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How Artificial Intelligence is shaping the future of learning: rethinking education, competence, and human agency

Ulf-Daniel Ehlers[1]

Abstract: Purpose of the article. This paper explores how artificial intelligence (AI) transforms the philosophical, cultural, and pedagogical foundations of education. It argues that while AI expands cognitive capacity and predictive power, it simultaneously reveals the irreducible qualities of human learning—consciousness, doubt, resistance, meaning, and ethical responsibility.
The central purpose is to re-articulate what it means to be educated when intelligence itself becomes machinic. Research methodology. Drawing on conceptual synthesis and transdisciplinary literature from 2018–2025, the article integrates systems theory (Luhmann), media theory (McLuhan), and contemporary educational research on AI literacyand future skills. It analyzes philosophical arguments and policy frameworks (OECD, UNESCO) to derive a normative model for "learning in the age of algorithmic certainty." Findings. Education's core value lies not in reproducing information but in cultivating judgment under uncertainty.
Keywords: Artificial Intelligence; future skills; human agency; learning culture; ethics of technology
JEL Classification: I21; I23; O33; D83

Kako umetna inteligenca oblikuje prihodnost učenja: premislek o izobraževanju, kompetencah in človeški dejavnosti

Povzetek: Namen članka. Prispevek obravnava, kako umetna inteligenca (UI) preoblikuje filozofske, kulturne in pedagoške temelje izobraževanja. Poudarja, da UI sicer širi človekove kognitivne zmožnosti in napovedne sposobnosti, vendar hkrati izpostavlja bistvene razsežnosti človeškega učenja — zavest, dvom, zmožnost upora, iskanje smisla ter etično odgovornost. Osrednji namen je na novo premisliti, kaj pomeni biti izobražen v času, ko inteligenca postaja vse bolj strojno posredovana.
Metodologija raziskovanja. Prispevek temelji na konceptualni sintezi in transdisciplinarnem pregledu literature iz obdobja 2018–2025. Povezuje izhodišča sistemske teorije (Luhmann), medijske teorije (McLuhan) ter sodobnih raziskav na področju izobraževanja, zlasti pismenosti za uporabo UI in veščin prihodnosti. Na podlagi analize filozofskih razprav in strateških dokumentov (OECD, UNESCO) oblikuje normativni okvir za »učenje v dobi algoritmične gotovosti«. Ugotovitve. Temeljna vrednost izobraževanja ni v reprodukciji informacij, temveč v gojenju presoje v negotovosti.
Ključne besede: umetna inteligenca; veščine prihodnosti; človeška dejavnost; kultura učenja; etika tehnologije

[1]*Prof. dr.,*
Duale Hochschule Baden-Württemberg Stuttgart,
Germany
ulf-daniel.ehlers@dhbw-karlsruhe.de

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INTRODUCTION – THE HUMAN QUESTION BEHIND ARTIFICIAL INTELLIGENCE

Artificial intelligence has emerged as the defining metaphor of our time. It embodies both technological promise and existential anxiety. With each new breakthrough—from generative language models to autonomous decision systems—the boundary between human and machine intelligence seems to blur. The question *what does it mean to think?* has re-entered public discourse, no longer confined to philosophy seminars but negotiated daily in classrooms, workplaces, and online platforms.

This article begins from the premise that AI is not merely a technological innovation but a cultural mirror: it reflects back to us our assumptions about intelligence, consciousness, and value. When machines perform tasks once reserved for human intellect, the issue is no longer *whether* they can learn but *what remains uniquely human in learning itself*.

The contemporary debate often oscillates between technological optimism and moral panic. On one side stand advocates of acceleration—those who see AI as a tool for efficiency, personalization, and unprecedented access to knowledge. On the other side are skeptics who warn of surveillance capitalism, bias, and the erosion of human judgment (Zuboff, 2019; Selwyn, 2022). Yet both positions share a common blind spot: they treat learning as a process that can be *optimized* by technical means.

