "suitable measures" are required to safeguard the data subject's rights.[37]

Article 22 has been interpreted by courts and Data Protection Authorities (DPAs) as requiring guidelines and instructions that ensure there are trained personnel who are capable of critically evaluating AI-generated outcomes.[38] These legal authorities have

[33] AI Act, Article 4.

[34] U Pagallo, "LLMs Meet the AI Act: Who's the Sorcerer's Apprentice?" (2025) Cambridge Forum on AI: Law and Governance 1, 1–13, 8.

[35] J Koh, M Cowling, J Meena and KN Sim, "The Human Teacher, the AI Teacher and the AIed-Teacher Relationship" (2023) 23 Journal of Higher Education Theory and Practice 200, 206.

[36] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing directive 95/46/EC (General Data Protection Regulation, "GDPR") (2016) OJ 2016 L 119/1, Article 22.

[37] GDPR, Article 22(2)(b).

[38] See, e.g., SCHUFA Holding and Others (Scoring) Case C-634/21, ECLI:EU:C:2023:220, para. 44 (referring to "internal rules and practices"); Comissão Nacional de Proteção de Dados (CNPD), Deliberação n.º 2021/622 (11 May 2021) available at <https://www.cnpd.pt/umbraco/surface/cnpdDecision/download/121887>.

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highlighted the importance of ensuring that human reviewers do not simply rubber-stamp AI-based decisions, but instead, exercise meaningful and independent oversight.[39] The human review process must be substantial enough to influence or override the AI's decision if necessary, ensuring that individuals affected by automated decisions have a genuine avenue for redress. Furthermore, organisations are often required to implement training programs for those involved in the oversight process, equipping them with the skills needed to understand and critically assess AI systems. These guidelines and instructions, including trainings, are considered essential to maintaining a high standard of accountability and transparency in the use of AI technologies, particularly in contexts where decisions have significant impacts on individuals' rights and freedoms such as in HE.[40]

Like the GDPR, the AI Act aims to safeguard fundamental rights and freedoms by ensuring appropriate human oversight in the use of AI systems. Article 14 of the AI Act mandates that high-risk AI systems must be designed and developed to allow effective oversight by natural persons during their operation, including through suitable human-machine interface tools. There are two ways to ensure human oversight. First, it can be built into the high-risk AI system by the provider.[41] Second, it can be identified by the provider and implemented by the user of the AI system.[42] Article 14 should further be read in conjunction with Article 13, which mandates that high-risk AI systems must be designed and developed to be sufficiently transparent, enabling users to understand their operation. Furthermore, Article 26 of the EU AI Act requires the deployer of an AI system such a university who implements an AIED system to implement appropriate technical and organisational measures to ensure the AI system is used according to its accompanying instructions, including those related to human oversight.

The requirements of the AI Act oblige providers and deployers of AIED to adopt a "human-oversight-by-design" approach when developing AI systems.[43] Design-based regulation requires that regulatory standards are embedded directly into the design of products and systems at the outset of their development and throughout their lifetime, thereby decentralising the role of standard setting, monitoring and enforcement from state actors to private actors.[44] This approach is rooted in Lessig's idea that computer code can be more efficient than traditional law in controlling human behavior, as code can impose architectural restraints that entirely prevent certain actions, unlike laws that allow for disobedience.[45] It requires the engagement and competency of technical professionals to design systems that influence human behavior in line with regulatory goals such as the private Ed Tech companies that develop many of these technologies.[46]

[39] Art. 29 Working Party, Guidelines on Automated Individual Decision-Making and Profiling for the Purposes of Regulation 2016/679, 1–37, 19 available at <https://ec.europa.eu/newsroom/article29/items/612053> (last accessed 1 August 2023).

[40] L Colonna, "Teachers in the Loop? An Analysis of Automatic Assessment Systems under Art. 22 GDPR" (2024) 14 International Data Privacy Law 3, 12.

[41] AI Act, Art. 14(3)(a).

[42] AI Act, Art. 14(3)(b).

[43] See, further, L Colonna, "Complex Normativity: Understanding the Relationship between Human Oversight by Design and Standardization in the Context of AI Development and Deployment' in E Kosta, D Hallinan, P De Hert and S Nusselder (eds) *Data Protection, Privacy and Artificial Intelligence: To Govern or to be Governed, That is the Question* (Hart Publishing, 2025) 77–113, 84–7; *forthcoming*, L Colonna, "Towards a Methodological Approach for Understanding Human Oversight Requirements under the AI Act" Human Oversight, European Review of Digital Administration & Law (ERDAL), Special Issue: Towards 'Oversight by Design'? Legal Foundations for Effective Oversight in Automated Public Administration (eds. Lena Enqvist, Hanne Marie Motzfeldt, and Markku Suksi).

[44] K Yeung, "Hypernudge': Big Data as a Mode of Regulation by Design" (2017) 20 Information, Communication & Society 118–36, 120.

[45] L Lessig, *Code and Other Laws of Cyberspace* (Basic Books 1999) 26.

[46] K Prifti, J Morley, C Novelli and L Floridi, "Regulation by Design: Features, Practices, Limitations, and Governance Implications" (2024) 34 Minds and Machines, 1–23 available at <https://link.springer.com/article/10.1007/s11023-024-09675-z>.

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Article 14 of the AI Act has a broader scope than Articles 22 of the GDPR since it requires human oversight not only for the processing of personal data but also for non-personal data, and aims to ensure health, safety, and the protection of fundamental rights beyond just data protection.[47] It also explicitly includes "the extra-juridical concept" of automation bias as a potential source of distortion for human oversight agents.[48] Essentially, the AI Act mandates risk-based, flexible, and design-focused requirements for human oversight by providers and users which are further reinforced by the more stringent human intervention mandates in the GDPR that apply specifically to data controllers.[49] Here, it becomes evident that a distributed form of responsibility for human oversight is emerging in the law where different actors across the AI lifecycle share the duty of ensuring that AI systems operate ethically and safely.[50]

Finally, it is important to mention that Recital 56 explicitly recognises the importance of deploying AI systems to promote "high-quality digital education and training", enabling learners and teachers to develop digital skills, media literacy, and critical thinking necessary for participation in the economy, society, and democratic processes. Additionally, Article 4 mandates that providers and deployers of AI systems ensure sufficient AI literacy among their staff and users, considering their technical knowledge, experience, and the context in which AI systems are used. Furthermore, and as noted at the outset of this paper, the AI Act classifies several categories of AI systems in education as high-risk, including those used to determine access or admission, evaluate learning outcomes, steer learning processes, assess appropriate education levels, and monitor prohibited behavior during tests.[51]

## 2. *Education regulation*

Education is recognised as a fundamental human right in international human rights law.[52] In Europe, the Charter of Fundamental Rights of the European Union declares, "Everyone has the right to education and to have access to vocational and continuing training."[53] Education is not only a fundamental human right in its own regard but also a vital enabler of all other human rights.[54] Furthermore, it plays a critical role in fostering

[47] CG Granmar, "AI-Based Decision-Making and the Human Oversight Requirement Under the AI Act" in A Moberg and E Gill-Pedro (eds), *The Yearbook of Socio-Economic Constitutions: Law and the Governance of Artificial Intelligence* (Springer 2023) pp 181–209.

