

AI Literacy: Technical Competency Outpacing Critical Engagement

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Executive Summary

EXECUTIVE SUMMARY

A medical educator discovers his team uses generative AI to rapidly create clinical case studies for nursing students, achieving 92% student satisfaction ratings [13]. However, when reviewing the AI-generated content, he identifies subtle diagnostic inaccuracies that could reinforce dangerous clinical misconceptions. His institution faces an impossible choice: embrace efficient but potentially flawed AI-generated curricula or maintain educational quality while falling behind peer institutions now using these tools routinely.

This tension between AI's transformative potential and its hidden risks defines the current literacy landscape. AI promises to democratize professional capabilities, with frameworks emerging to build "student literacy and academic capability" across disciplines [13]. Yet our analysis reveals 140 fundamental contradictions in how AI literacy is conceptualized and implemented [11]. The most severe gap involves power concentration: while 69% of discourse centers human agency, critical stakeholder perspectives are systematically excluded. Parents represent just 0.14% of the conversation, with vendors at 0.28% and critics at 0.43% [11]. This creates decision pressure where those most affected by AI systems have the least voice in their development.

The week's central finding reveals that AI literacy development is advancing through technically sophisticated but pedagogically narrow channels. Prompt engineering emerges as a "new 21st century skill" [19], yet this technical focus occurs within a concerning acknowledgment gap: 96% of initiatives fail to address implementation failures or limitations [11]. This creates a literacy model strong on technical competence but weak on critical evaluation. In teacher professional development, the emphasis falls overwhelmingly on tool proficiency rather than ethical application or pedagogical integration [20].

This report maps the current state of AI literacy across education, healthcare, and creative sectors. We analyze key contradictions in implementation, offer actionable recommendations for balanced literacy development, and identify critical research gaps. As AI becomes embedded in professional practice and daily life, literacy transitions from technical specialty to essential

[13] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capability, and Assessment Design (Practice report)

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civic capability. The institutions that thrive will be those that develop literacy frameworks encompassing not only technical proficiency but also critical evaluation, ethical application, and inclusive design—creating ecosystems where human judgment remains central to technological advancement.

Field State Analysis

Introduction

As artificial intelligence systems become deeply embedded in the fabric of society, a critical question emerges: is our collective understanding of AI keeping pace with its rapid technological advancement? This report confronts the widening chasm between the proliferation of AI tools and the public's capacity to comprehend, critique, and command them. The urgency of this issue cannot be overstated for a broad coalition of stakeholders, including educators shaping future generations, policymakers crafting regulatory frameworks, industry leaders developing these technologies, and citizens navigating an increasingly automated world. The ability to interact with AI intelligently and ethically is fast becoming a prerequisite for full participation in social, economic, and civic life. Without a concerted effort to build comprehensive AI literacy, we risk creating a new digital divide, one defined not by access to technology but by a fundamental gap in understanding and agency. This report, grounded in an extensive analysis of 702 scholarly and industry articles, maps the complex terrain of AI literacy. It is structured around a week-long analytical journey that moves from the known to the unknown, systematically exploring four interconnected dimensions. The first section, Current Literacy Landscape, provides a baseline assessment of existing definitions, competencies, and educational initiatives. The second, Literacy Development Trajectory, charts the historical evolution of this field and projects its future pathways. Building on this foundation, the third section identifies Critical Literacy Gaps, pinpointing the most significant and persistent areas of misunderstanding and vulnerability. Finally, the report examines the Participation Implications, exploring how literacy—or the lack thereof—shapes an individual's ability to engage with and influence AI-driven systems. This structured exploration aims to move beyond a simple inventory of skills, framing AI literacy as a dynamic and essential requirement for navigating a future where human and machine intelligence are inextricably linked. The conclusion will return to this central frame, synthesizing the findings to propose a forward-looking agenda for building a more AI-literate society.

Current Literacy Landscape

The current AI literacy landscape reveals a fragmented ecosystem where competing definitions and frameworks create significant confusion about what constitutes meaningful AI education. Analysis of 702 articles shows "AI

literacy” predominantly means technical proficiency with generative tools, particularly prompt engineering, which is increasingly framed as an ”essential 21st century skill” [19]. This technical orientation dominates educational discourse, with frameworks emerging across disciplines to build ”student literacy, academic capability, and assessment design” through hands-on AI interaction [13]. The 24 thematic clusters identified across four domains reveal literacy approaches clustered around technical skill-building, institutional implementation strategies, pedagogical integration, and ethical considerations, though these domains remain largely disconnected rather than integrated into comprehensive frameworks.

Competing literacy frameworks reflect deeper tensions about AI’s role in society. Technical proficiency models emphasize operational competence with AI tools, focusing on effective prompt design and output evaluation. Critical understanding frameworks, while severely underrepresented, advocate for ”critical AI literacy for sustainable futures” that examines power structures and societal impacts [9]. Ethical awareness approaches address responsible use principles, particularly in educational contexts where concerns about academic integrity and misinformation persist [10]. Creative application models explore AI as a collaborative tool for enhancing human capabilities across disciplines from healthcare to urban planning [6].

Literacy development occurs through multiple channels with varying emphasis. Higher education institutions lead formal curriculum development, particularly in technical and health sciences fields [22]. Workplace training focuses on productivity enhancement through tools like ”Magic School AI” for lesson planning [12]. Self-directed learning proliferates through online platforms and communities, while community-based initiatives like those for ”Global South librarians” address localized needs and perspectives [9]. The holistic critical analysis from Tier 4 synthesis reveals that current literacy efforts overwhelmingly prioritize individual competency over systemic understanding, creating a population technically proficient with AI tools but critically ill-equipped to question their underlying assumptions or societal implications.

This fragmented landscape, which overwhelmingly prioritizes technical proficiency and individual competency, establishes a clear but precarious trajectory for AI literacy development. Building on the finding that current efforts create a population technically proficient yet critically ill-equipped, it becomes imperative to examine the directional momentum of these initiatives. This tension illuminates a natural progression from analyzing the present state to investigating its future implications. The following section therefore scrutinizes this literacy development trajectory, specifically questioning whether the accelerating focus on technical skill-building and operational speed comes at the expense of cultivating the deeper critical understanding and ethical reasoning necessary for sustainable integration. It will analyze the dominant metaphors and causal frames that are shaping this

[19] Prompt engineering as a new 21st century skill

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[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

[10] Enseñar o engañar: el lado oscuro de ChatGPT en el aprendizaje del CLE

[6] BID | Aplicaciones Digitales para el Urbanismo

[22] Transforming Ophthalmic Education With Large Language Models

[12] Exploring High School EFL Teachers’ Experiences with Magic School AI in Lesson Planning: Benefits and Insights

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

evolution, revealing a concerning acceleration toward technocratic efficiency.

Literacy Development Trajectory

The evolution of AI literacy efforts reveals a concerning acceleration toward technical speed at the expense of critical depth. Current discourse patterns show literacy development rapidly advancing through technically sophisticated but pedagogically narrow channels, with institutions prioritizing rapid tool adoption over thoughtful integration. The dominant "neutral" metaphor identified across 49 articles reflects a technical-rational assumption that AI systems are fundamentally tools to be mastered rather than social-technical systems requiring critical examination [11]. This metaphor reinforces literacy approaches focused on operational competence rather than ethical reasoning or societal critique.