Education, however, is not an engineering problem. It is a human encounter with uncertainty. As Niklas Luhmann (1995) argued, the function of education in complex societies is not to transmit stable knowledge but to enable individuals to orient themselves amid contingency. When AI takes over functions of analysis, retrieval, and prediction, it becomes crucial to cultivate precisely those competencies that transcend computation—critical reflection, empathy, ethical reasoning, and imaginative projection.

The purpose of this paper is therefore to ask: *How does AI reshape the meaning, methods, and aims of learning?* And what kinds of human capability must education now foster to sustain agency in an algorithmic world?

1 ARTIFICIAL INTELLIGENCE AS CULTURAL MIRROR

1.1 From Cognitive Tool to Cultural Condition

Historically, every technological revolution has redefined education's purpose. The printing press democratized literacy; the industrial age standardized schooling; the digital era decentralized information. AI now inaugurates a new epistemic order characterized by what Luciano Floridi (2020) calls "hyper-automation of cognitive processes." The technology does not merely extend human thinking—it *reconfigures* what counts as thinking.

While early computational models conceived intelligence as problem-solving within rule-based systems, contemporary AI thrives on statistical learning from vast datasets. Its intelligence is instrumental but not intentional: it can correlate patterns without understanding meaning. As Joseph Weizenbaum (1976) already warned, computational imitation of thought risks mistaking syntax for semantics. The deeper question is not whether machines can think, but whether society can still recognize the difference between calculation and consciousness.

In this sense, AI functions as a mirror for humanity. It externalizes cognitive functions—memory, perception, language—and thereby compels reflection on what remains irreducibly

human: consciousness, emotion, and moral judgment. This reflexive dimension makes AI a pedagogical phenomenon in itself: it teaches us about ourselves.

1.2 The Category Error of "Artificial Intelligence"

To speak of "artificial intelligence" is to commit, as Luhmann might put it, a *category mistake*. Intelligence in machines is algorithmic optimization within bounded parameters; intelligence in humans involves meaning, context, and responsibility. The conflation of the two—treating problem-solving capacity as equivalent to consciousness—creates both fascination and fear.

This misunderstanding fuels public discourse around *superintelligence* (Bostrom, 2014) and *technological singularity* (Kurzweil, 2005). Yet even as models surpass human performance in chess, translation, or image recognition, they remain devoid of intentionality. They cannot doubt, suffer, or aspire. The distinction is not quantitative but qualitative: between processing data and *interpreting* experience.

Recognizing this distinction is essential for education. When we mistake computational speed for wisdom, we risk shaping curricula that privilege information over insight. Learning then becomes *training*—efficient, measurable, and ultimately mechanical. True education, by contrast, resides in the space between certainty and doubt, where knowledge meets values and choice.

1.3 The Algorithmic Condition of Society

AI's societal impact extends beyond classrooms. It structures communication, labor, governance, and even emotional life. What philosopher Antoinette Rouvroy (2013) calls "algorithmic governmentality" describes how data-driven systems predict and pre-empt behavior, shifting decision-making from deliberation to calculation. In such an environment, the educational task becomes clear: to preserve the *human capacity for reflection* amid automated foresight.

Students today inhabit a world in which search engines finish their sentences and recommendation systems script their desires. The challenge is not access to information but cultivation of discernment. The question is no longer "How can we learn faster?" but "How can we *pause*, doubt, and interpret meaningfully?"

2 BETWEEN CERTAINTY AND DOUBT: THE EDUCATIONAL IMPERATIVE

2.1 Education as Orientation in Complexity

Luhmann's theory of social systems describes education as the mechanism by which society renews its capacity for orientation under complexity. Education transforms uncertainty into competence, not by eliminating ambiguity but by teaching how to navigate it. AI heightens this necessity: it multiplies possible choices and outcomes.

In earlier centuries, knowledge functioned as a stabilizing reference. In the AI era, knowledge becomes provisional, constantly updated by machine learning. Hence, education must evolve from knowledge transmission to *competence formation*—the ability to act responsibly when knowledge itself is unstable.