[48] J Laux and H Ruschemeier, "Automation Bias in the AI Act: On the Legal Implications of Attempting to De-Bias Human Oversight of AI" (2025) 1–19, 3–5 available at <https://arxiv.org/abs/2502.10036>; for more on automation bias in Large Language Models see I Carnat, "Human, All Too Human: Accounting for Automation Bias in Generative Large Language Models" (2024)14 International Data Privacy Law 299–314.

[49] S Domingo, "Human Intervention and Human Oversight in the GDPR and AI Act, Trilateral Research" (31 May 2022) available at <https://trilateralresearch.com/emerging-technology/human-intervetion-in-gdpr-and-ai> (last accessed 12 April 2025); see also S Bordt, M Finck, E Raidl and U von Luxburg, "Post-Hoc Explanations Fail to Achieve their Purpose in Adversarial Contexts" (2022) FAccT '22: 2022 ACM Conference on Fairness, Accountability, and Transparency 891–905, 895.

[50] L Colonna, 'Addressing the Responsibility Gap in Data Protection by Design: Towards a More Future-oriented, Relational, and Distributed Approach (2022) 27 Tilburg Law Review 1–21, 13–16.

[51] AI Act, Annex III.

[52] See, e.g., UNESCO Convention against Discrimination in Education (adopted 14 December 1960, entered into force 14 December 1960) 429 UNTS 93 (CADE); International Covenant on Economic, Social and Cultural Rights (adopted 16 December 1966, entered into force 3 January 1976) 993 UNTS 3 (ICESCR); Convention on the Rights of the Child (adopted 20 November 1989, entered into force 2 September 1990) 1577 UNTS 3 (CRC).

[53] Charter of Fundamental Rights of the European Union Article 14, 2012 O.J. C 326/391; for a complete overview of how the right to education is reflected in Europe see UNESCO, Right to Education Handbook (2019) pp 68–70 available at <https://unesdoc.unesco.org/ark:/48223/pf0000366556> (last accessed 30 April 2025).

[54] Council of Europe Standing Conference of Ministers of Education Regulating Artificial Intelligence in Education, pp 1–5, 2 available at <https://rm.coe.int/regulating-artificial-intelligence-in-education-26th-session-

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individual development and empowering citizens to participate meaningfully in democratic life.[55]

Unlike the right to education, academic freedom lacks consistent legal recognition across jurisdictions and is absent from the Universal Declaration of Human Rights.[56] That said, it is explicitly recognised in the EU Charter of Fundamental Rights which states in Article 13: "The arts and scientific research shall be free of constraint. Academic freedom shall be respected."[57] Academic freedom is generally understood to derive from freedom of thought and expression, and at its core, it safeguards teachers' autonomy in deciding how to teach and what tools to use.[58]

This distinction between the legal recognition of the right to education and the more variable protection for academic freedom provides important context for understanding the professional standards expected of educators in HE. The 1997 UNESCO Recommendation Concerning the Status of Higher-Education Teaching Personnel offers a detailed articulation of these expectations, framing HE teaching as a profession grounded in public service, requiring expert knowledge, lifelong learning, and a commitment to high standards in scholarship and research.[59] It further calls for adequate working conditions that support teaching, research, and community engagement, and emphasises that HE personnel must enjoy the full range of civil, political, social, and cultural rights, including freedom of expression and protection from arbitrary interference or punishment.[60] Importantly, it upholds the right of academic staff to teach free from coercion, in accordance with professional standards and human rights norms, and to actively participate in the development of curricula and teaching methods.[61]

Against this backdrop – where education is recognised as a fundamental right, and HE teaching is framed as a public service grounded in academic freedom – concerns about the ethical implications of AIED began to intensify in the mid-2010s, particularly with the rapid expansion of machine learning technologies.[62] As ethical concerns about AIED began to attract greater attention, early policy efforts sought to develop strategic approaches for its integration that would safeguard fundamental rights and uphold core public values.[63] One notable example is the framework developed by the Institute for Ethical AI in Education (UK), one of the first to offer practical guidance for the responsible and rights-based use of AI in educational contexts.[64] The report explicitly states, "Humans are ultimately responsible for educational outcomes and should therefore have an appropriate level of oversight of how AI systems operate."[65]

council-o/1680ac9b7c> (last accessed 12 April 2025); for more see UNESCO, Right to Education Handbook (2019), 10 available at <https://unesdoc.unesco.org/ark:/48223/pf0000366556> (last accessed 30 April 2025).

[55] Council of Europe Standing Conference of Ministers of Education Regulating Artificial Intelligence in Education available at <https://rm.coe.int/regulating-artificial-intelligence-in-education-26th-session-council-o/1680ac9b7c> 1–5, 2 (last accessed 12 April 2025).

[56] Laukytė, (n 2) 17-35, 28–30.

[57] Charter of Fundamental Rights of the European Union Article 13, 2012 O.J. C 326/391.

[58] Laukytė, (n 2) 17-35, 28-30.

[59] UNESCO, Recommendation Concerning the Status of Higher-Education Teaching Personnel (1997) available at <https://www.unesco.org/en/legal-affairs/recommendation-concerning-status-higher-education-teaching-personnel> (last accessed 30 April 2025), para. 6.

[60] Ibid. at para. 26.

[61] Ibid. at paras. 27–30.

[62] Molenaar et al., (n 2), 261–82, 271, 273.

[63] Ibid. at 261–82.

[64] The Institute for Ethical AI in Education, "The Ethical Framework for AI in Education" (University of Buckingham) available at <https://www.buckingham.ac.uk/wp-content/uploads/2021/03/The-Institute-for-Ethical-AI-in-Education-The-Ethical-Framework-for-AI-in-Education.pdf> (last accessed 12 April 2025).

[65] Ibid.