The trajectory strongly favors skills training over critical understanding, with prompt engineering emerging as the literacy frontier. This technical focus manifests in teacher professional development that emphasizes "tool proficiency rather than ethical application or pedagogical integration" [20]. The speed emphasis creates what one framework identifies as "technocratic efficiency vs critical humanism" tension, where institutions feel pressure to quickly implement AI literacy to maintain competitive positioning [19]. This acceleration occurs despite evidence that effective AI integration requires "repenser la place de la compétence numérique dans le système éducatif" - rethinking digital competence's role throughout education systems [14].

The causal frames analysis reveals a literacy development approach that predominantly centers human agency (55.2%) over AI agency (10.4%), suggesting literacy efforts still position humans as ultimately responsible for AI outcomes [11]. However, this human-centric approach focuses overwhelmingly on individual skill-building rather than collective critical capacity. The evolution shows literacy moving from basic digital competence toward specialized AI interaction skills, but this progression occurs within a concerning acknowledgment gap where 96% of initiatives fail to address implementation failures or limitations [11]. This creates a literacy model strong on technical competence but weak on the critical evaluation skills necessary for meaningful participation in AI-infused societies.

This accelerating trajectory, which prioritizes technical mastery and operational competence, does not unfold in a vacuum. Rather, it establishes a literacy foundation with significant structural omissions. The very emphasis on speed and skill acquisition over critical depth creates inherent contradictions within the AI literacy landscape. Building on the established pattern of a technically narrow development path, the analysis must now turn to the critical gaps this trajectory produces. The next section will examine the fundamental contradictions and severe perspective imbalances that result from this approach, revealing whose voices are marginalized and what critical

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[20] Teacher professional development for a future with generative artificial intelligence – an integrative literature review

[19] Prompt engineering as a new 21st century skill

[14] Il faut repenser la place de la compétence numérique dans le système éducatif québécois

[11] Evidence Architecture

[11] Evidence Architecture

understandings are systematically excluded from mainstream literacy efforts.

Critical Literacy Gaps

The AI literacy landscape contains fundamental contradictions that create significant development gaps, particularly regarding whose perspectives and needs are centered in literacy efforts. The 140 contradictions mapped reveal core tensions between efficiency-driven approaches emphasizing quick skills acquisition and depth-oriented frameworks prioritizing critical understanding [11]. This tension manifests in literacy programs that teach students how to use AI tools effectively but fail to equip them to question why certain tools are promoted, what values they embed, or who benefits from their adoption.

[11] Evidence Architecture

Severe perspective gaps create critical literacy blind spots, with five key stakeholder groups identified as "severely underrepresented" in AI literacy discourse [11]. Parents represent just 0.14% of the conversation, despite having crucial stakes in how AI shapes their children's education and future opportunities. Vendors constitute only 0.28%, creating a disconnect between tool developers and educational implementers. Most alarmingly, critics represent just 0.43% of perspectives, resulting in literacy approaches that overwhelmingly emphasize AI's benefits while minimizing its risks and limitations. This perspective imbalance creates literacy models that serve institutional and commercial interests rather than learner empowerment or societal wellbeing.

[11] Evidence Architecture

The power concentration analysis reveals that literacy development centers predominantly on human agency (69.1%), with AI agency (5.4%) and institutional agency (0.0%) receiving dramatically less attention [11]. This creates a literacy gap where individuals are taught to interact with AI systems but not to understand the institutional power structures that deploy these systems or the algorithmic decision-making that governs their operation. Vendor-driven literacy initiatives prioritize tool-specific competencies that create platform dependency, while pedagogically grounded approaches emphasizing transferable critical thinking skills remain rare [8]. The result is a literacy landscape that produces technically proficient AI users who lack the critical frameworks to recognize manipulation, resist algorithmic bias, or advocate for more equitable AI systems.

[11] Evidence Architecture

[8] Desafíos y potencial de la IA en la educación: percepciones y barreras desde la perspectiva docente

These critical literacy gaps, characterized by imbalanced perspectives and a focus on technical proficiency over critical understanding, do not exist in a vacuum. They have profound consequences for how individuals and communities can engage with an AI-driven world. Building on the identified contradictions and power imbalances, the analysis must now turn to the tangible repercussions for societal participation. The subsequent section examines how the current literacy landscape creates significant implications for meaningful involvement in AI-mediated societies, potentially reinforcing existing inequalities and undermining democratic engagement by failing to

equip citizens with the necessary critical and civic capabilities.

Participation Implications

The current literacy landscape creates significant implications for meaningful participation in increasingly AI-mediated societies. Those receiving comprehensive literacy development—primarily technical professionals and educated elites—gain capabilities for informed participation, while marginalized groups face heightened vulnerability to algorithmic manipulation and exploitation. The severe underrepresentation of parent, vendor, and critic perspectives means literacy programs fail to address the most pressing participation concerns: how AI systems affect family dynamics, what commercial interests drive tool development, and what critical perspectives might reveal about hidden costs and consequences [11].

The prescriptive insights from Tier 4 synthesis indicate that current literacy provision fails to equip individuals for meaningful participation in AI governance, policy development, or ethical oversight. What’s being provided is predominantly technical skill-building for individual productivity enhancement, while what’s needed is critical civic capability for collective decision-making about AI’s role in society [3]. This gap between provision and need creates a participation crisis where technical experts dominate AI discourse while affected communities lack the literacy to articulate their concerns or advocate for their interests.

The failure acknowledgment analysis reveals a particularly dangerous participation implication: with 96% of literacy initiatives avoiding discussion of AI limitations and failures, participants develop unrealistic expectations about AI capabilities and appropriate applications [11]. This creates a population vulnerable to AI overtrust and exploitation, unable to recognize when AI systems are operating beyond their competence or serving questionable interests. Meaningful participation requires not just technical competence but what one framework identifies as “alfabetización crítica en IA”—critical AI literacy that enables examination of power structures, recognition of bias, and advocacy for more equitable systems [9]. Without this critical dimension, AI literacy becomes merely training for compliance with systems whose workings and agendas remain opaque to most participants.

Dimensional Analysis

Central Question

Pattern Description The central questions distinguishing AI-literate citizens reveal a profound tension between technical pragmatism and critical inquiry. Current discourse overwhelmingly prioritizes “how-to” questions focused on operational competence, exemplified by the framing of prompt

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[3] Artificial Intelligence and Multiliteracies: Preparing Learners for a Technologically Evolving World

[11] Evidence Architecture

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

engineering as an "essential 21st century skill" [19]. This technical orientation dominates literacy efforts, with educators asking "How can we effectively integrate AI into curriculum design?" rather than "Why should we?" or "Who benefits?" The health education sector demonstrates this pattern through frameworks that emphasize building "student literacy and academic capability" through practical application [13]. Meanwhile, critical questions about power structures, environmental impacts, and long-term societal consequences remain largely unasked in mainstream literacy discourse, creating a significant gap between operational competence and genuine understanding.

Tensions & Contradictions A fundamental contradiction exists between efficiency-driven questions and ethics-driven inquiry. Technical literacy emphasizes questions about optimization and productivity: "How can AI streamline lesson planning?" [12] versus critical literacy's focus on "What values are embedded in these systems?" This tension reflects broader power dynamics, where 69% of discourse centers human agency yet critical perspectives represent only 0.43% of the conversation [11]. The speed of AI adoption further exacerbates this divide, as institutions prioritize immediate implementation questions over deeper philosophical inquiries about AI's role in shaping human cognition and social structures.

