

AI Literacy and Critical Digital Literacy in School Practice: Collaborative Digital Writing as a Cognitive and Instructional Model for 21st Century Learning

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Abstract

The rapid expansion of Artificial Intelligence (AI) in educational settings has transformed writing practices, assessment structures, patterns of student engagement, and underlying epistemological assumptions about knowledge production. While AI systems offer unprecedented opportunities for cognitive scaffolding, emotional regulation, and inclusive participation, they simultaneously challenge traditional notions of authorship, intellectual agency, and pedagogical authority. The integration of AI into school practice therefore requires robust theoretical grounding, ethical governance, and organizational coherence. This article develops a comprehensive, human centered framework that connects AI literacy, critical digital literacy, collaborative digital writing, metacognition, emotional intelligence, and organizational culture in secondary education. Drawing upon interdisciplinary research in areas such as AI and adolescent emotional well being, AI and school related anxiety, collaborative ICT based inclusion, digital tools as cognitive instruments, technology as cultural bridge building practice, organizational culture and school vision, metacognition and emotional intelligence models, theory of mind in ICT contexts, digitally assisted mindfulness, and psychoanalytic cultural theory, the study proposes a multilayered instructional model for AI supported collaborative digital writing. The article argues that AI literacy must be cultivated not merely as technical competence but as epistemic responsibility embedded within reflective, relational, and culturally coherent school ecosystems. Collaborative digital writing emerges as a pedagogically optimal environment for fostering metacognitive regulation, socio emotional awareness, critical evaluation, and inclusive participation. The study concludes that AI integration in education must be guided by visionary leadership, organizational culture, ethical transparency, and human centered pedagogical design.

Keywords: Artificial Intelligence in Education; AI Literacy; Critical Digital Literacy; Collaborative Digital Writing; Organizational Culture; Metacognition; Emotional Intelligence; Inclusion; Secondary Education; Human Centered Pedagogy

1. Introduction

1.1. From Digital Tools to Cognitive Partners: The Rise of Generative AI in Schooling

Over the last decade, digital technologies have shifted from peripheral learning aids to central mediators of educational experience. Learning management systems, systems can now generate essays, summarize readings, translate texts, offer feedback, and simulate dialogic interaction on demand.

In secondary education, this transformation is already visible in students' writing practices. Learners increasingly encounter AI not only as a background technology but as an apparent cognitive partner: something that proposes thesis statements, suggests structure, reformulates paragraphs, and even drafts entire assignments. This development raises

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fundamental questions about what counts as learning, understanding, and authorship in the algorithmic age. If a student can quickly obtain a coherent essay from an AI system, what exactly is being assessed by traditional writing tasks? What does it mean to claim intellectual ownership of a text that has been co-produced—implicitly or explicitly—by a generative model? And how should teachers respond when the boundaries between support, collaboration, and substitution become fluid and ambiguous?

These questions reveal that AI in education is not a merely technical innovation but an epistemological turning point. It disrupts long-standing assumptions about the relationship between thinking, writing, and evidence of learning. Writing has historically functioned as both a cognitive process and an evaluative artifact: through composing, students externalize their reasoning, and through assessing the written product, educators infer the quality of that reasoning. Generative AI decouples these two dimensions. A polished text can now exist without corresponding internal cognitive work by the student, while deep understanding may remain invisible if hidden behind AI-generated formulations. Consequently, educational systems are compelled to revisit the very criteria by which they define and recognize knowledge.

1.2. Writing, Authorship, and Assessment in the Generative Era

Traditional conceptions of writing in education rest on a relatively clear distribution of roles. The student is the author; the teacher, the evaluator; and tools—such as dictionaries, grammar checkers, and word processors—are neutral instruments that assist with surface features of text production. Even when collaborative writing is introduced, the human participants are understood as intentional agents who jointly construct meaning.

First, AI systems can now generate extended, structurally coherent discourse that superficially resembles human writing. This capability challenges the assumption that the text product transparently reflects a student's internal reasoning process. It is increasingly difficult to know to what extent a given piece of writing is the result of the student's own cognitive labor versus algorithmic suggestion.

Second, the notion of authorship becomes contested. If a student uses AI to propose an outline, rewrite sentences, or offer counterarguments, where exactly does authorship lie? Is the AI a co-author, a sophisticated tool, or something in between? From a legal and ethical perspective, current debates tend to treat AI outputs as tool-mediated human products, but from a pedagogical and psychological perspective, the boundaries are less clear. Students may experience AI both as an aid and as an alternative mind, thereby reshaping their sense of agency, competence, and responsibility.

Third, assessment practices rooted in the individual production of text under controlled conditions are destabilized. If AI can be accessed from home or even on personal devices in school, then take-home essays and many homework assignments no longer reliably indicate independent mastery. Merely prohibiting AI use is both impractical and misaligned with broader societal trends, where AI is rapidly becoming an integral component of professional writing and knowledge work. Instead, educational systems must redesign tasks, criteria, and processes so that AI-supported work can still serve as valid evidence of learning.

These tensions have already begun to surface in empirical and conceptual studies. Work on AI and adolescent emotional well-being in inclusive secondary education suggests that when AI is embedded within thoughtful pedagogical design, it can enhance engagement and emotional stability rather than erode autonomy (Simos, Larios, & Papoutsis, 2026). Similarly, research on AI in addressing school-related anxiety indicates that AI-mediated feedback, when framed appropriately, may reduce performance pressure by offering iterative, non-judgmental support (Simos, Larios, & Katsiampoura, 2026). Such findings complicate reductive narratives that portray AI either as an existential threat or as a purely beneficial innovation. Instead, they point to a central question: under what cultural, organizational, and pedagogical conditions can AI augment rather than replace human learning and authorship?

1.3. The Risk of Epistemic Outsourcing

One of the most pressing concerns in the adoption of generative AI in schooling is the risk of epistemic outsourcing: the delegation of core cognitive tasks—such as understanding, evaluating, and integrating information—to a system that does not itself understand in human terms. Large language models operate through probabilistic pattern recognition across vast training corpora. They simulate coherence and expertise without possessing consciousness, intentionality, or genuine semantic grasp.

When students rely on AI to generate arguments, explanations, or textual formulations without engaging in critical evaluation, they may gradually weaken their own capacity for independent reasoning and self-regulated learning. The

immediate convenience of obtaining ready-made text can obscure the long-term costs: diminished metacognitive awareness, superficial processing of content, and decreased tolerance for cognitive effort.

The problem is not simply that AI might provide inaccurate information. Even when outputs are factually correct, uncritical acceptance undermines the development of what might be called *epistemic responsibility*—the disposition to question sources, cross-check evidence, and justify claims. As Simos, Larios, and Papoutsi (2026) emphasize in the context of inclusive secondary education, AI must be framed explicitly as a support mechanism whose outputs require human scrutiny, not as an authoritative source that displaces teacher guidance or student inquiry. Similarly, Simos, Larios, and Katsiampoura (2026) stress that AI systems are not neutral; they shape users' cognitive and emotional experiences. Thus, literacy regarding AI's underlying logic, limitations, and biases becomes a crucial component of responsible educational practice.