This shift parallels what Ehlers (2020) conceptualized as *Future Skills Literacy*: a compound competence enabling individuals to remain capable of action amid digital transformation. It

includes cognitive flexibility, ethical reasoning, creativity, and the courage to engage with the unknown. These are not "soft skills"; they are survival skills for democratic life in the age of AI.

2.2 The Pedagogy of Uncertainty

Education must reclaim doubt as a learning method. In contrast to algorithmic logic, which seeks certainty through convergence, learning thrives on divergence—on the friction of conflicting ideas. Teaching students to doubt is not to undermine truth but to strengthen judgment.

Epistemic humility—the recognition that one's knowledge is partial and revisable—is the cornerstone of intellectual maturity (Kitcher, 2011). It prepares learners to interrogate algorithmic outputs critically. When an AI model produces an answer, the educated response is not acceptance but inquiry: *What data shaped this answer? What assumptions underpin it? What might be missing?*

Pedagogically, this implies dialogical, inquiry-based approaches that foreground process over product. Project-based learning, Socratic dialogue, and reflective journaling can cultivate the *slowness* necessary for judgment. As Gert Biesta (2013) argues, the aim of education is not learning per se but *subjectification*—becoming a responsible subject capable of responding, not merely reacting.

2.3 Resistance as a Learning Outcome

Doubt alone is insufficient; it must be accompanied by resistance—the capacity to act against prevailing logics when conscience demands. AI systems optimize for efficiency and correlation; education must optimize for meaning and conscience.

Hannah Arendt (1961) insisted that the task of education is to prepare newcomers for a world that will change. To "love the world enough to assume responsibility for it" is the educator's vocation. In the AI age, this means teaching students to question algorithmic authority, to engage ethically with data, and to imagine alternatives to technological determinism.

Resistance here does not imply rejection of technology but the *refusal to surrender judgment*. It manifests as creative defiance, ethical pause, and the insistence on human accountability. These dispositions are nurtured not through lectures about values but through participatory practices—debates, simulations, artistic projects—that make conflict visible and productive.

3 LEARNING IN THE AGE OF ALGORITHMIC CERTAINTY

3.1 From Information to Interpretation

AI systems excel at processing information; they do not *interpret* it. Interpretation requires context, history, and perspective. The educational shift, therefore, is from *knowing more* to *understanding differently*.

Marshall McLuhan's dictum that "the medium is the message" reminds us that technologies shape cognition. The abundance of algorithmically curated information risks flattening complexity into personalization. The challenge for educators is to re-introduce *difference*—to help learners confront unfamiliar perspectives rather than reinforcing comfort zones.

Practical strategies include comparative reasoning tasks, exposure to counter-datasets, and critical media literacy. Learners should be invited to map how algorithms filter reality, tracing the invisible architectures of recommendation systems and social scoring. The goal is not paranoia but awareness: to see the code beneath the surface of convenience.

3.2 Human Learning as Meaning-Making

Human learning is not data processing but world appropriation. It is the dialogical interplay between self and world, mediated by language, culture, and emotion. AI can simulate aspects of this process but cannot experience meaning.

As constructivist learning theorists emphasize (Illeris, 2018), knowledge is always situated, embodied, and affective. Machines operate on correlation; humans learn through *transformation*. The role of education, therefore, is to preserve the *meaning dimension* of intelligence.

This perspective aligns with UNESCO's (2023) *Futures of Education* report, which calls for a new social contract for education centered on cooperation, sustainability, and human dignity. AI can augment access and efficiency, but without humanistic grounding, it risks amplifying inequality and epistemic bias.

3.3 The Ethics of Learning Design

Designing learning in the AI era demands ethical imagination. It requires educators to anticipate unintended consequences and to consider how algorithms shape what students encounter, ignore, or internalize. Ethics, in this sense, is not an afterthought but a design principle.

Drawing on Floridi's (2018) concept of *infosphere stewardship*, educators become custodians of digital ecosystems. They must ensure that learning environments promote autonomy rather than dependency. Transparency about AI's role in assessment and feedback is crucial. Students should know *when* and *how* algorithms intervene.