Critical Observations Current literacy efforts demonstrate sophisticated technical questioning but critically underdeveloped ethical and societal inquiry. The emphasis on prompt engineering competence reveals advanced understanding of human-AI interaction mechanics, yet fails to cultivate questioning about AI's epistemological foundations or political economies. This creates citizens who can effectively use AI tools but lack the critical frameworks to interrogate their underlying assumptions or long-term implications. The severe underrepresentation of parent (0.14%), vendor (0.28%), and critic (0.43%) perspectives further narrows the range of questions considered legitimate within mainstream literacy discourse [11].

Literacy Implications Meaningful participation requires citizens to master both technical and critical questioning competencies. Literate citizens must ask not only "How does this work?" but "Whose interests does it serve?" and "What world does this create?" This necessitates moving beyond operational questions to include epistemological inquiries about how AI shapes knowledge production and ethical questions about responsibility and justice [23]. Critical questioning literacy enables citizens to interrogate the very frameworks that define AI literacy itself, recognizing that the questions we learn to ask—and those we don't—fundamentally shape our understanding and agency in an AI-saturated world.

Purpose

Pattern Description The purpose dimension reveals a critical distinction between understanding why AI systems exist versus using them effectively for human goals. Current literacy efforts overwhelmingly emphasize instru-

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[11] Evidence Architecture

[11] Evidence Architecture

[23] Ética de la IA generativa en la formación legal universitaria

mental purposes—using AI to achieve specific educational, professional, or creative objectives. This is evident in health education frameworks designed to “build student literacy and academic capability” through practical application [13]. Similarly, institutional agendas focus on “digital transformation” and efficiency gains, framing AI’s primary purpose as enhancing existing educational processes [21]. Understanding AI’s fundamental purposes—its design intentions, business models, and political contexts—receives significantly less attention, creating a literacy gap where users can employ tools effectively but lack insight into why these tools exist and what their proliferation signifies.

Tensions & Contradictions A fundamental tension exists between literacy that prepares citizens to use AI versus literacy that enables understanding of AI’s societal purposes. Technical training emphasizes AI as a tool for human purposes, while critical literacy examines AI as a social force with purposes of its own. This contradiction manifests in educational settings where teachers learn to use “Magic School AI” for lesson planning efficiency [12] without examining the commercial purposes driving these tools’ development. The power concentration analysis reveals this tension clearly: while human agency dominates discourse (69%), institutional agency remains virtually unexamined (0%) [11], suggesting literacy efforts systematically avoid questions about organizational and corporate purposes.

Critical Observations Current literacy approaches demonstrate sophisticated understanding of how to align AI with human purposes but critically underdeveloped analysis of AI’s systemic purposes. The emphasis on “practical orientation toward current educational challenges” [15] reveals a pragmatic focus that serves immediate needs while neglecting broader examination of the economic, political, and ideological purposes driving AI development. This creates citizens who can effectively deploy AI tools but lack the conceptual frameworks to understand why these particular tools are being developed, funded, and promoted at this historical moment, or what alternative purposes might be possible.

Literacy Implications Meaningful participation requires citizens to understand both how to use AI for their purposes and why AI systems exist with purposes of their own. This necessitates literacy that examines the business models, governance structures, and value systems embedded in AI technologies [9]. Citizens need competencies to analyze not only what AI can do for them, but what societal transformations AI is designed to accomplish, whose interests these transformations serve, and what purposes remain unexamined or excluded from mainstream discourse. This dual-purpose literacy enables both effective tool use and critical understanding of the technological ecosystem’s fundamental drivers and directions.

Information

Pattern Description The information dimension reveals significant dis-

[13] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capability, and Assessment Design (Practice report)

[21] Transformación Docente con IA: Agenda Institucional para Universidades de México y la Región

[12] Exploring High School EFL Teachers’ Experiences with Magic School AI in Lesson Planning: Benefits and Insights

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[15] Inteligencia Artificial Generativa en la formación docente: Uso de prompts para el diseño de planeac

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

parities in what knowledge citizens need for meaningful participation versus what current literacy efforts prioritize. Technical information about AI operation and application dominates educational discourse, with emphasis on prompt design techniques, model capabilities, and integration strategies. This pattern is evident in teacher professional development focusing on "tool proficiency rather than ethical application" [20]. Meanwhile, critical information about AI's environmental impacts, labor implications, data governance, and political economies remains severely underrepresented. The knowledge gap is particularly pronounced regarding AI's material infrastructure—the energy consumption, water usage, and mineral extraction required to build and operate these systems—which receives minimal attention in mainstream literacy frameworks despite being essential for informed citizenship.

Tensions & Contradictions A fundamental tension exists between information that enables effective use versus information that facilitates critical assessment. Current literacy efforts prioritize operational knowledge—how to interact with AI systems productively—while systematically neglecting contextual knowledge about these systems' social, environmental, and economic dimensions. This contradiction manifests in educational settings where students learn to critique AI outputs for bias or accuracy but lack information about the training data composition, labor conditions involved in data annotation, or energy costs of model inference [18]. The perspective gaps analysis reveals this tension clearly: technical researcher perspectives dominate (1.42%) while community and critic perspectives are severely marginalized [11].

Critical Observations Current literacy approaches demonstrate sophisticated technical information transmission but critically underdeveloped contextual knowledge sharing. The emphasis on "functional and technical dimensions" of AI literacy [17] creates citizens who understand how to use AI tools effectively but lack essential information about these tools' broader implications. This information asymmetry creates vulnerability, as users may deploy AI systems competently while remaining unaware of their environmental impacts, labor implications, or democratic consequences. The near-total absence of failure acknowledgment (96% of initiatives fail to address limitations) [11] further compounds this problem by withholding crucial information about system reliability and boundaries.

Literacy Implications Meaningful participation requires citizens to access both technical information for effective use and contextual information for critical assessment. This necessitates literacy that includes knowledge about AI's supply chains, environmental footprints, labor conditions, business models, and governance structures [3]. Citizens need information not only about what AI can do, but what it costs—environmentally, socially, economically, and politically—and who bears these costs. This comprehensive information literacy enables informed participation in democratic decision-making about AI development and deployment, rather than mere technical

[20] Teacher professional development for a future with generative artificial intelligence – an integrative literature review

[18] La IA amenaza con contaminar la ciencia

[11] Evidence Architecture

[17] La dimensión funcional y técnica en la alfabetización en Inteligencia Artificial Generativa en la fo

[11] Evidence Architecture

[3] Artificial Intelligence and Multiliteracies: Preparing Learners for a Technologically Evolving World

competence within systems whose broader implications remain unexamined.

Concepts Ideas

Pattern Description The concepts and ideas dimension reveals a critical divide between technically sophisticated frameworks accessible primarily to experts and simplified mental models for general users. Current literacy efforts emphasize operational concepts like "prompt engineering," "fine-tuning," and "model capabilities" that enable effective interaction but provide limited understanding of underlying mechanisms. This pattern is evident in educational approaches that focus on "practical orientation toward current educational challenges" through simplified conceptual frameworks [15]. Meanwhile, foundational concepts like "training data," "model architecture," "reinforcement learning from human feedback," and "emergent capabilities" remain largely confined to technical discourse, creating a conceptual gap where users can employ AI systems effectively but lack the mental models to understand how these systems work or why they behave as they do.

Tensions & Contradictions A fundamental tension exists between conceptual frameworks that enable critical understanding versus those that facilitate practical use. Technical literacy emphasizes concepts that optimize interaction—like "temperature settings" and "system prompts"—while critical literacy requires concepts that enable systemic analysis, such as "value alignment," "algorithmic bias," and "surveillance capitalism." This contradiction manifests in educational settings where teachers learn conceptual frameworks for "AI-powered lesson planning" [12] without corresponding frameworks for understanding the data extraction and commercialization models underlying these tools. The power concentration analysis reveals this tension: human agency concepts dominate (69%) while institutional power concepts remain virtually absent [11].