In this sense, AI literacy is inseparable from critical digital literacy. Students not only need to know *how* to use AI tools but also *how to position themselves* in relation to them: when to rely on AI suggestions, when to question them, how to verify claims, and how to preserve their own intellectual agency. Absent such frameworks, AI risks amplifying preexisting educational inequalities, benefiting those who already possess strong critical faculties while promoting dependency among more vulnerable learners.

1.4. AI in Relational and Cultural Context: Beyond Individual Tool Use

Technological transformations in education, including AI, do not unfold in a vacuum. They are interpreted, shaped, and constrained by the organizational cultures of schools: the shared norms, values, expectations, and practices that structure everyday life in educational institutions. The same AI tool can function very differently in two schools depending on leadership vision, policy frameworks, collegial trust, and the degree of teacher agency.

Research on school organizational culture underscores this point. Tzianakopoulou and Manesis (2018a) argue that school vision acts as a strategic and symbolic anchor for innovation, guiding how communities interpret change and decide which practices to adopt or resist. In subsequent work, they conceptualize organizational culture as a network of shared meanings that influences not only formal policies but also informal interactions, hidden curricula, and tacit norms (Tzianakopoulou & Manesis, 2018b). Their later study on the promotion of organizational culture (Tzianakopoulou & Manesis, 2021) highlights that sustained innovation requires intentional leadership practices that cultivate trust, collective responsibility, and reflective dialogue.

Applied to AI, these insights suggest that the question is not simply whether schools allow or prohibit AI, but how they narrate its role: as a threat to academic honesty, as a neutral efficiency tool, or as a catalyst for deeper collaborative and reflective learning. Without a coherent institutional vision, AI adoption can become fragmented, driven by individual teacher improvisation, student experimentation, or external pressures. With a clear, ethically grounded vision, by contrast, AI can be integrated into school life in ways that support inclusion, metacognition, and critical engagement.

Furthermore, digital technologies are not merely functional instruments; they are also cultural and relational practices. Studies on technology-mediated inclusion in schools show that digital tools can foster community, empathy, and shared identity when they are deliberately designed and used to build human bridges (Simos, 2025a, 2025b, 2025c). In this perspective, AI-supported collaborative writing is not just about improving textual quality; it is about creating spaces where students negotiate meaning together, recognize each other's voices, and develop socio-emotional competencies.

Consequently, AI integration must be understood as a multidimensional phenomenon involving organizational governance and culture (vision, policies, leadership practices), pedagogical design (tasks, roles, scaffolds, assessment methods), psychological processes (metacognition, emotional regulation, motivation), and cultural-symbolic dimensions (authorship, identity, and the meaning of learning). It is precisely this intersectional space that the present article aims to explore. The article argues that AI literacy must be cultivated not merely as technical competence but as epistemic responsibility embedded within reflective, relational, and culturally coherent school ecosystems. Collaborative digital writing emerges as a pedagogically optimal environment for fostering metacognitive regulation, socioemotional awareness, critical evaluation, and inclusive participation. The study concludes that AI integration in education must be guided by visionary leadership, organizational culture, ethical transparency, and human-centred pedagogical design.

1.5. Research Gap

The rapidly expanding literature on AI in education has tended to focus on specific dimensions in relative isolation: technical affordances of AI systems; ethical concerns about bias, privacy, and surveillance; impacts on learning outcomes; or questions of academic integrity. While these strands are undoubtedly important, there is a relative scarcity

of integrative frameworks that connect AI literacy, critical digital literacy, collaborative writing, metacognitive and emotional development, and organizational culture in a single, coherent model. More specifically, several gaps can be identified.

From tool use to epistemic responsibility, many discussions of AI literacy emphasize operational skills—how to construct effective prompts, how to interpret AI-generated summaries, or how to use AI to personalize learning. Less attention is paid to epistemic responsibility: how students understand the nature of AI-generated knowledge, how they evaluate its reliability, and how they maintain intellectual ownership of their work.

Collaborative digital writing as an integrative environment is another area where gaps appear. Research on collaborative digital writing and ICT-supported inclusion has shown that digital environments can promote unity, empathy, and shared authorship. However, these insights are often not systematically connected to AI-specific literacy frameworks. There is a need for pedagogical models where AI is integrated into collaborative writing in a way that strengthens, rather than undermines, relational and cognitive processes.

Metacognition, emotional intelligence, and AI interaction form a further domain of concern. Studies in educational psychology highlight the importance of metacognition and emotional intelligence for complex learning and leadership. Additional work on digitally assisted mindfulness and Theory of Mind development through ICTs shows that technology can support self-regulation and perspective-taking when used reflectively. Yet these theoretical frameworks are rarely applied directly to AI-supported writing, where the risk of cognitive dependency is particularly acute.

Organizational culture and AI governance also represent a significant gap. While there is a growing debate about AI ethics and policy at macro levels, such as national or international guidelines, fewer studies examine how school-level organizational culture and leadership vision concretely shape AI integration. The work on organizational culture has not yet been fully mobilized in AI-in-education research, leaving a gap in understanding how institutional factors condition classroom practices.

Psychoanalytic and cultural dimensions of authorship are likewise underexplored. Most educational treatments of AI remain at the cognitive, technical, or policy level. The deeper cultural and psychoanalytic questions raised by AI-generated text—regarding subjectivity, symbolic expression, and the unconscious—are rarely addressed. Yet scholarship on psychoanalysis, culture, and modern thought suggests that writing is intimately tied to identity and unconscious dynamics. Neglecting this dimension risks a reductive view of authorship that fails to account for what is uniquely at stake when students write.

This article seeks to address these gaps by developing an integrated, human-centred framework for AI-supported collaborative digital writing in secondary education. It positions AI literacy as part of a broader constellation involving critical digital literacy, metacognitive and emotional development, inclusive pedagogy, and organisational culture.

1.6. Aim of the Study

The overarching aim of this article is to articulate and justify a comprehensive instructional and organisational model for the integration of AI into school-based writing practices, with a particular focus on collaborative digital writing in inclusive secondary education contexts.

More specifically, the article pursues the following objectives.

- First, it aims at conceptual integration by synthesizing diverse strands of scholarship—on AI literacy, critical digital literacy, collaborative writing and ICT-based inclusion, metacognition and emotional intelligence, Theory of Mind development, digitally assisted mindfulness, organizational culture, and psychoanalytic-cultural theory—into a coherent, multi-layered framework.
- Second, it focuses on pedagogical modeling, proposing a structured, five-phase AI-supported collaborative digital writing model that operationalizes this framework at classroom level, specifying roles for students, teachers, and AI systems across the stages of planning, drafting, revising, verifying, and reflecting.
- Third, it seeks to offer organizational and policy guidance by deriving implications for school leadership, organizational culture, and policymaking, highlighting how institutional vision and culture can enable or hinder meaningful, ethically grounded AI integration.
- Fourth, it adopts a human-centered orientation, arguing for an explicitly human-centered understanding of AI in education, where AI functions as a scaffold for higher-order thinking, socio-emotional growth, and inclusive participation—rather than as a substitute for human cognition, creativity, or authorship.