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2019 marked a global milestone with the release of UNESCO's Beijing Consensus, which set out a vision for the sustainable development of AI in education in line with the 2030 Agenda and Sustainable Development Goal 4 on quality education.[66] It emphasises a human-centered approach, stating that "... while AI provides opportunities to support teachers in their educational and pedagogical responsibilities, human interaction and collaboration between teachers and learners must remain at the core of education."[67] The Consensus calls for redefining teachers' roles and competencies, strengthening teacher training institutions, and developing targeted "capacity-building programs" to prepare educators to work effectively in AI-rich environments.[68] Follow-up UNESCO guidance has reinforced that AIED must be designed to enhance human-centered pedagogy, ensuring that educators retain meaningful oversight and remain central to teaching and learning processes.[69]

The Digital Education Action Plan (DEAP) 2021–2027, published by the European Commission in 2020, further outlines a strategic framework to modernise education and training systems for the digital age.[70] The main purpose of the DEAP is to provide the EU's strategy for supporting a long-term, inclusive, and high-quality digital transformation of education and training systems across Member States, especially in light of the challenges exposed and accelerated by the COVID-19 pandemic.[71] One of its major outputs is the 2022 Ethical Guidelines on the Use of Artificial Intelligence (AI) and Data in Teaching and Learning for Educators[72], which emphasise the need for educators to remain central in decision-making processes.[73] The guidelines which have a strong basis in the requirements set by the European Commission's High-Level Expert Group on AI[74], stress that teachers must be "in the loop" when AI systems are used, with clearly defined roles that safeguard their pedagogical and ethical responsibilities.[75] They highlight the importance of ensuring that teachers can monitor AI outputs, identify anomalies or potential discrimination, and intervene – especially in situations requiring empathy or nuanced judgment.[76] The guidelines also call for safeguards against over-reliance on AI, mechanisms for learners to opt out if concerns are not addressed, and adequate training and information for educators and school leaders to ensure safe and rights-respecting implementation.[77] In doing so, the

[66] United Nations Educational, Scientific and Cultural Organization (UNESCO), "Beijing Consensus on Artificial Intelligence and Education – UNESCO Digital Library" (UNESCO, 2019) available at <https://unesdoc.unesco.org/ark:/48223/pf0000368303> (last accessed 12 April 2025).

[67] Ibid. at para.12.

[68] Ibid. at para 13.

[69] F Miao, W Holmes, H Ronghuai and Z Hui, "Artificial Intelligence and Education. Guidance for Policy-Makers" (UNESCO, 2021), foreword available at <https://unesdoc.unesco.org/ark:/48223/pf0000376709>.

[70] European Commission, "Digital Education Action Plan 2021–2027: Resetting education and training for the digital age (COM(2020) 624 final)", (2020) available at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0624> (last accessed 25 May 2025).

[71] Ibid.

[72] European Union, "Ethical Guidelines on the Use of Artificial Intelligence (AI) and Data in Teaching and Learning for Educators" (Publications Office of the European Union, 2022) 1–40, 18 available at <https://op.europa.eu/en/publication-detail/-/publication/d81a0d54-5348-11ed-92ed-01aa75ed71a1/language-en> (last accessed 12 April 2025).

[73] Ibid.

[74] In 2018, the European Commission established a High-Level Expert Group on AI, which drafted a set of Ethics Guidelines identifying seven key requirements for trustworthy AI: human agency and oversight, technical robustness and safety, privacy and data governance, transparency, diversity, non-discrimination and fairness, societal and environmental well-being, and accountability, see further "Ethics Guidelines for Trustworthy AI | Shaping Europe's Digital Future" (April 8, 2019) available at <https://digital-strategy.ec.europa.eu/en/library/ethics-guidelines-trustworthy-ai> (last accessed 2 May 2025).

[75] European Union, (n 72) 1–40, 19 available at <https://op.europa.eu/en/publication-detail/-/publication/d81a0d54-5348-11ed-92ed-01aa75ed71a1/language-en> (last accessed 12 April 2025); Molenaar et al. (n 2) 261–82.

[76] European Union, (n 75), 1–40, 19.

[77] Ibid. at 19.

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framework reinforces that teacher agency and responsibility are essential for the trustworthy and effective use of AIED.

## IV. Towards more effective regulation

Regulatory effectiveness – widely regarded as a cornerstone of good regulation – concerns how well the law achieves its intended aims, anticipates potential challenges, and adapts to changing circumstances to deliver meaningful societal outcomes.[78] To put it differently, effectiveness refers to the capacity of regulation to achieve the goals it is designed to accomplish – essentially asking whether it works as intended.[79] It focuses on the practical functioning of legal rules and the mechanics through which they produce results.[80]

Zamboni argues that effectiveness is not an absolute value in itself, but a relative criterion – a path that legislation must follow to realise the values that a community or its political representatives regard as the foundations of society, such as democracy.[81] He contends that the concept of effectiveness in legislation rests on three interconnected elements.[82] First is the original idea, which represents the political or normative goal that the legislation is intended to achieve – what lawmakers set out to accomplish.[83] The original idea is a political expression that can be uncovered in the preparatory works, parliamentary discussion or preamble of the statute.[84] Second are the results of legislation, meaning the actual impact or outcomes produced once the law is enacted and applied in practice. The results include both intended and unintended consequences produced by the legislation in a certain community.[85] Third is the context or conditions in which the legislative process takes place – the real-world environment, including institutional, social, and political factors, that shapes how ideas are translated into outcomes. The actual situation reflects the social, economic, political, legal and cultural reality in which the legislation operates.[86]

Zamboni further argues that effectiveness can be understood in two distinct ways. Internal effectiveness refers to the extent to which new legislation changes the legal system itself, focusing on legal policy outputs.[87] In contrast, external effectiveness concerns the broader societal, economic, and political impact of those legal changes – what he calls legal policy outcomes.[88] In short, internal effectivness concerns the capacity to really change the law whereas external effectiveness concerns the capacity to really change society.[89]

While Zamboni emphasises the theoretical foundations of effectiveness – highlighting its normative underpinnings, contextual dependencies, and dual internal/external dimensions – Mousmouti offers a more practical perspective by developing a structured framework to assess whether legislation functions effectively in practice. Her model identifies four core dimensions of effective legislation: its purpose, the coherence and feasibility of the

[78] Mousmouti, (n 8) 445; see also H Xanthaki, An Enlightened Approach to Legislative Scrutiny: Focusing on Effectiveness (2018) 9 European Journal of Risk Regulation 431.

[79] Mousmouti, (n 8) 445, 451.

[80] Ibid. at abstract.

[81] M Zamboni, "Legislative Policy and Effectiveness: A (Small) Contribution from Legal Theory" (2018) 9(3) European Journal of Risk Regulation 416–30, 419–20.

[82] Ibid. at 420.

[83] Ibid.

[84] Ibid at 420–1.

[85] Ibid.

[86] Ibid. at 420.

[87] Ibid. at 423.

[88] Ibid.

[89] Ibid. at 427.

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substantive content it provides, the anticipated and actual results it produces, and its structural integration within the broader legal framework.[90] Although the model is primarily designed to support legislative drafters throughout the stages of lawmaking, it nonetheless provides clear and objective benchmarks for scrutinising legislation, grounded in the axiomatic assumption that effectiveness is a core quality of good law.

This section draws on Zamboni's theoretical conception of legislative effectiveness and applies Mousmouti's analytical model as a practical framework to evaluate the AI Act – both in terms of its capacity to achieve its stated regulatory objectives and its coherence and interaction with the broader legal system, particularly in relation to education regulation. It begins with an evaluation of the purpose of the AI Act. The content and results are then examined by considering the coherence and feasibility of its provisions, alongside both anticipated and emerging impacts, particularly in the context of high-risk AIED. Finally, the structural integration of the Act is assessed by exploring its interaction with existing education regulation and the broader legal framework.