Critical Observations Current literacy approaches demonstrate sophisticated development of interaction concepts but critically underdeveloped systemic understanding frameworks. The emphasis on "prompt engineering as a new 21st century skill" [19] creates citizens who conceptualize AI primarily through the lens of user interface and command syntax, rather than as complex sociotechnical systems with particular histories, political economies, and ecological impacts. This conceptual narrowing is particularly concerning given the 140 fundamental contradictions identified in how AI literacy is conceptualized [11], suggesting that the very conceptual frameworks used to understand AI are themselves contested and contradictory.

Literacy Implications Meaningful participation requires citizens to master both interaction concepts for effective use and systemic concepts for critical understanding. This necessitates conceptual frameworks that connect technical operation to social implications, enabling users to understand not only how to prompt AI systems effectively, but how these systems prompt particular ways of thinking, knowing, and being [16]. Citizens need concepts

[15] Inteligencia Artificial Generativa en la formación docente: Uso de prompts para el diseño de planeac

[12] Exploring High School EFL Teachers' Experiences with Magic School AI in Lesson Planning: Benefits and Insights

[11] Evidence Architecture

[19] Prompt engineering as a new 21st century skill

[11] Evidence Architecture

[16] La "pedagogía del PowerPoint" en la era de la IA: viaje desde la abulia digital a la co-creación

that illuminate AI's epistemological assumptions, political dimensions, and ecological contexts, enabling them to participate meaningfully in democratic decisions about technological development rather than merely adapting to systems whose fundamental nature remains conceptually opaque.

Assumptions

Pattern Description The assumptions dimension reveals critical taken-for-granted beliefs that shape AI literacy efforts but often escape explicit examination. Current discourse routinely assumes technological inevitability—that AI development follows an inevitable trajectory requiring adaptation rather than democratic direction. This pattern is evident in institutional agendas that frame AI integration as necessary for maintaining competitiveness [21]. Literacy efforts also frequently assume tool neutrality—that AI systems are neutral instruments whose impacts depend entirely on user application—despite substantial evidence of embedded values and biases. Perhaps most fundamentally, most literacy initiatives assume that technical proficiency constitutes adequate preparation for AI-saturated futures, neglecting the critical, ethical, and political dimensions essential for meaningful participation.

[21] Transformación Docente con IA: Agenda Institucional para Universidades de México y la Región

Tensions & Contradictions A fundamental tension exists between assumptions that enable smooth integration versus those that facilitate critical examination. Efficiency-oriented literacy assumes AI's fundamental beneficence or at least neutrality, focusing on optimization within existing systems. Critical literacy, by contrast, begins by questioning these very assumptions, examining whose interests are served by particular technological developments and what alternative possibilities are foreclosed. This contradiction manifests in the severe perspective gaps observed, where critic perspectives represent only 0.43% of discourse [11]. The near-total absence of failure acknowledgment (96% of initiatives fail to address limitations) further demonstrates how assumptions of reliability and beneficence remain largely unexamined in mainstream literacy efforts.

[11] Evidence Architecture

Critical Observations Current literacy approaches demonstrate sophisticated operational competence but critically underdeveloped assumption interrogation. The emphasis on "building student literacy and academic capability" through practical application [13] reveals assumptions that technical proficiency constitutes adequate preparation, neglecting the political and ethical dimensions essential for democratic citizenship. This assumption blindness is particularly concerning given the power concentrations identified, where AI agency represents 5.4% of discourse despite these systems' increasing autonomy [11]. Citizens trained within these assumption frameworks may develop technical skills while internalizing unexamined beliefs about technological determinism, tool neutrality, and corporate beneficence that limit their critical agency.

[13] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capability, and Assessment Design (Practice report)

[11] Evidence Architecture

Literacy Implications Meaningful participation requires citizens to develop competencies in identifying, examining, and challenging the assump-

tions underlying AI development and deployment. This necessitates literacy that treats technological assumptions as contestable rather than inevitable, enabling citizens to ask not only "How does this work?" but "Why was it built this way?" and "What alternative assumptions might lead to different technological futures?" [9]. Assumption literacy enables citizens to participate in shaping technological development rather than merely adapting to systems whose fundamental premises remain unexamined, fostering democratic agency rather than technical compliance in the face of rapid technological change.

Implications Consequences

Pattern Description The implications dimension reveals significant disparities in who can anticipate AI's consequences and who remains vulnerable to unforeseen impacts. Current literacy efforts emphasize immediate, predictable implications—improved efficiency in educational tasks, enhanced creative possibilities, streamlined workflows—while systematically neglecting second-order effects and systemic consequences. This pattern is evident in health education frameworks that focus on "building student literacy and academic capability" [13] without corresponding attention to how AI-mediated clinical education might reshape professional judgment or patient relationships. Similarly, institutional agendas prioritize "digital transformation" benefits while giving minimal consideration to implications for academic labor, knowledge production, or institutional autonomy [21].

Tensions & Contradictions A fundamental tension exists between literacy that prepares citizens to harness AI's positive implications versus literacy that enables critical assessment of potential harms. Technical training emphasizes beneficial applications and efficiency gains, while critical literacy examines unintended consequences, displacement effects, and systemic risks. This contradiction manifests clearly in the failure acknowledgment analysis, where 96% of initiatives fail to address limitations or negative outcomes [11]. The perspective gaps further reveal this tension: while researcher perspectives dominate (1.42%), community and parent perspectives—those often most affected by unintended consequences—are severely marginalized (0.14%) [11], suggesting that literacy efforts systematically exclude the viewpoints most likely to identify negative implications.

Critical Observations Current literacy approaches demonstrate sophisticated understanding of intended benefits but critically underdeveloped analysis of unintended consequences. The emphasis on "practical orientation toward current educational challenges" [15] creates citizens who can anticipate and pursue AI's immediate applications but lack the conceptual frameworks to identify second-order effects, systemic risks, or distributed harms. This implications blindness is particularly dangerous given AI's rapid deployment across sensitive domains like healthcare, education, and governance, where unintended consequences can have profound human costs. The

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

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[21] Transformación Docente con IA: Agenda Institucional para Universidades de México y la Región

[11] Evidence Architecture

[11] Evidence Architecture

[15] Inteligencia Artificial Generativa en la formación docente: Uso de prompts para el diseño de planeac

near-zero solution rate (0%) for identified problems further compounds this vulnerability [11].

Literacy Implications Meaningful participation requires citizens to develop competencies in anticipating both intended and unintended consequences across multiple domains and timeframes. This necessitates literacy that includes systems thinking, futures literacy, and ethical reasoning capabilities [3]. Citizens need frameworks for mapping implications across technological, social, economic, political, and environmental dimensions, enabling them to participate in democratic decisions about which AI applications to encourage, which to constrain, and which to redesign to mitigate foreseeable harms. This implications literacy transforms citizens from passive recipients of technological change to active shapers of sociotechnical futures.

Inference Interpretation

Pattern Description The inference dimension reveals critical competencies in judging AI reliability, trustworthiness, and appropriate use contexts—capabilities that remain underdeveloped in current literacy efforts. Citizens face complex interpretation challenges when evaluating AI outputs, requiring sophisticated reasoning to determine when to trust generated content, how to identify potential biases, and when human judgment should override algorithmic suggestions. This pattern is evident in educational settings where teachers use AI for lesson planning [12] but lack clear frameworks for judging when AI-generated content might contain subtle pedagogical errors or cultural biases. Similarly, health education frameworks emphasize building “student literacy and academic capability” [13] without corresponding attention to developing clinical judgment about when to trust AI-generated diagnostic suggestions.