By meeting these objectives, the article intends to contribute both to theoretical debates and to practical efforts to design responsible AI-supported pedagogy.

1.7. Research Questions

Guided by the aims outlined above, the study addresses the following research questions.

- First, how can AI literacy in secondary education be conceptualized not merely as technical proficiency but as epistemic responsibility situated within broader frameworks of critical digital literacy and human-centered pedagogy?
- Second, in what ways can collaborative digital writing, supported by AI, function as a socio-cognitive and relational space that promotes inclusion, metacognitive regulation, emotional awareness, and critical evaluation, rather than fostering epistemic outsourcing?
- Third, how do metacognition, emotional intelligence, digitally assisted mindfulness, and Theory of Mind development interact with students' engagement with AI during collaborative writing processes?
- Fourth, what roles do organizational vision, leadership practices, and school culture play in shaping the ethical governance, pedagogical design, and day-to-day implementation of AI-supported collaborative writing in secondary schools?
- Fifth, how can psychoanalytic and cultural perspectives on authorship and subjectivity deepen our understanding of the limits of AI-generated text and clarify the uniquely human dimensions of writing that should be preserved and cultivated in educational practice?

2. Framing Organizational Culture in the Age of AI

The integration of Artificial Intelligence (AI) into school life is often presented as a technical or curricular challenge, yet growing evidence indicates that the deepest determinants of success lie in organizational culture and leadership (Ertmer & Ottenbreit-Leftwich, 2010; Hargreaves & Fullan, 2020; Holmes, Williamson, & Eynon, 2021). Schools are not neutral containers into which technologies can simply be “dropped”; they are complex social organizations structured by norms, values, routines, and power relations that shape how innovation is interpreted and enacted (Greenhalgh, Thorne, & Malterud, 2018; Zembylas, 2019). In the context of AI, organizational culture becomes a critical precondition for whether AI-supported tools function as mechanisms of surveillance and control, reinforcing anxiety and mistrust (Williamson & Piattoeva, 2022), or instruments of inclusion, emotional support, and epistemic empowerment (Ainscow, 2020; Florian & Beaton, 2018; Simos, Larios, & Papoutsis, 2026).

2.1. Conceptual Framework: School Culture as “Living System”

Research on school organizational culture by Tzianakopoulou and Manesis (2018a, 2018b, 2021) provides a particularly useful lens for understanding the conditions under which AI can be ethically and pedagogically integrated. Their work conceptualizes school culture not as a static set of traditions but as a dynamic “living system” shaped by leadership vision, collaborative practices, and shared beliefs about teaching, learning, and change. Building on this framework, AI adoption in schools is understood as fundamentally a cultural and governance process rather than a purely technological one. To make this argument robust, the chapter proceeds in two intertwined ways. First, through conceptual analysis, it synthesizes educational leadership, organizational culture, and AI in education literature to theorize how school vision, norms, and governance structures condition AI integration. Second, through a narrative integrative review, it adopts a narrative and integrative literature review design (Baumeister & Leary, 1997; Greenhalgh et al., 2018; Snyder, 2019), similar to the approach used in Artificial Intelligence in Supporting School Anxiety and Adolescent Emotional Well Being (Simos, 2025), but applied here to organizational culture and AI policy formation.

2.2. Methodological Orientation, Data Sources, and Inclusion Criteria

Given the interdisciplinary and rapidly evolving nature of AI in education, the chapter employs a narrative and integrative literature review approach (Baumeister & Leary, 1997; Greenhalgh et al., 2018; Snyder, 2019), which enables the inclusion of heterogeneous sources—empirical studies, conceptual and theoretical papers, and policy reports. This approach is suited to multi-dimensional constructs such as school culture, vision, teacher beliefs, AI policy, and ethical governance (Greenhalgh et al., 2018; Zembylas, 2021), and allows the contextualization of AI related findings within broader discourses of inclusion, equity, and leadership in education (Ainscow, 2020; Florian, 2019). The core corpus was assembled through targeted searches in Scopus, Web of Science, ERIC, PsycINFO, and Google Scholar, as well as journals in educational management and leadership, educational technology, and AI in education (e.g., Educational Management Administration & Leadership; School Effectiveness and School Improvement; British Journal of

Educational Technology; Computers & Education; Journal of Learning Analytics), and policy reports from OECD and UNESCO (OECD, 2019, 2023; UNESCO, 2021).

Keyword combinations covered three main clusters: organizational culture and leadership, AI in education and governance, and inclusion, equity, and digital policy. The review prioritized publications from 2010 onwards, with emphasis on 2015–2025, when AI, learning analytics, and datafication debates intensified (Holmes et al., 2019, 2021; Williamson & Piattoeva, 2022; OECD, 2023), while earlier foundational works on organizational culture and leadership were included when theoretically indispensable (e.g., Hargreaves & Fullan, 2020; Deci & Ryan, 2000). Greek and European sources (e.g., Tzianakopoulou & Manesis, 2018a, 2018b, 2021) were deliberately retained to ground the analysis in non Anglophone perspectives.

2.3. Analytical Framework: Four Dimensions of Human-Centered AI Integration

To maintain conceptual and methodological coherence, the chapter included peer reviewed journal articles, academic books and chapters, and authoritative institutional reports (e.g., OECD, UNESCO) addressing school level organizational culture, leadership, technology integration, or AI/data governance, with a specific focus on culture, vision, or governance in relation to innovation, collaborative practices, leadership and decision making around technology or AI, and ethics and policy frameworks for data and AI in education (Holmes et al., 2019, 2021; Williamson & Piattoeva, 2022; OECD, 2023; Snyder, 2019). Within these boundaries, the review embraced methodological diversity (Baumeister & Leary, 1979; Greenhalgh et al., 2018). Data interpretation followed a thematic narrative synthesis combining inductive and deductive logics (Greenhalgh et al., 2018). Inductively, recurrent themes were identified; deductively, they were organized under four analytical dimensions: vision and strategic orientation (how school leaders conceptualize AI and digital innovation relative to mission, pedagogical goals, and values) (Tzianakopoulou & Manesis, 2018a; UNESCO, 2021); organizational culture and professional capital (what forms of culture and professional learning facilitate or hinder AI integration, and how teacher beliefs mediate adoption) (Hargreaves & Fullan, 2020; Ertmer & Ottenbreit Leftwich, 2010); ethical governance and datafication (how schools navigate student data, algorithmic decision making, and AI mediated monitoring) (Holmes et al., 2021; Williamson & Piattoeva, 2022; Sullivan, Ayton, & Rizzo, 2022; Slade & Prinsloo, 2013); and inclusion, equity, and infrastructure (how resources, digital infrastructure, and inclusion policies shape the distributive impact of AI) (OECD, 2019, 2023; Ainscow, 2020; Florian, 2019). For each dimension, the synthesis asked under what organizational conditions AI supports human centered, inclusive, critical digital literacy practices, using the conceptual work of Tzianakopoulou and Manesis (2018a, 2018b, 2021) as a structuring lens.