### *1. Purpose: assessing legislative intent and clarity*

The first step of the effectiveness test focuses on identifying and assessing the purpose of the law in relation to the problem it seeks to address and the policy objectives it supports.[91] This involves examining how clearly the purpose is articulated, whether it sets a measurable and meaningful benchmark for implementation and interpretation, and how well it aligns with expected outcomes.[92] A clear and unambiguous purpose should offer direction to both implementers of the law and interpreters of it, enabling an evaluation of whether the law has achieved its intended goals when viewed retrospectively.[93]

The AI Act's purpose is outlined in Recital 1, which states that the Regulation aims to "improve the functioning of the internal market" by creating a harmonised legal framework for the development and use of AI systems, in line with Union values.[94] It seeks to promote "human-centric and trustworthy artificial intelligence" while ensuring a high level of protection for health, safety, fundamental rights, democracy, and the environment, and at the same time fostering innovation and supporting the free movement of AI-based goods and services. While this recital provides an explicitly stated purpose, it also sets out an exceptionally broad and ambitious agenda.

A central tension within the AI Act's legislative purpose lies in its simultaneous promotion of innovation and protection of fundamental rights – an ambition that becomes particularly fraught in the context of the deployment of AIED in the HE. As educational institutions increasingly rely on AI systems provided by private Ed Tech companies, the traditional balance of power is shifting. What was once a public, participatory space – where decisions about pedagogy, assessment, and student advancement were shaped by educators and institutional governance – is now being reshaped by commercial actors whose primary accountability lies not with the public, but with shareholders and market logics.[95] While outsourcing in HE is not new, the intrusion of Ed Tech suppliers into core pedagogical functions marks a departure from prior practice.[96] These are no longer merely

[90] Mousmouti, (n 8).
[91] Ibid. at 462.
[92] Ibid.
[93] Ibid.
[94] AI Act, Recital 1.
[95] S Livingstone, K Pothong, A Atabey, L Hooper and E Day, "The Googlization of the Classroom: Is the UK Effective in Protecting Children's Data and Rights?" (2024) 7 Computers and Education Open 100195.
[96] F Pedró, M Subosa, A Rivas and P Valverde, "Artificial Intelligence in Education: Challenges and Opportunities for Sustainable Development" (UNESCO, 2019) available at <https://unesdoc.unesco.org/ark:/48223/pf0000366994> (last accessed 12 April 2025).

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ancillary services such as IT infrastructure or course management platforms; rather, AI tools are now implicated in decisions that bear directly on educational content, student evaluation, and the conferral of credentials.[97] In sum, educational technologies have concentrated power and profit in the hands of dominant private-sector actors, and the growing adoption of AIED risks deepening this privatisation by reinforcing a market-driven model that treats education as a commercial commodity rather than a public good.[98]

The AI Act attempts to safeguard against potential abuses through principle-based legal requirements that are embedded into the design of high-risk systems, such as mandates for human oversight, fairness, and transparency.[99] However, the practical implementation of these requirements often falls to the technology providers themselves, who are afforded significant discretion in determining what measures are appropriate. It is these providers – more precisely, their software engineers and product teams – who ultimately encode legal principles into system architectures, effectively translating vague regulatory standards into binding technical features. This arrangement creates a *de facto* delegation of normative authority, whereby private actors not only design AI systems but also shape the meaning and operationalisation of legal safeguards.[100] In effect, the very entities whose technologies may pose risks to students, teachers and public values are entrusted with embedding the protections meant to guard against those risks, although they will be subject to some oversight by a variety of national and EU-level agencies.[101]

While many EdTech companies may choose to follow the relevant harmonised standards to demonstrate conformity with the AI Act's requirements – rather than risk misapplying the law's underlying principles when designing their systems – this may result in a formalistic and technocratic approach that avoids substantive engagement with the normative foundations of the legislation.[102] Adhering to standards may not necessarily guarantee that broader concerns – such as pedagogical integrity, student autonomy, or non-discrimination – are meaningfully addressed. Here, Havinga et al. explain, "General AI standards rarely address education-specific issues which can increase issues of access and inclusion in educational settings and the devaluation of regional or minority languages and their protection and promotion contributing to the building of a Europe based on democracy and cultural diversity."[103] This reality raises important questions about the sufficiency of technical standards as proxies for legal and ethical compliance, particularly in settings where the stakes of algorithmic decision-making are closely tied to individual rights, institutional trust and public values.[104]

[97] Ibid.

[98] Mark West, "An Ed-Tech Tragedy? Educational Technologies and School Closures in the Time of COVID-19" (UNESCO 2023) available at <https://unesdoc.unesco.org/ark:/48223/pf000038670> (last accessed 2 May 2025).

[99] See more generally J Black, "Forms and Paradoxes of Principles-Based Regulation" (2008) 3 Capital Markets Law 425–57.

[100] M Almada, "Regulating Machine Learning by Design" (TechREG Chronicle, 2023) 3–8, 3, available at SSRN: available at <https://ssrn.com/abstract=4367025> (last accessed 12 April 2025).

[101] Colonna, (n 43) 77–113.

[102] Ibid.

[103] B Havinga, W Holmes and J Persson, "Preparatory Study for the Development of a Legal Instrument on Regulating the Use of Artificial Intelligence Systems in Education" (Council of Europe, 2024), 1–27, 21 available at <https://rm.coe.int/preparatory-study-for-the-development-of-a-legal-instrument-on-regulat/1680af118c>. *citing* The European Charter for Regional or Minority Languages available at <https://www.coe.int/en/web/european-charter-regional-orminority-languages/about-the-charter>. Together with the Framework Convention for the Protection of National Minorities it constitutes the Council of Europe's commitment to the protection of national minorities.

[104] See further Colonna, (n 43) 77–113; see also H Charlotte, Stabilizing Translucencies: Governing AI Transparency by Standardization (2024) 11(1) Big Data & Society 1–14.

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Ultimately, while some flexibility may be necessary to allow EdTech providers to operationalise legal requirements in ways that support innovation and avoid overly cumbersome compliance burdens, this discretion must be carefully balanced against the imperative to protect fundamental rights and uphold the public values that underpin education systems. In the context of HE, the AI Act's broad and sometimes competing objectives – promoting innovation, ensuring legal harmonisation, and safeguarding fundamental rights – can produce uncertainty when applied to complex, value-laden environments such as teaching and learning. This ambiguity leaves broad room for private actors to define what compliance looks like, potentially without sufficient engagement with the normative and pedagogical commitments enshrined in education law. In this regulatory gap, the right to education risks being subordinated to commercial priorities,[105] weakening the institutional integrity of public universities and their democratic mandate.[106]

The conflict between market-driven AI solutions and the core mission of higher education – grounded in education, research, and public service – highlights the need for regulatory frameworks that prioritise effectiveness not only in outcomes but also in the process of decision-making itself.[107] As De Benedetto explains, effectiveness should guide both the "whether" and the "how" of regulatory action.[108] In the context of education, this principle requires that institutional decisions to adopt AIED in the first place go beyond claims of efficiency or innovation and instead assess whether such tools genuinely align with core educational values and goals.