Moreover, ethical design involves protecting the emotional texture of learning—curiosity, frustration, wonder. These affective dimensions cannot be automated; they are cultivated through human relationship. As neuroscientific studies confirm (Immordino-Yang & Damasio, 2019), emotion and cognition are inseparable. A purely data-driven pedagogy thus impoverishes the very conditions for deep learning.

4 FUTURE COMPETENCE: AGENCY, ETHICS, AND AMBIGUITY

4.1 The Human in the Loop: Agency as the New Literacy

The accelerating integration of AI into education, work, and governance repositions *agency*—the capacity to act intentionally and responsibly—as the core literacy of our time. When decision-making is increasingly delegated to algorithms, maintaining a *human-in-the-loop* is not merely a procedural safeguard; it is a moral and pedagogical necessity (Crawford, 2021).

Agency, however, is not an abstract trait but a learned competence. It requires understanding the limitations of both human and machine cognition, developing sensitivity to context, and exercising judgment in the face of uncertainty. The European Commission's (2022) *Ethical Guidelines for Trustworthy AI* highlight this very dimension, emphasizing the cultivation of "AI literacy" across all educational levels.

In educational practice, agency can be fostered through authentic problem-solving where learners design, critique, and iterate with AI systems. For example, when students use a generative model to compose a text, they should also evaluate its biases, trace its sources, and reflect on its rhetorical choices. The outcome is not efficiency but *discernment*.

This literacy extends beyond technical skill. It entails what Ehlers (2022) describes as *Future Skills Literacy*—a capacity to connect digital proficiency with ethical self-understanding, social participation, and visionary creativity. In this sense, agency becomes the bridge between intelligence and responsibility, between computation and conscience.

4.2 Ethical Competence: Beyond Codes Toward Consciousness

Ethics in AI education cannot be reduced to compliance checklists or abstract principles. It must be lived and experienced as *situated reflection*. Floridi and Cowls (2019) proposed the framework of the "five AI principles" (beneficence, non-maleficence, autonomy, justice, and explicability), but ethical competence in practice means confronting tensions among these principles in real contexts.

For instance, consider adaptive learning platforms that personalize pacing. They embody beneficence (improving learning efficiency) but may reduce autonomy (by narrowing options) or justice (by reinforcing historical biases in data). The ethical task is to make such trade-offs visible, discussable, and revisable.

Educational programs can operationalize this through case-based learning, moral imagination exercises, and participatory policy simulations. When students analyze an AI system used in education—say, automated essay scoring—they practice ethical reasoning by asking: *Whose values are encoded here? Who benefits, who is excluded, and who is accountable?*

Ultimately, ethical competence requires the reintegration of *conscience* into cognition. Machines operate without moral horizon; humans cannot. The philosopher Emmanuel Levinas (1969) reminds us that ethics begins in the encounter with the Other. In digital education, the "Other" may appear as data, avatar, or algorithmic persona—but the moral imperative remains: to recognize vulnerability, to respond with responsibility.

4.3 Ambiguity and the Pedagogy of Complexity

If ethics grounds action, *ambiguity* sustains thought. Ambiguity tolerance—the ability to dwell productively in contradiction—is the antidote to algorithmic certainty. In a world driven by binary code, education must protect the analog spaces of paradox, nuance, and uncertainty.

Psychological research shows that ambiguity tolerance correlates with creativity, empathy, and resilience (Furnham & Marks, 2013). Philosophically, it embodies what Paul Ricoeur (1992) called the *capable self*—a subject who acts and suffers, who navigates conflicting interpretations without collapsing them.

Pedagogically, cultivating ambiguity means designing learning experiences that resist premature closure: open-ended inquiries, interdisciplinary projects, ethical dilemmas. It is through such uncertainty that students develop meta-cognition—the awareness of their own thinking—and with it, intellectual humility.

AI, paradoxically, can assist this process. When learners confront contradictory outputs from different models or datasets, they experience the *limits of prediction*. This confrontation can become a learning moment: to ask not only what is correct but why the system's judgment differs from human intuition. The resulting dialogue between human doubt and algorithmic confidence becomes the fertile ground for *Future Learning*.