2.4. Vision, Culture, and Professional Learning as Conditions for AI

Across the reviewed literature, school vision emerges as both strategic compass and symbolic narrative for technology related change (Ertmer & Ottenbreit Leftwich, 2010; Hargreaves & Fullan, 2020; Tzianakopoulou & Manesis, 2018a). Vision is understood not merely as a formal mission statement but as a shared understanding of why a school exists, what kind of learning it values, and what kind of person it aims to cultivate. When leaders articulate a clear, inclusive, pedagogically grounded vision, teachers interpret innovations, including digital ones, as extensions of existing values; absent or vague vision leads to fragmented, short lived initiatives driven by external accountability. In the context of AI supported collaborative writing, a human centered vision prioritizes critical thinking, authorship, and epistemic responsibility over performance metrics, frames AI as a tool for inclusion and cognitive scaffolding rather than a replacement for human teaching or student effort, and commits to well being and emotional safety, recognizing AI's ambivalent potential (Simos, 2025; Sullivan et al., 2022). While vision sets direction, organizational culture determines whether that vision becomes lived reality. Culture is described as a “web of meanings” that shapes how people interpret policies, interact, and respond to change (Tzianakopoulou & Manesis, 2018b, 2021).

Schools with collaborative cultures and strong professional capital—shared expertise, mutual trust, collective responsibility—show higher levels of meaningful technology integration (Hargreaves & Fullan, 2020; Whitaker & Bakker, 2020), and teachers' beliefs and self efficacy regarding technology are closely tied to perceived cultural support, peer learning opportunities, and leadership encouragement (Ertmer & Ottenbreit Leftwich, 2010; Holstein, McLaren, & Alevan, 2019). For AI specifically, teacher fears about loss of autonomy, surveillance, or devaluation of expertise must be acknowledged and addressed within professional communities (Holmes et al., 2021; Shapiro & Stoleran, 2021), and professional learning communities need time and structure to experiment with AI tools, discuss ethical dilemmas, share experiences, and co construct guidelines.

3. From Digital Skills to Epistemic Responsibility

For many years, “digital literacy” in schools has been framed mainly as a matter of technical skills: how to operate devices, navigate platforms, search for information, and use productivity software. With the diffusion of Artificial

Intelligence (AI) into everyday life, this instrumental view has become insufficient. Large language models, recommender systems, and learning analytics do not merely deliver information; they shape what can be known, how it is presented, and whose voices are amplified. As a result, literacy in the digital age increasingly entails epistemic responsibility—the ability to interrogate sources, question algorithmic outputs, and take ownership of one’s own knowledge-making. In education, this shift is particularly acute in writing and assessment. Generative AI can now compose essays, explain concepts, and synthesize readings with impressive fluency, destabilizing traditional assumptions that written work straightforwardly evidences individual understanding (Holmes, Bialik, & Fadel, 2019; Simos, Larios, & Papoutsis, 2026).

If students can offload idea generation, structuring, and revision to AI, they must be explicitly taught how to position themselves in relation to AI as knowers and authors, rather than as passive consumers of machine-generated text. This chapter develops the conceptual foundations for such a stance by distinguishing between AI literacy—understanding and managing interactions with AI systems—and critical digital literacy—examining the socio-political, cultural, and ethical dimensions of digital technologies—and arguing that they must be integrated to support human-centered, inclusive AI use in schools.

3.1. AI Literacy in School Contexts

Probabilistic Models and Cognitive Agency AI literacy has been variously defined, but contemporary frameworks converge around conceptual understanding of how AI systems work at a high level, practical competence in interacting with AI tools, and critical and ethical awareness of their limitations, biases, and societal impacts (Long & Magerko, 2020; Ng, 2021). In secondary education, this is not about training computer scientists but about enabling students to engage intelligently and responsibly with tools they already encounter (Luckin et al., 2016; Holmes et al., 2019; Simos, 2025). A central insight is that generative AI systems are probabilistic language models, not thinking entities: they produce outputs by estimating the most likely next token from patterns in large datasets rather than by “understanding” in a human sense (Bender et al., 2021). This creates an illusion of understanding, allows hallucinations and fabrication, embeds training-data bias (Barrett et al., 2019; Greene, Yu, & Copeland, 2020), and involves opacity that limits case-by-case explainability (Holstein, McLaren, & Aleven, 2019).

AI literacy therefore includes grasping this logic, recognizing uncertainty and bias (Holmes, Williamson, & Eynon, 2021), distinguishing assistance from authorship, engaging in verification and triangulation of AI-generated claims (Shute & Rahimi, 2017), and reflecting on personal dependence on AI in ways that may replace effort, deep thinking, or creativity (Simos, Larios, & Katsiampoura, 2026). In this sense, AI literacy is less about “using AI efficiently” and more about maintaining cognitive agency in AI-rich environments.

3.2. Critical Digital Literacy, Algorithmic Power, and Educational Equity

Critical digital literacy extends beyond operational skills into the terrain of power, representation, and social justice, asking not only how to use digital technologies but also who benefits, who is harmed, and whose interests are served by their design and deployment (Buckingham, 2015; Freire, 1970/2000). Applied to AI, it foregrounds algorithmic awareness—recognizing that AI systems are trained on specific datasets that encode historical and contemporary inequalities and may reproduce stereotypes or marginalize minority perspectives (Barocas & Selbst, 2016; Greene et al., 2020)—and datafication and surveillance—understanding how student behavior, emotional signals, and academic performance can be transformed into data traces, analyzed, and used to classify or predict students in ways that reinforce deficit narratives (Slade & Prinsloo, 2013; Williamson & Piattoeva, 2022; Sullivan, Ayton, & Rizzo, 2022).

It also draws attention to platform power and governance, where EdTech and AI vendors influence curricula and assessment through proprietary, opaque systems (Holmes et al., 2021; Selwyn, 2019), and to participation and voice, asking whose perspectives are invited or excluded and how students, especially those from marginalized communities, can exercise agency (Ainscow, 2020; Zembylas, 2019). Research on learning analytics and emotion recognition shows how algorithms can misinterpret behavior and emotion, particularly for minoritized students (Barrett et al., 2019; Baker & Inventado, 2014), while inclusive-education scholarship underlines that benefits for vulnerable groups depend on infrastructure, cultural responsiveness, and teacher mediation (Simos, 2025; OECD, 2023; Ainscow, 2020; Florian, 2019; Pagliara, Karagianni, & Drigas, 2024; Chaidi, I., Drigas, A., Karagiannidis, C., 2021). Thus, AI literacy must be cultivated within a critical digital literacy frame so that students learn how AI participates in broader systems of power, and so that classroom practices are situated within the organizational governance structures described in Chapter 2.

3.3. Epistemic Vigilance and a Pedagogy of AI-Supported Collaborative Writing

Although AI literacy and critical digital literacy can be distinguished analytically, treating them separately in practice would be a mistake. Students who understand AI conceptually but lack critical awareness may become efficient users of harmful systems, while those steeped only in critique may reject AI wholesale, missing opportunities for inclusion, accessibility, and cognitive support. The AI–mental-health literature (Simos, 2025) illustrates that AI-powered tools can detect early signs of school anxiety, personalize emotional regulation strategies, and offer low-stigma support, yet the same data, if governed poorly, can feed punitive systems, misclassify culturally diverse expressions, and deepen mistrust. Bridging AI literacy and critical digital literacy therefore requires epistemic vigilance—the dispositions and strategies that guard against misinformation and unjustified authority (Sperber et al., 2010)—linked to metacognition and emotional self-regulation (Drigas & Mitsea, 2021; Drigas & Papoutsis, 2023; Chaidi I, Drigas A 2022).