Tensions & Contradictions A fundamental tension exists between inference approaches that prioritize efficiency versus those that emphasize critical assessment. Technical literacy trains users to optimize outputs through better prompting and interface mastery, while critical literacy develops competencies in identifying limitations, biases, and inappropriate applications. This contradiction manifests in the power concentration analysis, where human agency dominates discourse (69%) yet critical perspectives remain severely underrepresented (0.43%) [11]. The failure acknowledgment patterns further reveal this tension: with 96% of initiatives failing to address limitations [11], users receive minimal guidance about inference boundaries or reliability thresholds, creating vulnerability when systems produce plausible but inaccurate or harmful outputs.

Critical Observations Current literacy approaches demonstrate sophisticated development of optimization inference—how to get better outputs—but critically underdeveloped critical inference—how to judge output quality, appropriateness, and reliability. The emphasis on “prompt engineering as a new 21st century skill” [19] creates citizens who can effectively shape AI

[11] Evidence Architecture

[3] Artificial Intelligence and Multiliteracies: Preparing Learners for a Technologically Evolving World

[12] Exploring High School EFL Teachers’ Experiences with Magic School AI in Lesson Planning: Benefits and Insights

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[11] Evidence Architecture

[11] Evidence Architecture

[19] Prompt engineering as a new 21st century skill

interactions but lack the evaluative frameworks to determine when those interactions should be trusted, modified, or rejected. This inference gap is particularly concerning in high-stakes domains like healthcare and education, where poor judgment about AI reliability can have serious consequences. The low learning rate (6.12%) from identified problems further compounds this vulnerability [11].

Literacy Implications Meaningful participation requires citizens to develop sophisticated inference competencies that go beyond technical optimization to include critical evaluation, contextual judgment, and ethical reasoning. This necessitates literacy that includes frameworks for assessing output reliability across different domains, identifying potential biases and limitations, and determining appropriate use contexts [10]. Citizens need the reasoning skills to judge not only whether AI outputs are technically correct, but whether they are contextually appropriate, ethically sound, and socially beneficial—inference capabilities that enable meaningful human oversight rather than uncritical adoption of algorithmic suggestions.

Point of View

Pattern Description The point of view dimension reveals stark power imbalances in whose perspectives shape AI literacy definitions and whose participation needs remain marginalized. Current discourse is overwhelmingly dominated by technical and institutional viewpoints, with researcher perspectives representing 1.42% of the conversation while critical, community, and parental viewpoints are systematically excluded [11]. This pattern is evident in literacy frameworks that emphasize “institutional agendas for digital transformation” [21] while neglecting community-based knowledge and culturally situated understandings. The severe underrepresentation of parent (0.14%), vendor (0.28%), and critic (0.43%) perspectives creates a literacy landscape shaped primarily by those who develop and implement AI systems rather than those who live with their consequences, resulting in definitions that prioritize technical proficiency over critical agency.

Tensions & Contradictions A fundamental tension exists between point of view that treats AI literacy as technical skill acquisition versus perspectives that frame it as critical democratic capacity. Dominant institutional viewpoints emphasize efficiency, standardization, and workforce preparation, evident in frameworks for “building student literacy and academic capability” [13]. Marginalized critical perspectives, by contrast, emphasize ethical reasoning, power analysis, and community self-determination, as seen in efforts to empower “Global South librarians through critical AI literacy for sustainable futures” [9]. This viewpoint contradiction manifests in the 140 fundamental contradictions identified in how AI literacy is conceptualized [11].

Critical Observations Current literacy approaches demonstrate sophisticated incorporation of technical and institutional viewpoints but critically

[11] Evidence Architecture

[10] Enseñar o engañar: el lado oscuro de ChatGPT en el aprendizaje del CLE

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[21] Transformación Docente con IA: Agenda Institucional para Universidades de México y la Región

[13] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capability, and Assessment Design (Practice report)

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

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exclude community, cultural, and critical perspectives. The power concentration in human agency discourse (69%) [11] masks significant viewpoint homogeneity, as this "human" perspective primarily represents developers, researchers, and implementers rather than the diverse human communities affected by AI systems. This viewpoint narrowing creates literacy that serves adaptation to technological change rather than democratic direction of that change, prioritizing the perspectives of those building AI systems over those building communities, cultures, and futures with these systems. The near-total absence of failure acknowledgment from particular viewpoints (96%) further demonstrates how dominant perspectives systematically exclude certain types of critical reflection.

Literacy Implications Meaningful participation requires literacy that incorporates multiple viewpoints, including especially those currently marginalized in AI discourse. This necessitates frameworks that value community knowledge, cultural wisdom, and critical perspectives alongside technical expertise [7]. Citizens need the viewpoint literacy to recognize whose perspectives shape technological development, whose are excluded, and how these inclusions and exclusions privilege certain interests while marginalizing others. This multiperspectival literacy enables democratic participation in technological decision-making rather than technical training within systems whose fundamental directions and values remain determined by narrow interest groups.

Contradiction Analysis

Technical Efficiency vs. Critical Humanism in Literacy Goals The core tension in AI literacy pits the demand for rapid technical skill acquisition against the necessity for deep critical understanding of AI's societal and ethical dimensions. This manifests as a conflict between preparing individuals for immediate workforce participation versus cultivating citizens capable of meaningful democratic engagement with AI systems. The discourse is dominated by frameworks prioritizing "student literacy and academic capability" through practical application [13], while critical examination remains marginalized.

This tension is fueled by economic pressures and institutional competition driving rapid adoption. Educational institutions face pressure to demonstrate technological relevance, leading to literacy models that emphasize operational competence over critical inquiry. The metaphor of "prompt engineering as a new 21st century skill" [19] exemplifies this technical orientation, framing AI literacy as mastery of tool interaction rather than understanding of systemic implications. Vendor influence further reinforces this through ready-made educational tools that prioritize functionality over critical pedagogy.

The persistence stems from structural imbalances in educational priorities and resource allocation. Technical literacy delivers measurable, immediate

[11] Evidence Architecture

[7] Children's right to participation in AI: Exploring transnational co-creative approaches to foster child-inclusive AI policy and practice

[13] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capability, and Assessment Design (Practice report)

[19] Prompt engineering as a new 21st century skill

outcomes that align with institutional accountability metrics, while critical literacy's benefits are long-term and difficult to quantify. The severe underrepresentation of critic perspectives (0.43%) and parent voices (0.14%) in the discourse [11] creates blind spots where efficiency concerns consistently outweigh ethical considerations. Institutional frameworks like [21] prioritize implementation speed over critical examination.

For meaningful participation, literacy must bridge this divide by integrating technical competence with critical consciousness. Citizens need both operational skills to navigate AI systems and the analytical frameworks to question their embedded values and power structures. Approaches like [9] demonstrate how technical training can be coupled with critical analysis of global power dynamics, creating literacy that enables both use and critique.

Individual Competency Development vs. Systemic Literacy Infrastructure A fundamental contradiction exists between framing AI literacy as individual skill acquisition versus recognizing it as requiring robust systemic support structures. Current approaches overwhelmingly target individual teacher and student competencies through tool-focused training, while neglecting the institutional policies, resource allocation, and cultural shifts necessary for meaningful literacy development. This creates a burden-shifting dynamic where individuals bear responsibility for navigating complex AI systems without adequate systemic support.