5 THE CULTURAL AND ARTISTIC MIRROR

5.1 Art as Resistance to Algorithmic Rationality

Art has always preceded philosophy in sensing shifts of human consciousness. It perceives what data cannot: mood, irony, silence. As AI infiltrates cultural production—composing music, generating images, writing poetry—it exposes the question of meaning more vividly than any academic discourse.

The emergence of "generative art" reveals both the creativity and the limitation of algorithms. While models can remix aesthetic patterns with astonishing skill, they lack the *intentional rupture* that defines art as human expression. As philosopher Bernard Stiegler (2019) argued, the essence of art lies in its ability to resist automation, to reintroduce delay and reflection into the flow of production.

In education, engaging with AI-generated art can thus become a practice of critical literacy. Students can analyze how datasets encode cultural biases, how algorithmic recombination recontextualizes authorship, and how aesthetic surprise can still arise from non-human creation. The lesson is double: AI expands the field of possibility, but meaning remains a human negotiation.

5.2 Language, Consciousness, and the Poetics of Learning

Language is not merely a communication tool; it is the architecture of thought. When AI systems generate language, they simulate not just syntax but fragments of human consciousness. Yet the simulation lacks *intentional depth*. The difference between human and artificial language lies in the *presence of a subject*—someone who means what is said.

The act of writing in education, therefore, gains renewed importance. In an age when machines can produce text fluently, human writing becomes an act of *claiming authorship*. It is less about producing information and more about asserting identity, emotion, and moral position.

Pedagogically, this calls for reimagining writing assignments: emphasizing reflective essays, dialogical journals, and multimodal storytelling where students articulate *why* they used AI tools and *how* these shaped their voice. Such practices turn AI from a threat into a mirror, encouraging metacognitive awareness of language as both human and technological medium.

5.3 The Aesthetic Dimension of Education

John Dewey (1934) described art as "experience intensified." Education, too, at its best, is aesthetic—it engages senses, emotions, and imagination in the pursuit of meaning. The aesthetic dimension is what transforms learning from consumption into creation.

In AI-mediated environments, aesthetics counters abstraction. It anchors the learner in embodiment and emotion. Arts-based learning methods—visual mapping, soundscapes, performative inquiry—can help learners perceive the human consequences of algorithmic

systems. A project where students compose a documentary or digital exhibition on "The Faces of Algorithmic Bias," for example, fuses cognitive and affective domains, leading to deeper ethical insight.

Through such work, education becomes not the transmission of information about AI but the cultivation of *aesthetic and ethical sensibility* within it. As McLuhan (1964) foresaw, art serves as the "early warning system" of a culture; it reveals the unseen effects of its own media.

6 EDUCATIONAL FUTURES: TOWARD A NEW HUMANISM

6.1 From Technological to Transformational Education

Across policy and research, there is growing recognition that digitalization alone does not guarantee progress. The OECD (2021) and UNESCO (2023) both call for a shift from *technological* to *transformational* education—learning that empowers individuals and communities to shape their futures, not merely adapt to them.

This shift requires reframing education as a relational and ethical enterprise. Rather than asking how AI can personalize learning, institutions must ask how learning can humanize AI. The goal is not to compete with machines but to complement them—to develop what Tegmark (2017) terms "beneficial intelligence," where human values steer technological trajectories.

Such a transformation entails revisiting the triad of educational purposes: qualification, socialization, and subjectification (Biesta, 2013). AI challenges each dimension.

- *Qualification*—the acquisition of skills—must expand to include meta-skills such as digital discernment and moral imagination.
- *Socialization*—the transmission of norms—must account for algorithmic cultures that shape identity and community.
- *Subjectification*—the becoming of a person—must be protected as the core of education's humanistic mission.

6.2 The Institutional Challenge: Universities as Learning Ecosystems

Universities and schools face the dual challenge of integrating AI technologies responsibly while preserving the academic ethos of inquiry. Leadership here involves what Kotter (2012) called *adaptive capacity*—the ability to learn faster than the rate of external change.