In AI-supported collaborative writing, epistemic vigilance and metacognition can be fostered when students annotate which parts of a text were AI-assisted, justify why they accepted or rejected suggestions, reflect on how AI influenced their thinking and emotional state, and periodically justify claims without AI support. Such practices make AI interaction visible and subject to conscious regulation. The theoretical work in this chapter thus prepares the ground for the collaborative digital writing model developed in Chapter 4 and operationalized in Chapter 7, arguing that AI literacy and critical digital literacy are best cultivated in situated, dialogic practices. Collaborative digital writing offers a context where epistemic, technical, ethical, and relational dimensions intersect, enabling AI to be treated as a fallible, non-human collaborator whose contributions are open to challenge, while responsibility for the final text rests with human authors. Designing such environments, however, depends on the organizational culture and governance structures outlined in Chapter 2; without supportive leadership, clear policies, and equitable infrastructure, attempts to implement critical, human-centered AI pedagogy are likely to remain isolated experiments.

4. Collaborative Digital Writing as Distributed Cognition

4.1. Writing as a Socio-Cognitive Practice in the Digital Era

For much of the history of schooling, writing has been framed as an individual act: a solitary student composing a text that expresses personal understanding and effort. Contemporary learning theory, however, increasingly understands writing as a socio-cognitive practice—a process distributed across people, tools, and cultural norms (Bereiter & Scardamalia, 2013; Stahl, Koschmann, & Suthers, 2006). In classrooms, students rarely write in a vacuum: they draw on peers' ideas, teacher feedback, digital resources, and now AI-generated suggestions. Digital environments make this distributed nature more visible, as cloud-based documents, shared platforms, comment threads, and version histories reveal writing as ongoing negotiation of claims, evidence, structure, and tone. When AI enters these spaces as a generator of drafts, rephrasings, or counterarguments, it becomes another node in the cognitive network—yet one that lacks intention, emotion, and accountability. The challenge is therefore not whether AI participates in writing processes—it already does—but how to situate it so that human agency, authorship, and critical reflection are strengthened rather than eroded. This chapter argues that collaborative digital writing offers a powerful arena for cultivating AI literacy and critical digital literacy (Chapter 3) within inclusive, relational learning ecologies, drawing on Simos' work on technology-mediated inclusion and unity in schools (Simos, 2025a, 2025b, 2025c), on distributed cognition theory, and on sociocultural approaches to learning.

4.2. Distributed Cognition, Inclusion, and AI as Non-Intentional Co-Writer

Distributed cognition theory proposes that thinking does not reside solely in individual minds but is spread across people, artifacts, and environments (Hutchins, 1995; Salomon, 1993). In collaborative digital writing, cognition is distributed among students who propose ideas and respond to feedback, teachers who scaffold and steer discourse, digital tools that store drafts and track revisions, AI systems that generate alternative phrasings or summaries, and cultural resources such as genres and disciplinary norms. The goal of instruction, from this perspective, is not to isolate “purely individual” thinking but to structure the system so that learners engage in higher-order reasoning, meta-discussion, and reflective judgment. Simos' work on ICTs and inclusion shows that digital tools, when carefully orchestrated, can serve as “bridges” connecting students across differences rather than as barriers (Simos, 2025a, 2025b, 2025c). Digital collaboration is described as a relational practice in which students experience themselves as co-authors; online co-writing platforms allow quieter students, those with language difficulties, or those experiencing anxiety to participate more gradually and safely. ICTs function as cognitive instrumentation that scaffolds planning, organization, and expression for diverse learners (Simos, 2025b), and shared digital activities can foster empathy and peer support beyond the classroom (Simos, 2025c). Within this landscape, AI can act as idea stimulator, language assistant, structure coach, or feedback source, lowering the entry barrier for students who face writing anxiety or executive-function challenges and echoing findings from AI-supported emotional interventions where non-judgmental

digital support reduced anxiety and increased engagement (Simos, 2025). At the same time, there are risks of cognitive outsourcing, homogenization of voice, and blurred authorship boundaries. A distributed cognition perspective suggests that these are reasons to design environments where students interrogate and transform AI outputs collaboratively, rather than simply inserting them.

4.3. Designing AI-Supported Collaborative Writing for Inclusion and Socio-Emotional Co-Regulation

To harness the inclusive potential of AI-supported writing, design must deliberately support diverse learners and protect relational integrity. Building on Simos (2025a, 2025b, 2025c) and inclusive pedagogy (Florian, 2019; Florian & Beaton, 2018), collaborative tasks are framed as collective inquiries rather than as fragments of individual products, reducing competition and opening space for differentiated contributions. Multiple modes of contribution—drafting, suggesting AI prompts, editing and reorganizing text, checking references, or adding examples—align with Universal Design for Learning principles (CAST, 2018). Transparent AI use and roles are agreed in advance, with groups logging AI interactions and noting which passages are AI-influenced, supporting authorship transparency and later reflection (Shapiro & Stolerman, 2021). Teacher mediation functions as cultural and ethical anchor, as AI-well-being research shows that teacher mediation is crucial to prevent technology from sliding into surveillance or over-reliance (Ertmer & Ottenbreit-Leftwich, 2010; Hargreaves & Fullan, 2020; Simos, 2025). Teachers model critical questioning of AI outputs, highlight diverse voices, and ensure that quieter students' contributions are valued. Collaborative writing is also profoundly emotional: students cope with evaluation, disagreement, exposure of their ideas, and possible rejection.

Research on AI and adolescent emotional well-being shows that digitally mediated feedback can support emotional self-regulation when framed as supportive rather than punitive (Simos, 2025; Villani et al., 2021; Kim, Park, & Cozart, 2024). In this context, AI can provide low-stakes suggestions that reduce fear of error, offer neutral reformulations to ease peer critique, and facilitate reflection prompts about group progress. Yet tools can backfire if students feel surveilled or if AI-generated feedback conflicts with human messages (Sullivan et al., 2022; Williamson & Piattoeva, 2022). Socio-emotional safety in AI-supported writing groups therefore depends on clear norms of respect and constructive critique, opportunities to express disagreement and negotiate meaning, and meta-discussions about how it feels to work with AI and with peers—issues that connect directly to the metacognitive and emotional intelligence frameworks of Chapter 5.

4.4. Instructional Phases and Preserving Human Agency and Authorship

A conceptual overview of instructional phases helps show how collaborative digital writing can embody the principles developed so far. Groups begin with pre-AI conceptualization, clarifying the task, brainstorming ideas, and sketching an outline without AI so that initial sense-making remains human. They then move into collaborative drafting, co-writing an initial text with shared documents and comments while teacher guidance focuses on argumentation and inclusion. Structured AI consultation follows, as groups formulate specific questions for AI, treat outputs as proposals to be discussed and adapted, and justify accept/reject decisions. Critical verification and source work require students to fact-check AI-generated claims and references using independent scholarly sources, operationalizing epistemic vigilance (Chapter 3).