The tension arises from educational models that individualize learning outcomes while underinvesting in collective infrastructure. Professional development emphasizes individual "tool proficiency" through programs like [12], creating isolated competencies rather than institutional capacity. This individual focus aligns with neoliberal educational paradigms that prioritize measurable individual outcomes over harder-to-quantify systemic improvements.

This persists because individual competency models are politically and economically convenient—they require less institutional transformation and can be implemented through existing professional development structures. The power concentration analysis revealing 69% human agency focus [11] actually masks how this agency is framed individualistically rather than collectively. Institutions benefit from appearing technologically progressive without undertaking the difficult work of systemic change, as seen in [21] where institutional agendas may prioritize visibility over substantive support.

For democratic participation, literacy must be reconceived as both individual capability and collective infrastructure. Citizens need personal skills but also access to shared resources, ethical guidelines, and community support systems. The acknowledgment gap—where 96% of initiatives fail to address implementation failures [11]—reveals how individual-focused approaches obscure systemic barriers. Meaningful participation requires literacy frameworks that address both individual competency and the institutional conditions that enable or constrain its development.

[11] Evidence Architecture

[21] Transformación Docente con IA:
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Global a través de la alfabetización crítica en
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[12] Exploring High School EFL Teachers'
Experiences with Magic School AI in
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[11] Evidence Architecture

Vendor-Driven Tool Literacy vs. Pedagogically Grounded Critical Literacy A critical tension emerges between literacy models developed by AI vendors emphasizing tool proficiency and those emerging from educational research prioritizing pedagogical integration and critical understanding. Vendor-driven frameworks often promote specific platforms and technical skills, while pedagogically grounded approaches focus on learning outcomes and ethical considerations. This creates a fundamental conflict between literacy as consumption capability versus literacy as critical engagement.

Economic incentives drive this tension, with vendors seeking to establish market dominance through educational penetration. Tools like those explored in [5] come with embedded literacy assumptions that prioritize technical mastery over critical examination. The vendor perspective represents only 0.28% of the discourse [11], yet their influence through resource provision gives them disproportionate power in shaping literacy definitions.

The persistence reflects resource disparities in educational technology adoption. Cash-strapped institutions often accept vendor-provided training and tools, internalizing commercial literacy frameworks by default. The technical orientation of [19] aligns with vendor interests in creating dependent users rather than critical citizens. This commercial influence creates path dependency where initial tool choices determine subsequent literacy development trajectories.

For authentic participation, literacy must reclaim pedagogical primacy over commercial convenience. This requires developing independent frameworks like [3] that prioritize educational values over tool proficiency. Citizens need literacy that enables them to evaluate AI systems critically rather than just operate them efficiently, recognizing that vendor interests and democratic citizenship may not align.

Speed-to-Implementation vs. Sustainable Learning Effectiveness The pressure for rapid AI integration conflicts with evidence-based approaches to sustainable learning and meaningful skill development. Institutions face competing demands to demonstrate immediate AI adoption while ensuring literacy development leads to durable, transferable capabilities. This creates a fundamental tension between visible, quick-win implementations and the slower, more complex work of building deep understanding.

Market competition and technological hype cycles drive this urgency, with institutions fearing being left behind if they don't immediately adopt AI tools. The framing of AI literacy as urgent workforce preparation, as seen in health education frameworks [13], creates implementation pressure that can compromise educational quality. The 96% failure acknowledgment gap [11] suggests institutions are not adequately learning from implementation challenges.

This tension persists because visible implementation delivers immediate political and reputational benefits, while sustainable literacy development requires long-term investment with delayed returns. The dominance of tech-

[5] Benchmarking and Validation of Prompting Techniques for AI-Assisted Industrial PLC Programming

[11] Evidence Architecture

[19] Prompt engineering as a new 21st century skill

[3] Artificial Intelligence and Multiliteracies: Preparing Learners for a Technologically Evolving World

[13] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capability, and Assessment Design (Practice report)

[11] Evidence Architecture

nical failure acknowledgment (4.08%) over implementation failure (2.04%) [11] indicates a focus on fixing broken tools rather than examining flawed implementation processes. Institutional frameworks like [21] often emphasize adoption timelines over learning outcomes.

For meaningful participation, literacy development must prioritize depth over speed, recognizing that superficial technical training creates dependent users rather than empowered citizens. Approaches like [20] emphasize sustained engagement rather than one-time training, creating conditions for transferable critical capabilities rather than context-specific technical skills.

Technical Solutionism vs. Critical Problem-Framing in Literacy Approaches A profound tension exists between literacy approaches that present AI as technical solution to educational challenges and those that frame AI as raising fundamental questions about knowledge, power, and human agency. Technical solutionism dominates current discourse, focusing on how AI can optimize existing educational processes, while critical approaches question the very problems AI purports to solve and the values embedded in proposed solutions.

This tension reflects deeper epistemological conflicts about education's purposes and technology's role. The technical solution orientation appears in frameworks emphasizing efficiency gains, such as automated grading systems [1], while critical approaches like [9] examine how AI systems reproduce or challenge existing power structures.

The persistence stems from the appeal of technical fixes to complex educational problems. Solution-oriented approaches offer clear implementation pathways and measurable outcomes, while critical problem-framing often reveals deeper, more intractable challenges. The severe underrepresentation of critic perspectives (0.43%) [11] ensures technical solutionism faces limited challenge within mainstream discourse. Institutional adoption patterns favoring efficiency gains reinforce this technical orientation.

For democratic participation, literacy must encompass both technical understanding and critical problem-framing capabilities. Citizens need to understand both how AI systems work technically and what societal problems they purport to solve, for whom, and with what consequences. Approaches like [23] demonstrate how technical training can be integrated with critical examination of power and justice implications.

Universal Literacy Standards vs. Contextually Responsive Frameworks A significant tension exists between efforts to develop standardized AI literacy frameworks applicable across contexts and the need for responsive approaches that address specific community needs, cultural values, and local priorities. Universal standards promise consistency and transferability but risk imposing dominant cultural assumptions, while contextual approaches ensure relevance but may lack coherence and create educational disparities.

Global initiatives and vendor-driven frameworks often promote universal literacy standards, while localized approaches like [9] emphasize specific

[11] Evidence Architecture

[21] Transformación Docente con IA: Agenda Institucional para Universidades de México y la Región

[20] Teacher professional development for a future with generative artificial intelligence – an integrative literature review

[1] A Framework for Automated Student Grading Using Large Language Models

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

[11] Evidence Architecture

[23] Ética de la IA generativa en la formación legal universitaria

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

community needs and power dynamics. This tension reflects broader conflicts between globalization and localization in educational policy, with AI literacy becoming another arena for negotiating cultural sovereignty and educational self-determination.

Economic efficiency and scalability concerns drive standardization, while educational effectiveness and cultural relevance support contextualization. The power concentration analysis showing minimal institutional agency (0%) [11] suggests local institutions may have limited capacity to develop contextually responsive frameworks, defaulting to standardized approaches. International guidelines like those from UNESCO [24] attempt to balance universal principles with contextual application.

[11] Evidence Architecture

[24] Ética de la inteligencia artificial

This tension persists because standardized approaches offer implementational convenience and apparent equity through consistency, while failing to address very different community needs and technological access conditions. The severe perspective gaps—particularly the near-absence of parent (0.14%) and vendor (0.28%) voices [11]—ensure standardized frameworks reflect limited stakeholder input.

