

The Meta-Level Gap in Generative AI Competency Frameworks

Specifying Skills and Co-Creating Regulatory Capacity for AI in Education

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Introduction

A growing number of generative AI (GenAI) competency frameworks now shape how AI literacy is taught, assessed, and governed across educational systems. AI competency frameworks define engaging with AI well as a set of skills to be attained: UNESCO's AI Competency Frameworks (2024) inform curricula in more than 40 countries, offering a broad account of the knowledge and skills AI engagement requires. DigComp 2.2 (European Commission, 2022) provides the reference standard across and beyond the EU, building on an established digital competency model. Emerging frameworks such as Ecopedagogies (Wardak, 2026) bring a systems-level, equity-oriented perspective developed specifically for higher education policy.

Research on self-regulated learning has long distinguished between regulation that happens within an individual learner (self-regulation), regulation that happens between learners (co-regulation), and regulation that happens across a group working toward a shared goal (shared regulation). Competency frameworks, including those built on digital-literacy models pre-suppose these capacities to monitor, adjust, and distribute responsibility across human and AI agents. This brief calls that shared omission the meta-level gap, including metacognitive monitoring, co-regulation, and institutional accountability, that the frameworks assume but leave unaddressed.

Where a framework leaves the regulatory process unspecified, the work of regulation does not disappear; it is displaced downstream onto individual learners and onto whichever institutions can least afford to absorb it. This is where the consequences become a matter of equity, inclusion, and accessibility, the benchmarks against which AI integration in education should be assessed.

This brief makes two contributions. First, it locates the meta-level gap across three regulatory levels (individual, social, and institutional), arguing that the appropriate policy

response is the deliberate cultivation, through co-creation with learners and educators, of high-level problemsolving and meta-skills. Second, it offers a practical instrument, tested in small workshops: a meta-level assessment, operationalised through the DeBiasMe collaborative bias-mapping prototype, that policymakers and institutions can use to score AI integration against equity, inclusion, and accessibility benchmarks.

1. The individual level: From Skill Endpoints to Metacognitive Monitoring

When a learner interacts with a GenAI system, the system does not simply respond to a fixed request; its outputs can shape how the learner frames subsequent questions, how confident they feel in an answer, and what they take to be true. The emerging Human-AI Shared Regulation in Learning (HASRL) framework introduces a configuration in which the regulatory processes of planning, monitoring, and adjusting are distributed across learner, educator, and AI system together. It reshapes what each level of regulation involves: an individual learner's monitoring extends to their own role in an exchange with a system that is itself shaping that exchange. Evidence from AI-literacy research points to an efficiency gap: learners readily adopt AI to complete tasks faster, while the metacognitive skills needed to maintain meaningful control over their own thinking do not keep pace.

Three interacting risks follow when the individual level is specified declaratively rather than procedurally:

- Over-reliance and cognitive offloading: learners over-rely on AI outputs without the monitoring habits, treating the system as a black-box productivity tool.
- Human bias amplification: an algorithmic auditing alone cannot address the bias emerging from the interaction.
- Erosion of critical thinking: efficiency-focused use builds dependency without building skill, widening the gap between confidence and actual competence (poor metacognitive calibration).

Recommendations:

1. Specify metacognitive monitoring as an assessable competency, the process by which a learner checks the correspondence between confidence and knowledge when working with AI, rather than listing bias awareness as an attitude.

2. Treat the meta-skill of knowing when and whether to rely on AI as a core competency in its own right, not an implicit by-product of skills instruction.

2. The Social Level: From Individual Use to Co-Regulation and Co-Creation

When AI mediates the exchange between people, the social processes that make learning robust, including conversation, contestation, and joint sense-making, are restructured. The social dimension includes the learner's and educator's relationship with that system that requires high-level problem-solving and meta-skills that are inherently relational: the ability to work with others to expand one's interpretation of a problem and the resources available to address it. They have to be cocreated and built with learners and educators in their own contexts, positioned as those who define which risks and solutions matter.

Risks when the social level is unspecified:

- Restructured social processes remain ungoverned: facilitation, contestation, and peer monitoring are displaced by AI mediation with no framework guidance on how to sustain them.
- Facilitator capacity is assumed rather than resourced: shared regulation depends on skilled facilitation, which is unevenly distributed and rarely provided for.
- Co-creation collapses into consultation: without explicit provision, learner and educator voice becomes tokenistic rather than constitutive.

Recommendations:

1. Specify the relational conditions for co-regulation (trust, interpretive alignment, etc.) as explicit design requirements.
2. Require participatory co-creation in which learners and educators help define the competencies relevant to their context.

3. The Institutional Level: From Automation Efficiency to Regulatory Capacity and Equity

At the institutional level, the orientation across frameworks is toward how AI integration works in classrooms for efficiency, adoption, and automation, rather than toward whether

institutions hold the regulatory capacity to govern it. When frameworks do not specify the institutional process and provisioning needed to reach them, AI integration risks widening the digital divide and deepening existing educational inequalities.

Risks when the institutional level is unspecified:

- Uneven capacity widens the divide: well-resourced institutions can build the monitoring, facilitation, and accountability structures while under-resourced ones cannot. The institutions least able to govern AI are the ones whose learners are most exposed to its harms.
- Accountability gaps obscure systematic disparities: without aggregated, auditable evidence, differential impacts across learner populations remain invisible to those who could intervene.

Recommendations:

1. Require auditable, privacy-preserving accountability mechanisms capable of detecting systematic disparities across learner populations.
2. Provision regulatory capacity for under-resourced institutions explicitly, and specify equity, inclusion, and accessibility as process standards an integration is assessed against.

4. A Meta-Level Assessment Instrument: DeBiasMe Prototype

This section offers a concrete instrument for acting on them: a meta-level assessment that allows a policymaker, framework author, or institutional leader to score a proposed or existing AI integration (a policy, a procurement, a curriculum, a tool deployment) against the process-quality and equity standards the gap analysis identifies. The instrument operationalises the DeBiasMe collaborative AI Literacy prototype, repurposing a learning artifact as a governance tool.

How it works. Each of those three regulatory levels is scored against three equity benchmarks: equity (differential impact across learner groups), inclusion (participatory co-creation), and accessibility (usability for non-technical users and under-resourced settings). The mapping is structured by a three-category bias model (pre-existing, technical, and emergent) so that human and machine biases are examined together rather than separately.

Early use. The prototype was tested as design-feedback probes in one-hour workshops

with ten K-12 teachers and twelve industry professionals in Seoul, South Korea. Collaborative bias-mapping made distributed regulatory demands visible and discussable, and collaboration and contextual understanding emerged as key skill requirements.

Conclusion

The recurring choice presented to education systems, speed or thoughtfulness, efficiency or rigour, is a false one. Systems can have both, but only if they design for it: by specifying the regulatory process, not just the skill endpoint, and by cultivating the high-level problem-solving and meta-skills that AI-mediated learning most requires through co-creation with learners and educators rather than delivery to them. This brief offers an interpretive analysis and an early prototype, and its limits mark the work ahead. The framework analysis is interpretive, and the instrument's process-quality indicators still lack the full triadic dynamic between learner, facilitator, and AI regulating together, which remains to be tested empirically. The instrument is offered for collaborative testing across national and institutional contexts; international partners working on AI integration in education are welcome to apply, adapt, and contest it, so that the benchmarks it encodes are themselves cocreated.

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