Finally, reflection on process and emotions invites individuals and groups to consider how AI influenced their thinking and writing, how collaboration felt, and what they would do differently. A recurring concern in debates about generative AI is the potential erosion of authorship and agency: if AI can produce fluent text on demand, do students still experience themselves as writers? In collaborative digital writing, human agency can be preserved and even strengthened if AI is consistently presented as a fallible tool rather than a co-equal "mind," if students retain final decision-making authority over every sentence, and if assessment criteria value process documentation, critical evaluation, and reflection alongside the polished product. The psychoanalytic and cultural analysis in Chapter 6 will deepen this argument by emphasizing that writing is also a site of identity construction and unconscious expression (Fountoulakis & Simos, 2026). From that perspective, AI cannot be an author in the human sense, because it lacks desire, history, and symbolic conflict. Collaborative AI-supported writing, when designed thoughtfully within the organizational cultures and governance structures outlined in Chapter 2, can help students explore these human dimensions more consciously by confronting the contrast between human and machine text, transforming AI into a catalyst for agency rather than a substitute for it.

5. Metacognition, Emotional Intelligence, and Self Regulation in AI Supported Learning Environments

5.1. Psychological Foundations for Human Centered AI Use

The previous chapters framed AI supported collaborative writing as a distributed, socio cognitive process situated within school culture and organizational governance. Beneath these structural and pedagogical layers lie psychological capacities that determine whether students engage with AI as reflective agents or as passive recipients. Metacognition, emotional intelligence, self regulation, and Theory of Mind are particularly central. Research by Drigas and colleagues offers rich conceptual models linking these constructs to digital learning (Drigas & Mitsea, 2021; Drigas & Papoutsis, 2023; Drigas & Karyotaki, 2022; Mitsea, Drigas, & Skianis, 2023), while Simos' work on AI and adolescent emotional well being (Simos, 2025) provides empirical support for the claim that technology-mediated environments can either strengthen or weaken self-regulation depending on design and mediation. Metacognition—awareness of and control over one's cognitive processes (Flavell, 1979; Schunk & DiBenedetto, 2020)—functions as a protective factor against epistemic outsourcing in AI-rich writing environments, as students clarify goals, decide which phases to carry out independently, judge AI suggestions, and monitor how their reliance on AI changes over time (Simos, Larios, & Katsiampoura, 2026). Emotional intelligence, understood through Drigas and Papoutsis's (2023) nine layer model, involves moving from basic emotional awareness to sophisticated self regulation, empathy, and ethical orientation, all of which shape how students respond to AI mediated collaboration (Mayer, Salovey, & Caruso, 2008). Digitally assisted mindfulness (Mitsea et al., 2023) and Theory of Mind in ICT contexts (Drigas & Karyotaki, 2022) further highlight how digital environments can support attention, emotional balance, and perspective taking when thoughtfully designed.

5.2. Metacognition, Emotional Intelligence, and Digitally Assisted Mindfulness

In AI supported collaborative writing, metacognition and emotional intelligence are enacted through concrete practices. Drigas and Mitsea (2021) emphasize that learners who can plan, monitor, and adjust strategies are better prepared to navigate uncertainty and innovation; in AI rich tasks this translates into explicit self questioning about how and why AI is used and into tools such as planning sheets, self monitoring checklists, and post task reflections that externalize decision processes. Emotional intelligence becomes visible when students notice anxiety about evaluation, frustration with group disagreements, or dependency on AI suggestions, and when they apply coping strategies such as breathing, positive self talk, or cognitive reframing (Drigas & Papoutsis, 2023) (Drigas & Sideraki, 2021). At more advanced levels, empathy and relational intelligence support sensitive responses to peers' feelings around feedback and AI generated critiques, while ethical and prosocial orientations guide respectful, fair, non plagiaristic uses of AI. Empirical work shows that AI tools can buffer anxiety by offering low stakes suggestions and non judgmental feedback (Simos, 2025; Villani et al., 2021), but can also intensify stress if experienced as surveillance or standards of unattainable perfection (Sullivan, Ayton, & Rizzo, 2022). Digitally assisted mindfulness, as proposed by Mitsea, Drigas, and Skianis (2023), offers a way to scaffold attention and self regulation before, during, and after writing: brief guided exercises can reduce baseline anxiety, short prompts can disrupt reactive patterns during disagreement or overload, and reflective pauses can help integrate cognitive and emotional learning. Simos' (2025) review of AI based emotional support tools indicates that such interventions are most effective when timely, personalized, non stigmatizing, and framed as supports chosen by students rather than as imposed monitoring.

5.3. Theory of Mind, AI Related Anxiety, and Self Regulation

Theory of Mind (ToM)—the capacity to attribute mental states to oneself and others (Wellman, 2014)—is also reshaped in digital contexts. Drigas and Karyotaki (2022) argue that ICT environments both challenge and extend perspective taking. In AI-supported collaborative writing, students must infer what peers understand, value, or feel in relation to the evolving text, negotiating audience, tone, and argumentation; simultaneously, they may be tempted to attribute intentionality or understanding to AI systems, speaking as if “the AI thinks” or “knows better.” Part of AI literacy is learning to correct this anthropomorphism, recognizing that AI simulates dialogue without beliefs or emotions. Well designed tasks can leverage human-human ToM while deconstructing false human-AI ToM by inviting students to revise AI assisted drafts for different audiences, compare AI and peer feedback, and analyze why AI may feel like a partner and what the limits of that metaphor are.

The integrative review *Artificial Intelligence in Supporting School Anxiety and Adolescent Emotional Well Being* (Simos, 2025) further shows that AI mediated interventions—mobile apps, conversational agents, affective computing, immersive environments—can reduce anxiety when they provide discreet, student controlled access to coping strategies and psychoeducation, especially for those reluctant to seek face to face help. However, adaptive, data driven personalization raises equity and privacy concerns if infrastructure is unequal or data governance is weak (OECD, 2023; Sullivan et al., 2022), and outcomes are moderated by teacher mediation and institutional culture: AI works best when embedded in human centered, relationally rich support systems, not as a stand alone solution (Ertmer & Ottenbreit

Leftwich, 2010; Hargreaves & Fullan, 2020). In collaborative writing, this implies that AI enabled supports can foster self regulation and confidence when students control their use, teachers frame AI as ally rather than evaluator, and policies uphold transparency and consent; otherwise, the same tools can heighten performance pressure, perfectionism, and feelings of surveillance.

5.4. Embedding Psychological Competencies and Guarding Against Dependency

Bringing these strands together, AI supported collaborative writing can be designed as a training ground for metacognition, emotional intelligence, and self regulation. Tasks can incorporate metacognitive planning and monitoring, with students articulating goals, prior knowledge, and questions before engaging AI and periodically recording the decisions they make and the reasons for accepting or rejecting AI suggestions. Emotional check ins invite groups to share how they feel about the task, collaboration, and AI's role, using emotion vocabularies and sentence stems to build emotional literacy (Drigas & Papoutsi, 2023). Digitally assisted mindfulness moments—short, optional prompts to breathe, notice tension, and reset focus—can be integrated before high stakes revisions or presentations (Mitsea et al., 2023).