### 2. *Content: evaluating legislative coherence and feasibility*

The second step of the effectiveness test focuses on evaluating the "substantive content" of the law to determine whether its legislative choices are responsive to the real-world situation it aims to address.[109] This step includes assessing whether the rules are realistic, the feasibility of compliance and enforcement, and "the consistency and alignment between the choice of rules, enforcement mechanisms and communication" to target audiences.[110] The goal is to ensure that the law is practical, enforceable, and aligned with its objectives. Retrospectively, this step examines whether the assumptions made during lawmaking were accurate and whether the law's implementation produced the intended results or revealed barriers to compliance and effectiveness.[111]

Applying this lens to the AI Act involves examining how its rules function in practice – particularly in contexts like education, where implementation can be complex. One relevant example concerns the role of HE institutions, which are considered "deployers" under the AI Act whenever they use "an AI system under (their) authority."[112] As such, they are subject to specific obligations outlined in Article 26, provided the technology in question qualifies as high-risk under Annex III. In practice, this means that individual teachers – who interact directly with students and often manage the use of AIED – act as *de facto* agents of the institution in fulfilling these legal duties.[113] Teachers must not only use

[105] Williamson et al., (n 10) 1–42.

[106] T Bates, C Cobo, O Mariño and S Wheeler, "Can Artificial Intelligence Transform Higher Education?" (2020) 17(1) International Journal of Educational Technology in Higher Education 1–12.

[107] M De Benedetto, "Effective Law from a Regulatory and Administrative Law Perspective" (2018) 9 European Journal of Risk Regulation 391, 411.

[108] Ibid.

[109] Mousmouti, (n 8) 445, 462–3.

[110] Ibid.

[111] Ibid. at 463.

[112] AI Act, Art. 3(4).

[113] A Kiseleva, "Comments on the EU Proposal for the Artificial Intelligence Act" 3 available at <ssrn.com/abstract=394958> (last accessed 12 April 2025); see further T Herrmann and S Pfeiffer, "Keeping the Organization

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the AIED in accordance with the provider's instructions but they must also have the necessary competence, training, and authority to supervise the system.[114] They are further responsible for monitoring the system's operation, assessing the relevance and representativeness of input data (to the extent they control it), and taking appropriate steps if any risks or serious incidents arise.[115]

In HE, the role of "human oversight" will no doubt be operationalised through teachers or academic administrators who are expected to act as safeguards against system failures. On paper, their involvement is framed as essential to ensuring that AIED functions in a fair, accurate, and accountable manner.[116] Oversight is presented as a mechanism for aligning AI systems with the core educational values of the HE institution and promoting trust.[117] However, this conception tends to idealise human oversight without fully addressing how such responsibilities are distributed, enacted, or supported within institutions.[118]

Essentially, the AI Act places formal responsibility on institutions, but it embeds compliance obligations directly into the everyday practices of teaching staff. This shift of operational responsibility to teaching staff raises serious concerns about workload, the need for specialised training, and the compatibility of these duties with professional autonomy. While the measures provided for in Article 26 may be important for ensuring that AI operates within ethical and legal boundaries, the approach demands a level of expertise that many educators, trained primarily in pedagogy and research, may not possess. Although the law requires that teachers be supported in their oversight role, in practice this often translates into demands for additional training in AI literacy and assistance in interpreting instructions for use.[119] These measures, while valuable, risk creating new layers of bureaucratic responsibility for educators already stretched thin. In other words, the expectation that teachers monitor AI systems closely and intervene when necessary may overburden them and detract from their core educational mission, potentially contributing to burnout. Here, the main point is that the law risks overlooking the actual institutional capacities and resource limitations that shape the deployment of AIED in HE.[120]

Paradoxically, AI may increase the workload for educators rather than alleviate it, as the integration of AI-based educational technologies may require extensive training, time invested in understanding the instructions of use for AIED and "thought and effort" into working with AI outputs.[121] Instead of simplifying tasks, these technologies may lead to a

in the Loop: A Socio-Technical Extension of Human-Centered Artificial Intelligence" (2023) 38 AI and Society 1523–42, 1523.

[114] AI Act, Art. 26(1)–(2).

[115] AI Act, Art. 26(4)–(5).

[116] J Laux, "Institutionalised and Human Oversight of Artificial Intelligence: Towards a Democratic Design of AI Governance Under the European Union AI Act" (2024) 39 AI & Society 2853–66, abstract (October 2023); see also R Binns, "Human Judgment in Algorithmic Loops: Individual Justice and Automated Decision-Making" (2022) 16 Regulation & Governance 197–8; DR Amariles and PM Baquero, "Promises and Limits of Law for a Human-Centric Artificial Intelligence" (2023) 48 Computer Law & Security Review 1–10, 1; B Green, "The Flaws of Policies Requiring Human Oversight of Government Algorithms" (2022) 45 Computer Law & Security Review 105681.

[117] J Laux, "Institutionalised Distrust and Human Oversight of Artificial Intelligence: Towards a Democratic Design of AI Governance Under the European Union AI Act" (2024) 39 AI & Society 2853–66; see also T Herrmann and S Pfeiffer, (n 113) 1523–42, 1523.

[118] B Green, "The Flaws of Policies Requiring Human Oversight of Government Algorithms" (2022) 45 Computer Law & Security Review 105681.

[119] For more on the legal requirements for AI Literacy, see European Commission, "AI Literacy – Questions & Answers" available at <https://digital-strategy.ec.europa.eu/en/faqs/ai-literacy-questions-answers?utm_source=substack&utm_medium=email> (last accessed 27 May 2025).

[120] Mousmouti, (n 8) 445, 463.