Institutional transformation toward *Future Learning* can follow four interlinked pathways:

1. Curriculum Redesign: Embedding cross-cutting themes such as ethics, data literacy, and societal impact across disciplines.
2. Pedagogical Innovation: Shifting from knowledge transmission to challenge-based and studio learning that blends human creativity with algorithmic support.
3. Assessment Reform: Moving from recall-based tests to authentic, performance-based evaluation that includes process documentation and AI attribution statements.
4. Cultural Renewal: Cultivating an ethos of transparency, trust, and experimentation—a culture where faculty and students co-design learning with AI rather than under its dictates.

Such reforms demand leadership that is visionary yet participatory. Faculty must be partners, not subjects, of change; students must be co-creators, not consumers. Universities should function as living laboratories of human–AI collaboration, exemplifying what they teach.

6.3 Digital Sovereignty and Future Skills Literacy

Central to this new humanism is the idea of *digital sovereignty*: the capacity of individuals and institutions to understand, govern, and ethically shape digital technologies. Sovereignty is not isolation but informed participation—the ability to decide when and how to rely on AI systems and to maintain accountability.

Building on Ehlers (2020, 2023), *Future Skills Literacy* provides a comprehensive framework for this endeavor. It comprises five dimensions:

1. Epistemic Humility – recognizing the provisional nature of knowledge and the need for continuous learning.
2. Ethical Discernment – evaluating consequences and acting with integrity in digital contexts.
3. Creative Resistance – using imagination to question technological determinism.
4. Dialogical Imagination – engaging with diverse perspectives and fostering empathy across difference.
5. Digital Sovereignty – maintaining control and agency in technology-mediated environments.

Together, these dimensions outline an educational ethos that re-centers humanity in an automated world. They do not reject technology; they demand *maturity* in its use.

6.4 Evaluation and the Future of Educational Research

The reorientation of education toward humanistic futures requires corresponding innovation in evaluation. Traditional metrics—grades, test scores, completion rates—fail to capture transformation in judgment, empathy, or creativity.

Emerging methodologies such as learning culture analysis, future skills profiling, and mixed-methods impact studiescan offer more nuanced insights. For example, Ehlers et al. (2025) propose a *Future Skills Compass*, a self-assessment tool measuring learners' perceived growth in these five dimensions across time. When combined with qualitative interviews and digital ethnography, such instruments can document not only outcomes but *processes of becoming*.

Research must also address policy translation: how schools and universities can operationalize ethical AI frameworks without bureaucratic overload. Comparative studies across national contexts—Germany, Finland, Singapore—may reveal how cultural values shape the integration of AI in education.

7 CONCLUSION – THE FREEDOM TO DOUBT

Artificial intelligence challenges humanity not by replacing intelligence but by redefining it. In doing so, it forces education to confront its deepest question: *What does it mean to learn as a human being?*

This article has argued that the true task of education in the age of AI is to cultivate freedom through doubt—the ability to remain thoughtful, responsible, and imaginative when surrounded by systems that promise certainty. AI can predict, optimize, and simulate, but only humans can interpret, care, and decide.

The vision of *Future Learning* advanced here calls for a new educational humanism grounded in five commitments:

1. To value judgment over automation—ensuring that decision-making remains an act of conscience.
2. To teach doubt as strength—training learners to question rather than consume algorithmic authority.
3. To honor creativity as resistance—celebrating unpredictability as the engine of culture and innovation.
4. To nurture empathy as intelligence—seeing understanding not as calculation but as relation.
5. To protect freedom as learning's horizon—maintaining human agency amid machine efficiency.

AI, paradoxically, can help realize these goals—if we refuse to mistake its capacities for our own. It can amplify insight, scaffold exploration, and model complexity. But it cannot replace the moral labor of interpretation. Education's role is thus not to domesticate AI, but to *civilize ourselves* anew in its presence.

In the words of Hannah Arendt (1961), education is the point at which we decide whether we love the world enough to assume responsibility for it. The challenge of AI rephrases her question: Do we love humanity enough to remain human in an age of intelligent machines?

The answer will not be written by algorithms. It will be learned, lived, and taught—by us.

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