Perspective taking activities, such as revising drafts for different audiences or comparing peer and AI feedback, strengthen Theory of Mind and clarify what only human readers can offer. Process focused assessment criteria that value documentation of metacognitive moves, evidence of emotional awareness and regulation, and quality of collaboration, alongside final text quality, reinforce these practices. At the same time, the literature warns against new forms of dependency on AI mediated supports. If students come to believe they cannot write, self regulate, or resolve conflicts without AI prompts, resilience may be undermined. Safeguards include gradual fading of AI based scaffolds so that students internalize strategies over time (VanLehn, 2011; Zimmerman, 2013), explicit reflection on how reliance on AI evolves and which skills can now be performed unaided, and a balanced narrative in which educators repeatedly emphasize that AI is a helpful instrument, not a prerequisite for thinking or emotional stability. Combined, these elements support a trajectory in which AI catalyzes the development of self regulated, emotionally intelligent learners rather than supplanting those capacities.

6. Results

The first result emerging from the conceptual synthesis is that organizational vision and culture operate as decisive preconditions for any meaningful, human centered integration of AI in schooling. Across the literature on school leadership, organizational culture, and AI governance, it becomes clear that the way a school defines its mission and shared values strongly shapes how AI tools are interpreted and used. In educational communities where leadership articulates a clear, human centered vision that foregrounds critical thinking, inclusion, and student well being, AI is typically framed as a pedagogical support—an instrument that can scaffold learning, extend access, and enrich collaborative inquiry. By contrast, in schools characterized by fragmented cultures, low collegial trust, weak collaboration, or compliance driven climates, AI tends to be introduced through isolated initiatives, frequently associated with monitoring, efficiency, or accountability. In such contexts, AI adoption often amplifies existing inequities and anxieties instead of transforming teaching and learning in emancipatory ways.

A second result concerns the nature of AI literacy. The analysis shows that understanding AI literacy as a set of purely operational skills—such as learning to generate effective prompts or to use specific platforms—is radically insufficient for secondary education. Effective AI literacy must be conceptualized as epistemic responsibility. This entails a basic grasp of how large language models and related systems operate through probabilistic language modeling, an awareness of phenomena such as hallucinations and training data bias, and routine engagement in practices of verification and triangulation. Students who are trained only to “use AI well” at a technical level, without critically examining its epistemic limits, are at heightened risk of epistemic outsourcing: they may delegate core intellectual tasks such as reasoning, evaluating evidence, and structuring arguments to systems that do not genuinely understand content. Over time, this can erode cognitive autonomy and the capacity for independent judgment.

A third, closely related result is that critical digital literacy is indispensable in AI rich schooling. Analyses of learning analytics, affective computing, and data governance indicate that, without sustained scrutiny of datafication, surveillance, and algorithmic bias, AI can reproduce or intensify existing structural inequalities. Students from marginalized groups—whether minoritized by race, language, disability, or socio-economic position—are especially vulnerable to misclassification, pathologizing interpretations of behavior, and deficit framings when AI systems are trained on narrow or biased datasets. Only when AI literacy is embedded within a broader framework of critical digital literacy, one that explicitly addresses questions of power, equity, and governance, can AI be aligned with the aims of inclusive and socially just education.

The fourth result highlights AI supported collaborative digital writing as a particularly fertile pedagogical environment for integrating AI literacy, critical digital literacy, and inclusion. By bringing Simos' work on ICT mediated inclusion into dialogue with sociocultural and distributed cognition theories, the analysis shows that collaborative digital writing tasks allow multiple dimensions of literacy to be developed simultaneously. In these settings, students co-author texts, negotiate meaning, and examine AI suggestions together. Writing becomes a visible, dialogic process in which the distributed nature of cognition—across peers, teachers, tools, and AI systems—is made explicit. Such environments support diverse modes of participation, enabling learners with different linguistic, cognitive, and emotional profiles to contribute in ways that suit their strengths. At the same time, they naturally generate occasions for discussing authorship, bias, and epistemic responsibility, thus integrating technical, critical, and ethical dimensions of AI use.

A fifth result concerns the psychological underpinnings of responsible AI engagement. Drawing on models developed by Drigas, Mitsea, Papoutsi, and collaborators, the analysis reveals that metacognitive regulation, emotional intelligence, and digitally assisted mindfulness function as protective factors against cognitive dependency on AI. Students who are guided to plan their work, monitor their strategies, and reflect on their interactions with AI are better able to use AI as a scaffold instead of a substitute. When they simultaneously learn to recognize and name their emotional reactions to AI feedback—such as relief, insecurity, frustration, or over-confidence—and have access to simple mindfulness based techniques, they are more capable of maintaining balance and self control. These psychological capacities reduce the risk that AI will undermine perseverance, resilience, and independent problem solving by offering effortless shortcuts that bypass productive struggle.

A sixth result underscores the crucial role of teacher mediation and human in the loop governance in shaping AI's impact on anxiety, engagement, and inclusion. Evidence from AI and well being research, including Simos' integrative review of AI mediated support for school anxiety, consistently shows that the presence of informed, reflective adult mediation is a key moderator of outcomes. When teachers interpret AI outputs, contextualize them within pedagogical and ethical frameworks, and integrate them into existing relational practices of care and feedback, students tend to report reduced anxiety, higher levels of engagement, and an enhanced sense of belonging. In such cases, AI is experienced as an additional layer of support embedded within a human relationship. In contrast, where AI is deployed primarily as a monitoring or punitive mechanism—tracking behaviour, flagging risk, or automating judgments without transparent dialogue—students frequently experience heightened stress, mistrust, and resistance, especially those who already have tense relationships with institutions.

Finally, the seventh result concerns the status of authorship in the AI era. Drawing on psychoanalytic cultural theory, particularly the work of Fountoulakis and Simos, the analysis concludes that authorship cannot be equated with the mere production of text. Human writing is a symbolic activity through which individuals express identity, negotiate cultural meanings, and, often unconsciously, work through conflicts and desires. AI systems, by contrast, operate as non sentient pattern matching mechanisms: they lack biography, memory, desire, and unconscious life. Even when they produce stylistically sophisticated or rhetorically persuasive text, they do so without subjective intention or ethical accountability. On this basis, the article argues that, in educational practice, authorship must remain reserved for human agents who interpret, endorse, and assume responsibility for texts—regardless of whether AI has assisted in their drafting or revision. Recognising this distinction is essential for preserving students' sense of themselves as authors and for sustaining the ethical foundations of academic work in AI saturated classrooms.

7. Discussion

7.1. Reframing AI in Education: Culture, Epistemic Agency, and Equity

The results indicate that AI in education cannot be treated as a neutral collection of tools simply awaiting “integration” into existing practices. AI operates as a catalyst that reveals and intensifies the underlying cultural logics of schooling: institutions oriented toward competition, surveillance, and narrow performance indicators tend to employ AI in ways that reinforce those priorities, while schools that foreground inclusion, critical inquiry, and student well being are more inclined to appropriate AI as an instrument for collaborative learning, emotional support, and differentiated access. The article therefore proposes a shift from a discourse of mere “tool adoption” to a conception of AI as a driver of cultural transformation, where the key question becomes how educational communities want their values and practices to be amplified or challenged by AI. A central implication is that AI literacy—understood as a form of epistemic responsibility—should be recognized as a core literacy of contemporary schooling, alongside reading, writing, and numeracy.