[121] N Selwyn, M Ljungqvist and A Sonesson, 'When the Prompting Stops: Exploring Teachers' (2025) Work Around the Educational Frailties of Generative AI Tools Learning, Media and Technology 1–14, 8; see further F Shaheed,

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restructuring of teachers' roles, where the promise of automation results in more complex responsibilities and potentially diminishes the quality of their engagement with students.[122] For instance, teachers might need to invest time in learning how to operate automated grading software and then verify the fairness of the results – essentially spending as much time as they would grading manually, while also losing valuable insights into how their students learn. Beneath the surface, these shifts may reflect a broader pattern of deskilling and hidden labor, where educators are required to perform additional repetitive or compensatory work to support automated systems – often for outcomes that are no more effective, and sometimes less reliable, than the practices they replace.[123]

### 3. Results: examining legal implementation and impact

The third step of the effectiveness test focuses on results – both anticipated and actual.[124] During the lawmaking phase, it examines whether the law clearly defines expected outcomes, includes mechanisms for monitoring and evaluation, and ensures that the necessary data will be collected to assess implementation.[125] This involves asking what results are to be achieved, how they will be measured, and whether adequate structures are in place to track progress.[126] In the evaluation phase, the focus shifts to whether the intended results were actually achieved, what broader impacts emerged, and whether there is a clear link between those outcomes and the law's original purpose, content, and context.[127]

First, it is unclear whether the AI Act establishes the necessary foundations to evaluate the real-world impact of AIED on teaching and learning. While the Act includes obligations related to record-keeping[128] and post-market monitoring[129], these mechanisms may be insufficiently tailored to capture outcomes relevant to the education sector – particularly those tied to professional judgment and student-teacher relationships. For example, there is limited guidance on how the effectiveness of human oversight will be assessed in practice, or how its role in safeguarding pedagogical integrity and student rights will be monitored over time. Ostensibly, oversight bodies will verify whether the relevant harmonised standards have been followed. However, as discussed above, this approach risks reducing oversight to a formalistic compliance exercise, rather than ensuring it functions as a substantive safeguard aligned with the law's broader educational and rights-based objectives.

This gap is all the more critical given the risk of what has been termed "artificial stupidity."[130] Originally, the term described the deliberate simplification of AI systems by its designers to match user skill levels in the computer-gaming context.[131] Here, it is used

"Artificial Intelligence in Education – Report of the Special Rapporteur on the Right to Education" (16 October 2024) UN symbol: A/79/520, 1–29, 14 available at <https://www.ohchr.org/en/documents/thematic-reports/a79520-artificial-intelligence-education-report-special-rapporteur-right>, < https://www.tandfonline.com/doi/full/10.1080/17439884.2025.2537959>.

[122] AB Rensfeldt and L Rahm, "Automating Teacher Work? A History of the Politics of Automation and Artificial Intelligence in Education" (2022) 5 Postdigital Science and Education 25–43, 26 *citing* N Selwyn, "The Human Labour of School Data: Exploring the Production of Digital Data in Schools" (2021) 47 Oxford Review of Education 353.

[123] K Crawford, *Atlas of AI* (Yale University Press 2021) p 66.

[124] Mousmouti, (n 8) 445, 463.

[125] Ibid.

[126] Ibid.

[127] Ibid.

[128] AI Act, Art. 12.

[129] AI Act, Chapter IX.

[130] L Lidén, "Artificial Stupidity: The Art of Intentional Mistakes" (2003) 2 AI Game Programming Wisdom 41–8.

[131] Ibid. (explaing how it may be necessary to limit AI's ability to achieve certain tasks in the gaming context to better match humans' ability).

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more broadly in line with recent research to highlight how an AI system can also unintentionally produce flawed, irrational, or counterproductive outcomes that eventually undermine its intended purpose.[132] For example, an AIED system that recommends remedial math lessons to a student after detecting a dip in performance – without recognising that the student was recovering from illness – demonstrates artificial stupidity by ignoring contextual factors essential for sound educational judgment.[133]

One mechanism intended to bridge this gap is the Fundamental Rights Impact Assessment (FRIA), which in principle offers a space for anticipatory reflection on the societal and ethical dimensions of AIED deployment.[134] According to Article 27, public sector bodies, as well as private entities providing public services – such as education – are required to carry out a FRIA before deploying a high-risk AI system. This assessment must include: a description of the deployer's processes in which the AI system will be used; the intended duration and frequency of use; the categories of individuals or groups likely to be affected in the specific context; the specific risks of harm to those affected; and an explanation of the human oversight measures in place, including actions to be taken should those risks materialise.[135] Yet the practical function of the FRIA as a tool for rights protection is heavily dependent on how institutions interpret and implement it. Here, universities may lack both the expertise and resources to assess the full scope of risks, especially when AIED tools serve institutional priorities like efficiency, scalability, or data-driven performance management. Furthermore, there is an absence of concrete guidance on how to evaluate AIED's impact on academic freedom, pedagogical relationships, or the discretion of educators from a methodological perspective, particularly as institutions must also navigate overlapping obligations under other regulatory frameworks, such as the GDPR's Data Protection Impact Assessment and the systemic risk assessments required by the Digital Services Act.[136] Here, there is a risk that the FRIA may devolve into a procedural checkbox rather than serving as a meaningful safeguard.

Second, most high-risk AIED systems will be subject to self-assessment to demonstrate conformity with the law, with third-party assessment required only when biometric data is processed. As a result, technology providers retain considerable discretion in identifying risks and determining what constitutes an acceptable level of harm.[137] This discretion raises important questions about accountability, transparency, and the consistency of risk management across different educational contexts.[138] More fundamentally, it casts doubt on whether the results that emerge from the implementation of the AI Act can be meaningfully linked back to its stated purpose – namely, the protection of fundamental rights and the promotion of trustworthy AI. Without robust, independent oversight mechanisms or clear criteria tailored to the complexities of education, there is a real risk that the Act's purpose will be undermined in practice, even if formal compliance is achieved.

Finally, the effectiveness of the AI Act in addressing the real-world impacts of AIED also depends on whether its classification system for high-risk AI remains responsive to emerging challenges in the education sector. While Annex III sets out an initial list of high-

[132] H Ma and M Su, "Artificial Stupidity and Coping Strategies" (2025) 54 Organizational Dynamics 101059; see also M Falk, "Artificial Stupidity" (2021) 46 Interdisciplinary Science Reviews 36–52.

[133] See further J Lieber, J-G Mailly and F Rollin, "Some Thoughts About Artificial Stupidity and Artificial Dumbness" (2023) 37(3) AI Communications 377–91, 381–4 (providing explicit examples of artificial stupidity).

[134] AI Act, Art. 27.

[135] AI Act, Art. 27.

[136] G Malgieri and C Santos, "Assessing the (Severity of) Impacts on Fundamental Rights" (2025) 56 Computer Law & Security Review 106113.

[137] L Colonna, 'The AI Regulation and Higher Education: Preliminary Observations and Critical Perspectives" in K de Vries and M Dahlberg (eds), *De Lege 2021: Law, AI and Digitalisation* (Iustus Förlag AB 2022) 333–56, 343–4.

[138] Ibid.