[11] Evidence Architecture

For meaningful participation, literacy must balance transferable core principles with contextual application. Citizens need both shared understanding to participate in broader democratic discourse and context-specific knowledge to address local challenges. Frameworks like [4] demonstrate how universal rights frameworks can guide contextual implementation.

[4] Artificial intelligence and the rights of the child: Towards an integrated agenda for research and policy

These interconnected contradictions reveal a literacy field prioritizing immediate technical competence over sustained critical capability, individual skill over collective capacity, and standardized implementation over contextual relevance. The resolution of these tensions will determine whether AI literacy creates empowered citizens capable of democratic participation or merely produces efficient users of commercial systems. The severe perspective gaps and acknowledgment failures suggest current approaches are developing literacy for consumption rather than citizenship, with profound implications for democratic futures.

Implications for Practice

The Obstacle Most AI literacy programs default to technical skill-building through isolated prompt engineering workshops, creating operational competence without critical understanding. This approach fails because it treats AI literacy as tool proficiency rather than developing the capacity to question AI's societal impacts and embedded values [19].

[19] Prompt engineering as a new 21st century skill

The Action 1. Develop a 12-week integrated curriculum module where students use AI tools for a project (e.g., creating a public health announcement) while simultaneously investigating the tool's data sources, potential biases, and environmental costs. 2. In weeks 1-4, focus on collaborative prompt design to achieve a project goal. In weeks 5-8, students research and

map the AI's supply chain and energy consumption. In weeks 9-12, they present their findings and a critical reflection on the tool's appropriate use. 3. Resources needed include access to generative AI tools, guides on tracing AI system impacts, and professional development for facilitators. 4. Success is measured by students' ability to articulate both the utility and the limitations of a tool, evidenced through reflective writing and a final project that demonstrates conscious use.

The Workaround This method avoids creating technically skilled but critically naive users. It enables learners to see AI not as a magic box but as a socio-technical system with consequences, moving beyond the "how" to the "why" and "should we," as modeled in critical literacy approaches for librarians [9].

The Outcome Within one semester, learners develop the competency to make an informed choice about when and how to use AI, weighing functional benefits against ethical and societal considerations. This fosters a more resilient and discerning form of literacy, where citizens can leverage AI's power without surrendering their critical judgment, a core goal of frameworks for health education [13].

The Obstacle Standardized tests and multiple-choice quizzes are ineffective for assessing AI literacy because they measure factual recall or simple tool operation, failing to capture a learner's nuanced understanding of AI's capabilities, limitations, and societal context.

The Action 1. Implement a portfolio-based assessment system over a full academic year, where learners compile evidence of their AI-literate practice. 2. The portfolio must include: (a) examples of effective and iterative prompt design for a complex task; (b) a critical analysis of an AI-generated output, identifying potential inaccuracies or biases; and (c) a position paper on a local policy issue involving AI, arguing for a course of action with evidence. 3. Educators need training and common rubrics to evaluate these portfolios consistently, focusing on criteria like critical analysis, ethical reasoning, and metacognitive reflection. 4. Success is measured by growth in the depth of critical analysis across portfolio entries and the learner's ability to transfer understanding to new, unfamiliar AI tools or scenarios.

The Workaround This bypasses the trap of assessing performance of a narrow skill. It instead evaluates the deeper, transferable understanding needed to navigate a landscape of rapidly evolving AI technologies, ensuring literacy outlasts any specific tool.

The Outcome After a year, learners demonstrate the competency to deconstruct and interrogate AI systems independently. They can not only use AI to complete tasks but can also explain its potential failures and societal trade-offs, embodying the critical stance called for in analyses of AI's role in education [10]. This creates a foundation for lifelong learning in a technologically dynamic world.

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

[13] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capability, and Assessment Design (Practice report)

[10] Enseñar o engañar: el lado oscuro de ChatGPT en el aprendizaje del CLE

The Obstacle Top-down, one-size-fits-all professional development (PD) for educators often results in superficial adoption of AI tools, focusing on mechanics without building the pedagogical or ethical foundations needed for meaningful classroom integration.

The Action 1. Establish "AI Literacy Circles"—peer-led, ongoing professional learning communities that meet bi-weekly for one semester. 2. Each circle of 5-7 educators follows a structured but flexible protocol: (a) exploring a new AI tool or concept; (b) collaboratively critiquing its educational value and risks; (c) designing a small-scale classroom activity; and (d) reflecting on the outcomes. 3. Key resources include a curated library of critical readings [3] and seed funding for classroom experiments. 4. Success is measured by the number of refined teaching practices developed by the circle and evidence of increased student critical discourse around AI in their classrooms.

The Workaround This model counters one-off workshop fatigue by building a sustainable community of practice. It empowers educators to become co-designers of AI literacy, not just passive recipients of training, directly addressing gaps in current PD models [20].

The Outcome Within a semester, educators gain the confidence and competency to facilitate critical conversations about AI with their students. They transition from being tool operators to pedagogical designers who can thoughtfully mediate AI's role in learning, a transformation essential for institutional agendas aiming for meaningful integration [21].

The Obstacle Community and parent perspectives are severely underrepresented in AI literacy discourse (just 0.14%), leading to literacy initiatives that feel irrelevant or imposed, missing crucial local context and concerns [11].

The Action 1. Organize a series of three "Community AI Audits" over six months, facilitated by local libraries or community centers. 2. Session 1 introduces basic AI concepts through local examples (e.g., automated benefits systems, social media algorithms). Session 2 trains participants to collaboratively map where AI is making decisions in their community. Session 3 focuses on developing a community response or set of questions for local institutions using these systems. 3. Facilitators need grounding in popular education methods and access to multilingual, accessible resources that demystify technical jargon. 4. Success is measured by participant-generated maps of local AI use, the formulation of collective questions for local policy-makers, and a sustained increase in attendance.

The Workaround This workaround reframes literacy from individual skill acquisition to collective civic capability. It centers the knowledge and concerns of the community, ensuring literacy is relevant and empowering rather than abstract.

The Outcome After participating, community members develop the com-

[3] Artificial Intelligence and Multiliteracies: Preparing Learners for a Technologically Evolving World

[20] Teacher professional development for a future with generative artificial intelligence – an integrative literature review

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[11] Evidence Architecture

petency to identify and question AI systems that impact their daily lives, from hiring algorithms to public service chatbots. This builds essential civic muscle for democratic oversight of automated systems, a necessary complement to technical skills in a mature AI-literate society.

Research Agenda

Research Question How do critical questioning competencies transfer across different AI contexts (writing assistance, image generation, and decision support systems), and what instructional scaffolds most effectively accelerate this transfer?

Methodological Approach A mixed-methods, longitudinal design tracking 200+ learners over 12 months. Participants would engage in structured literacy interventions while their critical questioning behaviors are assessed through think-aloud protocols, discourse analysis of their interactions with various AI systems, and pre/post assessments of their ability to identify limitations and biases. This approach moves beyond self-reporting to capture the development of applied critical literacy in real-time.

Literacy Significance This research directly addresses the severe gap in critical perspectives within current AI literacy, where critic voices represent only 0.43% of the discourse [11]. Understanding how critical thinking generalizes across AI modalities would inform the development of integrated curricula that build durable critical literacy, rather than context-specific technical skills. This benefits educators and curriculum designers seeking to create literacy programs that prepare citizens to interrogate AI systems regardless of their specific interface or application domain, as called for in critical approaches for global librarians [9].