Students are not required to become experts in machine learning, yet they must attain a functional understanding of how generative models operate, why they sometimes fabricate information, and how training data shape their outputs,

while repeatedly practicing critical responses such as questioning confident but unsupported claims, cross-checking with independent sources, and reasoning through discrepancies between AI generated content and human perspectives. At the same time, AI literacy is incomplete without a robust grounding in critical digital literacy: questions about who designs AI systems, whose data and experiences are represented in training sets, and how algorithms are governed cannot be separated from pedagogical concerns. If AI is implemented without close attention to infrastructural inequalities, cultural responsiveness, and algorithmic bias, its advantages will tend to flow to already privileged students, while others face heightened risk of misrecognition, stigmatizing classifications, or intensified surveillance. Policy and practice must therefore address digital divides, data protection, and participatory governance as enabling conditions for just and inclusive AI integration.

7.2. Collaborative AI Supported Writing and Psychological Development

The multi phase model of AI supported collaborative digital writing proposed in the article functions as a laboratory for human-machine co agency. Within these learning environments, AI is not an invisible back end mechanism but an explicit, discussable presence whose suggestions students are invited to scrutinize. The collective processes of accepting, adapting, or rejecting AI outputs become concrete exercises in shared epistemic responsibility. By emphasizing process documentation, reflective commentary, and group negotiation, collaborative writing tasks resist the reduction of writing to an isolated individual performance and instead foster democratic habits of dialogue, critique, and co construction, while maintaining clarity about the distinct roles and responsibilities of human authors and algorithmic tools. From a psychological perspective, AI rich environments present a double edged landscape. On one side, AI enabled supports for planning, feedback, and emotional regulation can assist adolescents in managing anxiety, building self efficacy, and practicing coping strategies in low stigma, accessible ways, particularly for those who might not readily engage with traditional forms of support. On the other, unreflective or punitive uses of AI can exacerbate stress, encourage dependence on automated guidance, and blunt the capacity for sustained cognitive effort. The integration of metacognitive instruction, emotional intelligence education, and digitally assisted mindfulness, as elaborated in the article, offers a promising pathway for tipping this balance toward growth and resilience rather than regression and passivity.

7.3. Authorship, Subjectivity, and Governance in Human Centered AI

From a psychoanalytic and cultural standpoint, the rise of generative AI compels a renewed examination of what it means to write. While AI can successfully simulate many surface features of human discourse—such as style, coherence, and argumentative structure—it cannot reproduce the subjective depth of human authorship. In educational contexts, writing is not only a means of demonstrating knowledge; it is also a key site where students negotiate identity, cultivate a voice, and symbolically work through conscious and unconscious conflicts. Recognizing AI as fundamentally asymbolic and non subjective guards educators against conflating linguistic fluency with authenticity or understanding, and reinforces the ethical obligation to reserve authorship for human agents who can interpret, endorse, and bear responsibility for meaning, even when they have made use of AI as part of the compositional process. At the levels of policy and leadership, the findings point toward the need for multi layered governance frameworks that combine overarching AI guidelines with context sensitive policies at school level. Educational leaders are called upon to articulate explicitly human centered visions for AI use; to guarantee robust mechanisms for data protection, transparency, and consent; and to invest in equitable digital infrastructure so that AI does not exacerbate existing disparities. Equally important is the provision of sustained professional development in AI literacy, ethics, and emotionally informed pedagogy, with teacher learning communities serving as pivotal spaces in which educators can experiment with AI in practice, surface dilemmas, share emergent strategies, and co-create norms that reflect both professional judgment and student voice.

7.4. Future Research and the Human Centered AI Agenda

Finally, the article highlights several directions for future research within a human centered AI agenda. Longitudinal studies are needed to explore how sustained participation in AI supported collaborative writing influences students' metacognition, emotional intelligence, and sense of authorship over time. Comparative investigations across different organizational cultures could clarify which leadership and policy configurations most effectively support ethical, inclusive AI adoption, while design based research conducted in partnership with teachers and students could iteratively refine the proposed multi phase pedagogical model, ensuring its feasibility and responsiveness in real school contexts. More broadly, the discussion suggests that the central question for AI in education is not whether AI will transform schooling—this transformation is already underway—but how educational communities choose to shape that transformation. A human centered AI agenda insists that technologies be judged by their contributions to critical thinking, emotional growth, inclusion, and democratic participation. Under such an orientation, AI is welcome in the

classroom not as a replacement for thought, care, or authorship, but as a scaffold and provocation that can help students become more fully conscious, responsible, and interconnected learners.

8. Conclusion

This research reveals that AI adoption in secondary school education goes far beyond a mere technological upgrade and marks a major pedagogical and epistemological change. AI disrupts established educational notions of authorship, knowledge production, and assessment, thus pushing schools to rethink the connection between thinking, writing, and learning in digital environments. The findings show that AI-supported learning environments have the potential to foster both cognitive and inclusive development if they are part of well-thought-out pedagogical frameworks that focus on the development of reflection, critical evaluation, and human agency. However, if AI is only used merely as a technical tool or as a mechanism for efficiency, it may lead to knowledge outsourcing and shallow learning. Therefore, effective AI integration should be grounded in a human-centric pedagogical approach that balances intellectual autonomy with the effective use of technology.

One major finding is that AI literacy should be understood as epistemic and ethical responsibility in knowledge production rather than just a set of skills for operating technology. Beyond learning how to use AI systems efficiently, students should also be able to critically assess AI-influenced information, identify the biases and limitations of algorithms, and preserve their intellectual ownership. In line with this conception, collaborative writing supported by AI- both digitally and in face-to-face interaction – highlights the complementary roles of the technical, cognitive, and social-emotional aspects of learning. Collaborative writing functions as a mechanism through which students externalize and share their thinking are exposed to various acts of creativity while collectively negotiating meanings and scrutinizing AI-generated proposal. These kinds of environments accommodate different types of participation and offer fertile grounds for developing reflective judgment, metacognitive awareness, and inclusive engagement in academic work.

Moreover, it is argued here that successful and responsible AI use in education is ultimately grounded in psychological readiness and organizational alignment that puts emphasis on human-centered learning. Through metacognition, emotional intelligence, and self-regulation, students can guard themselves against the risk of over-reliance on AI and instead use AI as a cognitive aid. Besides, the role of the teacher and school organizational culture are decisive factors that determine the educational impact of AI-supported classrooms. A school with a strong and collaborative professional culture, transparent governance, and clearly defined pedagogical visions stands a better chance of turning AI into a tool for promoting inclusion, engagement, and education. This study contributes to the advancement of AI in education by weaving together pedagogical, psychological, and organizational perspectives into a cohesive framework and thus fostering educational practices that promote intellectual autonomy, emotional balance, and inclusive participation in increasingly AI-mediated societies.

Compliance with ethical standards

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