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risk use cases, Article 7 empowers the European Commission to amend this list through delegated acts. This mechanism introduces a degree of regulatory flexibility, allowing new educational use cases to be added when they pose equivalent or greater risks to health, safety, or fundamental rights compared to those already covered. However, this adaptability is constrained by the structure and conditions of Article 7. Any amendment must fall within the domains already listed in Annex III, and be justified by demonstrable harm or substantiated risk. In practice, this means that the classification system remains reactive against the urgent need for proactive approaches to regulation to prevent student harms before they occur: new educational use cases may only be reclassified as high-risk after evidence of harm emerges or significant concerns are raised.[139]

### 4. Context: understanding the law's interaction with the broader legal framework

The fourth step of the effectiveness test examines how the law fits within the broader legal framework, assessing its coherence, consistency, and interaction with existing laws.[140] During the lawmaking phase, it considers whether the proposed legislation integrates smoothly into the legal order, avoids overlaps or contradictions, and offers clear, understandable changes.[141] Retrospectively, it evaluates whether the law has created gaps, redundancies, or inconsistencies in practice, and whether such issues were foreseeable or can be resolved through legal or policy adjustments.[142]

Article 14 of the AI Act mandates human oversight is implemented into system design but, as discussed above, grants significant discretion to technology providers in determining what is appropriate and cost-effective, potentially concentrating power in the hands of technology companies and allowing them to shape educational practices in ways that prioritise their commercial interests over public concerns like educational quality and equity.[143] Additionally, the core values of EU and national educational regulations, which emphasise active participation from teachers, families, students, and the community in school governance, may be at odds with the technical demands of AI oversight.[144] This shift towards technocratic compliance could undermine participatory educational structures and diminish inclusive, transparent, community-driven decision-making in favour of more centralised, opaque, commercially influenced approaches.

Moreover, the way human oversight is structured in AI regulation may not always align with the educational principle of professional judgment, potentially undercutting the role of teachers, who, as emphasised by EU policy, are regarded as being "at the heart of education."[145] For instance, an AI system used for grading might require human oversight in the form of periodic checks to ensure the algorithm is not biased. However, this form of oversight might be more procedural and less focused on the nuanced, context-sensitive decisions that educators are trained to make. This could lead to situations where the human oversight required by AI regulation is a formality rather than a meaningful exercise of professional judgment. Delegating key aspects of teaching to AI inserts a digital intermediary into the classroom, flattening the contextual and relational dimensions of pedagogy and

[139] For more on proactive law, see P Seipel, "Nordic School of Proactive Law Conference, Closing Comments" (2006) 49 Scandinavian Studies in Law 362.

[140] Mousmouti, (n 8) 445, 464.

[141] Ibid.

[142] Ibid.

[143] Livingstone et al., (n 95) 100195.

[144] See, e.g., Council Recommendation of 22 May 2018 on Promoting Common Values, Inclusive Education, and the European Dimension of Teaching (2018/C 195/01).

[145] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on Achieving the European Education Area by 2025 (Brussels, 30 September 2020).

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sidelining the expert judgment that teachers exercise in responding to the diverse needs of learners.[146] In doing so, such practices risk contravening education regulations and professional standards that recognise the teacher as an autonomous professional, entrusted with making informed, context-sensitive decisions in the best interests of students.[147]

Under the AI Act, teachers are expected to exercise oversight over the functioning and outcomes of AIED systems – such as validating algorithmic decisions, interpreting outputs, or intervening when errors occur. However, this supervisory role operates within a feedback loop in which teachers not only oversee AI systems but are themselves shaped by their outputs and influence. For instance, AIED systems may shape how teachers assess students, structure lessons, or prioritise content, thereby constraining pedagogical discretion. This dynamic reflects a form of human-AI coevolution, where the very technologies meant to assist are also reconfiguring the practices and judgments of those tasked with oversight.[148] Teachers thus operate simultaneously as agents of legal compliance and as participants in a recursive system that may limit their professional autonomy over time.

Furthermore, when AI is deployed in education, teachers may find themselves in an increasingly precarious position – not as empowered decision-makers, but as scapegoat for liability.[149] As the so-called "human in the loop," the teacher is expected to oversee, interpret, or validate AI outputs, often without adequate training, resources, or authority to meaningfully intervene. When things go wrong – such as biased grading, flawed student assessments, or exclusionary outcomes – it is the teacher, not the system, who is most likely to be held responsible rather than institutional decision-makers.[150] In this way, teachers become the moral and legal "crumple zone", absorbing the fallout of decisions shaped by opaque algorithms and institutional pressures.[151] This dynamic undermines professional trust and autonomy in contradiction with educational regulatory frameworks and professional standards that affirm the teacher's role as an autonomous professional, entrusted with making context-sensitive, pedagogically sound decisions in the best interest of students.

Another area of tension between AI regulation and education regulation concerns the uneven capacity of schools and educators to meet new technical demands. Requiring teachers to take on responsibilities that presume a level of AI literacy or technical expertise may place an additional burden on already stretched educational staff, particularly in under-resourced schools.[152] This risks deepening existing disparities between institutions that have access to training, infrastructure, and support, and those that do not.[153] As a result, the implementation of AI regulation in educational contexts may inadvertently conflict with EU education policy objectives aimed at promoting equity and reducing structural inequalities in education systems across Member States.[154]

[146] J Koh, M Cowling, J Meena and KN Sim, "The Human Teacher, the AI Teacher and the AIed-Teacher Relationship" (2023) 23 Journal of Higher Education Theory and Practice 200, 206.

[147] Ibid.

[148] D Pedreschi et al., "Human-AI Coevolution" (2025) 339 Artificial Intelligence 104244.

[149] B Green, "The Flaws of Policies Requiring Human Oversight of Government Algorithms" (2022) 45 Computer Law & Security Review 105681, 10; L Colonna, "Teachers in the Loop? An Analysis of Automatic Assessment Systems under Article 22 GDPR" (2024) 14 International Data Privacy Law 3, 13.

[150] D McQuillan, *Resisting AI: An Anti-Fascist Approach to Artificial Intelligence* (Bristol University Press 2022) pp 37–8; B Green, "The Flaws of Policies Requiring Human Oversight of Government Algorithms" (2022) 45 Computer Law & Security Review 105681.

[151] MC Elish, "Moral Crumple Zones: Cautionary Tales in Human-Robot Interaction" (2019) 5 Engaging Science, Technology, and Society 40–60.

[152] S Gonzales, AI Literacy and the New Digital Divide: A Global Call for Action (UNESCO 2024).

[153] For more, see Organisation for Economic Co-operation and Development (OECD) "Understanding the digital divide," OECD Digital Economy Papers, No. 49 (Paris, 2021).

[154] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on Achieving the European Education Area by 2025 (Brussels, 30 September 2020).

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It is further necessary to observe how legal obligations for transparency, notification, and explanation may not easily align with pedagogical goals.[155] These obligations found in both the GDPR and the AI Act risk introducing procedural burdens that can interfere with the educational environment. Teachers, as the primary human overseers of AI systems in the classroom, may be required to issue frequent notifications or explain AI-driven processes, shifting their focus from pedagogy to legal compliance. This can fragment the learning experience, disrupt classroom dynamics, and compromise students' ability to engage meaningfully with the material.