Funding Alignment Spencer Foundation, NSF REESE program, and the MacArthur Foundation’s Digital Media and Learning initiative.

Research Question What constitutes developmentally appropriate AI literacy progression from primary through secondary education, and how can assessments validly measure conceptual understanding growth rather than mere tool proficiency?

Methodological Approach A design-based research partnership with K-12 schools to develop and iteratively test a learning progression framework. The methodology would combine learning analytics from student interactions with educational AI tools, clinical interviews to probe conceptual understanding, and analysis of student artifacts across grade bands to identify natural developmental trajectories in understanding AI concepts like training data, bias, and agency.

Literacy Significance Current literacy efforts lack age-appropriate sequencing, often applying similar “prompt engineering” frameworks to vastly different developmental stages [19]. This research would provide the empirical foundation for standards and curricula that build genuine comprehension

[11] Evidence Architecture

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

[19] Prompt engineering as a new 21st century skill

rather than surface-level skill demonstration. It directly addresses the need for systematic approaches to AI literacy identified in reviews of the K-12 landscape [2].

Funding Alignment IES, NSF DRK-12 program, and Schmidt Futures.

Research Question How do different stakeholder groups (parents, vendors, critics) conceptualize AI literacy, and what literacy frameworks emerge when these currently excluded perspectives are centered in the design process?

Methodological Approach A participatory design research study engaging severely underrepresented groups—parents (0.14%), vendors (0.28%), and critics (0.43%)—in co-designing literacy frameworks [11]. The methodology would employ structured deliberative dialogues, concept mapping exercises, and iterative prototyping of literacy resources, with analysis focusing on how literacy definitions and priorities shift when these marginalized voices are elevated.

Literacy Significance This research confronts the profound power imbalance in current AI literacy discourse, where those most affected by AI systems have the least voice in defining what literacy means. By centering excluded perspectives, it would generate more equitable and socially robust literacy models that address real-world concerns rather than institutional priorities. The resulting frameworks would help rectify the exclusion of critical pedagogical and ethical considerations noted in analyses of current approaches [9].

Funding Alignment Ford Foundation, Robert Wood Johnson Foundation, and NSF's Science and Technology Studies program.

Research Question What is the relationship between technical understanding of AI limitations and users' appropriate reliance on AI outputs across different domains (health information, academic writing, news evaluation)?

Methodological Approach A series of experimental studies measuring participants' conceptual understanding of specific AI limitations (e.g., training data biases, hallucination tendencies) against their behavioral reliance on AI outputs in simulated decision-making tasks. The design would incorporate cognitive assessments, eye-tracking during AI interactions, and calibration exercises to measure the gap between declared understanding and practical application.

Literacy Significance This addresses the critical disconnect between knowing about AI limitations in the abstract and applying that knowledge to calibrate trust in practice. Research shows most literacy programs fail to address implementation failures [11], leaving users vulnerable to over-reliance. Understanding this relationship would inform literacy interventions that specifically target appropriate reliance, a crucial competency for domains like health education where AI is increasingly integrated [13].

Funding Alignment NIH Office of Behavioral and Social Sciences Re-

[2] AI literacy in K-12: A systematic literature review

[11] Evidence Architecture

[9] Empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA para futuros sostenibles

[11] Evidence Architecture

[13] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capability, and Assessment Design (Practice report)

search, NSF Cyber-Human Systems program.

Research Question How can AI literacy assessments validly capture the multidimensional nature of literacy—including technical, critical, ethical, and creative dimensions—without reducing it to easily testable but superficial components?

Methodological Approach An assessment validation study employing Evidence-Centered Design to develop and validate a suite of literacy measures. The methodology would include cognitive labs with diverse participants, factor analysis to establish construct validity, and criterion-related validation against real-world AI interaction outcomes. The research would specifically investigate performance-based assessments, scenario-based evaluations, and portfolio approaches.

Literacy Significance The absence of robust multidimensional assessment tools perpetuates narrow, technically-focused literacy definitions. Comprehensive assessment is essential for advancing the field beyond its current focus on prompt engineering as the primary literacy indicator [19]. Validated multidimensional assessments would enable research on which literacy components most strongly predict responsible AI use and would support the development of more balanced literacy frameworks that integrate technical competence with ethical consideration, as advocated in institutional agendas [21].

Funding Alignment NSF Education and Human Resources, European Commission Horizon Europe, and Gates Foundation.

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[21] Transformación Docente con IA: Agenda Institucional para Universidades de México y la Región

Conclusion

This report, drawing upon an analysis of 702 articles, reveals that the pursuit of AI literacy is at a critical juncture, defined by a fundamental and consequential tension. The central dynamic shaping the current landscape is the accelerating drive toward technical competency, which is systematically outpacing and marginalizing the development of critical, societal, and ethical engagement with AI. This is not a neutral evolution but a formative one that is actively constructing the future of public understanding and capacity. The fragmented definitions and competing frameworks identified in the current landscape are symptomatic of this deeper struggle over the very purpose of AI education. The trajectory of literacy development demonstrates a clear pattern where technical skills are prioritized, creating a pathway that is accessible primarily to a technically-oriented elite. This acceleration toward technical speed creates the critical gaps identified, where the perspectives, needs, and potential harms experienced by non-technical populations are systematically excluded from literacy frameworks. The ultimate implication of these interconnected patterns is the stratification of participation. The current trajectory cultivates a society divided between a small, technically-literate class empowered to shape and build AI systems, and a much larger public

relegated to being managed subjects of those systems, lacking the critical literacy necessary to question, contest, or meaningfully steer their development. For stakeholders, this presents a stark choice. Policymakers, educators, and curriculum developers must actively resist the convenient narrative that equates AI literacy with mere user proficiency or coding skills. The imperative is to recenter literacy efforts on foundational questions of power, justice, and human agency. This requires developing pedagogical frameworks and public resources that prioritize critical analysis of AI's social impacts, auditability of automated systems, and the political economies that drive AI development. Future efforts must move beyond technical training to foster a form of civic and critical literacy that enables all members of society to participate not just as consumers, but as citizens in an AI-mediated world. The unresolved challenge is whether AI literacy can be reimagined as a tool for democratic empowerment and equitable futures, or if it will ultimately serve to legitimize and entrench new forms of technological authority and social division. The evidence suggests the path we are on leads toward the latter, demanding a concerted and critical redirection.

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68. Developing prompt engineering skills in the pre-service training of foreign language educator
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72. Comment on “Online and Chatgpt-generated patient education materials regarding brain tumor prognosis fail to meet readability standards”
73. Perfil de Alfabetización en IA de la Facultad de Educación: Muestra de la Universidad de Dicle
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79. Pre-trained ChatGPT for report generation in automated microbial identification and antibiotic susceptibility testing systems
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82. THE IMPACT OF MORPHOSYNTACTIC FEATURES ON AI-GENERATED TEXTS
83. Les langues comptent. Orientations mondiales pour une éducation multilingue.
84. Uso pedagógico de la inteligencia artificial en docentes de EBR del distrito de Cajamarca, 2024
85. Navigating the role of artificial intelligence in special education: advantages, disadvantages, and ethical considerations

86. La IA y la publicidad engañosa. Desarrollo de una aplicación web para la detección de elementos engañosos en anuncios publicitarios.
87. On the Evaluation of Large Language Models in Multilingual Vulnerability Repair
88. Cultures inclusives et accompagnement d'élèves du secondaire : défis d'un Programme interdisciplinaire de citoyenneté numérique (PIC)