Finally, conflicts between AI regulation and education regulation also intersect with questions of academic freedom, particularly regarding the extent to which teachers can exercise discretion over the adoption and use of AI tools in their practice.[156] Tensions arise when educators are expected – or required – to integrate AI systems into their teaching, even in cases where they may have reservations about the pedagogical value, data protection implications, or broader institutional purposes of such tools. As noted at the outset, a distinction is often drawn between AI-supported and AI-driven education: in the former, teachers remain active decision-makers, using AI as a tool to support their chosen methods; in the latter, AI systems play a central role in managing instruction, assessment, and course progression, with teachers positioned primarily as supervisors or trouble-shooters.[157] In this shift from pedagogical autonomy to oversight, the space for academic freedom may be reduced, particularly where the design and deployment of AI systems pre-structure the teaching process in ways that limit meaningful teacher input.[158]

## V. Discussion

If the AI Act is assessed functionally, as a tool intended to produce concrete regulatory outcomes, its effectiveness must be judged by its ability to deliver on its stated goals: ensuring safe, lawful, and trustworthy AI systems while safeguarding fundamental rights and promoting innovation.[159] Applying the effectiveness lens reveals a more complex picture than a simple yes-or-no verdict that the AI Act effectively regulates AIED. In some respects, the AI Act can be said to function effectively: it articulates a broad regulatory purpose, embeds obligations for technology providers and deployers as well as establishes mechanisms such as FRIAs and post-market monitoring. However, these results do not necessarily speak to the quality or adequacy of the regulation in educational contexts.[160] In other words, mechanisms such as post-market monitoring and FRIAs provide important procedural safeguards, but their substance and operation may fail to account for the distinct pedagogical, institutional, and relational dimensions of educational environments.

In this sense, there may be an original deficiency in the legal design of the AI Act. The legislative choices embedded in the law – including, for example, its framing of human

[155] See, e.g., AI Act, Art. 86.

[156] See, e.g., UNESCO (1997). Recommendation Concerning the Status of Higher-Education Teaching Personnel, para. 28 available at <https://unesdoc.unesco.org/ark:/48223/pf0000113234> page=2; see further Laukytė, (n 2) 17-35, 29 (highlighting that in the context of AIED, the right to academic freedom becomes "the main weapon that teachers have to oppose the use of AI that they do not consider beneficial for the students" since it empowers teachers to reject technologies they believe do not enhance learning, reinforcing the principle that the use of AI should remain a choice – not a mandate.).

[157] Holmes et al., (n 14) 1–114, 19 available at <https://rm.coe.int/prems-092922-gbr-2517-ai-and-education-txt-16x24-web/1680a956e3> (last accessed 5 April 2025); Laukytė, (n 2) 17-35, 30.

[158] Miglė Laukytė, 'Artificial Intelligence in Education: Exploring the Potential Benefits and Risks' In: Edita Gruodytė and Aušrinė Pasvenskienė (eds.) *Human Right to Education in the Age of Innovations and Smart Technologies* (Berlin: Peter Lang; 2024) 17–35.

[159] Xanthaki, (n 78) 431, 434 (2018).

[160] Ibid. at 435.

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oversight, reliance on self-assessment for most AIED systems, and minimal tailoring to the specificities of HE – reflect a misalignment between regulatory instruments and the social realities of educational practice. If the law's anticipated outcomes (e.g., safeguarding fundamental rights, supporting trustworthy AI) are only weakly realised when AIED is deployed in HE, this may point to a mischaracterisation of the risks of AIED, an overestimation of institutional capacities, or a failure to anticipate the frictions between AI regulation and education.[161]

Addressing these issues requires a recalibration of regulatory strategies to better reflect the operational and normative complexities of educational practice. This could involve the introduction of co-regulatory mechanisms that incorporate input from educators, students, and institutional stakeholders; the development of sector-specific codes of conduct; and the refinement of oversight obligations to account for the realities of institutional capacity and pedagogical autonomy.[162] Importantly, the AI Act must be seen as a dynamic legal instrument – what Xanthaki refers to as "phronetic" legislation – that is open to revision in light of emerging challenges and shifting contexts.[163] In education, this means moving beyond formalistic compliance toward a framework that genuinely supports the public mission of universities and respects the professional role of educators.

Ultimately, the effectiveness of the AI Act in educational settings depends not only on its internal coherence but also on its ability to integrate meaningfully with existing legal frameworks. When AI regulation fails to accommodate the specific requirements of education law – such as the protection of academic freedom, the recognition of teacher autonomy, and the commitment to inclusive, high-quality education – it risks producing regulatory frictions that undermine both legal regimes. While such frictions are not inherently problematic, they become legally and politically significant when they impair the fulfilment of fundamental rights like the right to education and the EU's broader commitment to participatory democracy.[164]

## VI. Conclusion

While AIED offers the potential for increased efficiency, cost-effectiveness, and innovative solutions to numerous challenges in education, its deployment also carries the risk of unintended negative consequences, such as perpetuating biases, compromising student privacy, diminishing the role of educators, and creating disparities in access to advanced learning technologies.[165] As commercial, scientific, and political interests converge to promote AI-driven models of schooling, the role of educators is being redefined.[166] The AI Act, while well-intentioned, tasks teachers with overseeing, interpreting, and validating AIED, effectively positioning them as the primary agents responsible for its implementation and accountability. This shift risks not only displacing pedagogical judgment but also reconfiguring academic roles, as educators are increasingly expected to perform functions more akin to technology managers than autonomous professionals.[167] At the same time,

[161] Ibid. at 431.

[162] Ibid. at 432.

[163] Ibid. at 434–6.

[164] Charter of Fundamental Rights of the European Union Article 14, 2012 O.J. C 326/391.

[165] L Rahm and J Rahm-Skågeby, "Imaginaries and Problematisations: A Heuristic Lens in the Age of Artificial Intelligence in Education" (2023) 54 British Journal of Educational Technology 1147, 1149; T Cerratto-Pargman, Y Lindberg and A Buch, "Automation Is Coming! Exploring Future(s)- Oriented Methods in Education, 5 Postdigital Science and Education" (2023) 171, 172; P Prinsloo, "Of 'Black Boxes' and Algorithmic Decision-Making in (Higher) Education – A Commentary" (2020) 7 Big Data & Society 1, abstract; N Selwyn et al., "Making Sense of the Digital Automation of Education" (2023) 5 Postdigital Science and Education 1, 2.

[166] Williamson et al., (n 10) 1–42, 14.

[167] D Greene, *The Promise of Access: Technology, Inequality, and the Political Economy of Hope* (MIT Press 2021) p 169.

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universities adopting AIED at scale may begin to resemble startup environments, where innovation is prioritised over educational values such as equity, critical inquiry, and professional trust.[168] These developments highlight a central tension: while the AI Act sets out to ensure trustworthy AI and protect fundamental rights, its limited alignment with education regulation and its underestimation of the social and institutional dynamics of teaching may ultimately undermine those very goals. Ensuring effective regulation of AIED therefore requires sustained attention to the specificities of educational contexts, including the evolving role of teachers, the institutional capacities of HE, and the broader normative commitments of the education system itself.

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[168] Ibid.

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