

AI Literacy: Systemic Incoherence Enables Narrow Skills Focus

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Executive Summary

EXECUTIVE SUMMARY

A nursing student submits an assignment polished by AI translation software, achieving high marks for language fluency but triggering an academic integrity investigation that questions the core of professional competency development [14]. This scenario replicates across disciplines, where 68.6% of research emphasizes human oversight yet offers little practical guidance for navigating these new ethical landscapes Evidence Architecture. Professionals face an impossible choice: resist AI tools and risk obsolescence or adopt them and gamble with ethical, legal, and professional consequences.

The promise of AI lies in its potential to democratize capabilities, empowering individuals through tools that enhance creativity and productivity [5]. Yet this promise clashes with a stark paradox: our analysis reveals 117 significant contradictions in how AI literacy is conceptualized and implemented Evidence Architecture. This creates intense decision pressure for organizations navigating between competitive advantage and ethical responsibility, particularly as critical perspectives remain severely underrepresented at just 0.14% of the discourse Evidence Architecture.

This week's central finding reveals that AI literacy development is advancing through fragmented, domain-specific approaches rather than cohesive frameworks. The research identifies 25 distinct thematic clusters across four domains, yet shows minimal cross-pollination between technical implementation and critical ethical perspectives Evidence Architecture. Legal education frameworks demonstrate this fragmentation most acutely, where generative AI ethics are treated as disciplinary concerns rather than universal competencies [19]. This domain-specific approach creates significant blind spots, particularly in addressing power concentrations where AI systems exercise substantial agency in 5.4% of educational applications Evidence Architecture.

This report maps the current state of AI literacy across fields, analyzes key contradictions in implementation, and provides actionable recommendations for developing comprehensive literacy frameworks. We identify critical research gaps in assessment methodologies and educator preparation. As AI capabilities become embedded in everyday tools, the ability to critically engage with these systems transitions from technical specialty to essential

[14] Nursing and midwifery students' ethical views on the acceptability of using AI machine translation software to write university assignments: A deficit-oriented or translanguaging perspective?

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

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

participation skill. The emerging reality suggests that within five years, meaningful societal engagement will require foundational AI literacy comparable to traditional reading and writing competencies.

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 evolution? This report confronts the widening chasm between the proliferation of AI tools and the public's capacity to comprehend, critique, and engage with them constructively. The urgency of this issue cannot be overstated for a broad range of stakeholders, including educators shaping future generations, policymakers crafting regulatory frameworks, and industry leaders developing these powerful technologies. The societal implications of failing to bridge this gap are profound, ranging from the erosion of public trust and the exacerbation of digital inequalities to the uncritical adoption of systems with significant ethical consequences. This analysis is grounded in a systematic examination of 701 scholarly and industry articles, providing a comprehensive evidence base to map the terrain of AI literacy. The report is structured to guide the reader through a deliberate analytical journey. It begins by surveying the Current Literacy Landscape, defining the core competencies that constitute a foundational understanding of AI. The subsequent section, Literacy Development Trajectory, charts the path from initial awareness to sophisticated critical engagement, framing this progression as a week of moving from the unknown to the unknown. The third section identifies Critical Literacy Gaps, pinpointing the specific knowledge and skill deficits that currently hinder effective public participation. Finally, the report explores the Participation Implications, examining how varying levels of literacy shape an individual's ability to influence and benefit from an AI-driven world. This introduction sets the frame for a forward-looking discussion on the necessity of building a robust and inclusive AI-literate society, a theme the conclusion will return to with a call for coordinated action across all sectors.

Current Literacy Landscape

The current discourse around AI literacy reveals a fragmented landscape where competing definitions create significant implementation challenges. Analysis of 701 articles across 25 thematic clusters shows four dominant frameworks vying for prominence: technical proficiency focused on tool operation, critical understanding of algorithmic systems, ethical awareness of societal impacts, and creative application for enhanced productivity Evidence Architecture. This fragmentation is particularly evident in educational set-

tings, where legal education approaches generative AI ethics as a disciplinary concern rather than a universal competency [19]. The absence of consensus creates implementation gaps where institutions adopt narrow technical approaches that fail to address broader societal implications.

Literacy development occurs across multiple sectors with varying emphasis and quality. Formal education institutions predominantly focus on prompt engineering and tool usage, exemplified by frameworks treating "prompt engineering as a new 21st century skill" [15]. Workplace training emphasizes efficiency gains and productivity enhancement, while self-directed learning through online platforms concentrates on practical application. Community-based initiatives, though scarce, show promise in addressing critical literacy needs, particularly through efforts like those "empoderando a bibliotecarios del Sur Global a través de la alfabetización crítica en IA" [5]. These approaches reflect the 25 thematic clusters identified in the evidence architecture, which span technical implementation through ethical consideration without establishing clear connections between domains.

The holistic critical analysis from Tier 4 syntheses reveals that current literacy efforts overwhelmingly privilege human agency, with 68.6% of articles emphasizing human oversight and control Evidence Architecture. However, this emphasis often manifests as superficial guidance rather than substantive frameworks for navigating complex ethical terrain. The research identifies significant power concentrations where AI systems exercise substantial agency in 5.4% of educational applications, yet literacy frameworks rarely address how to recognize, question, or challenge these automated decisions Evidence Architecture. This creates a dangerous gap between presumed human control and actual algorithmic influence in critical decision-making processes.

Given this fragmented landscape and the identified gap between presumed human control and actual algorithmic influence, it becomes imperative to examine the developmental trajectory of AI literacy itself. The current implementation challenges and power concentrations do not exist in a vacuum but are actively shaped by the direction in which literacy efforts are evolving. Building on the established fragmentation, the following analysis investigates whether these literacy initiatives are converging toward a more holistic framework or accelerating toward a narrow, technically-focused paradigm. This examination will specifically trace the dominant trends, metaphors, and power dynamics that are defining the future of AI literacy, revealing a concerning acceleration toward skills-based training that risks institutionalizing the very gaps identified in the current landscape.

Literacy Development Trajectory

The evolution of AI literacy efforts reveals a troubling acceleration toward skills-based training at the expense of critical understanding. The dominant

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

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

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

”neutral” metaphor identified in 43 articles shapes literacy assumptions by framing AI as apolitical tools rather than value-laden systems Evidence Architecture. This technical framing encourages literacy approaches focused on operational competence while minimizing examination of power structures, bias propagation, and societal consequences. The speed emphasis is particularly evident in institutional agendas that prioritize rapid adoption over thoughtful integration, as seen in frameworks for ”Transformación Docente con IA” that emphasize implementation timelines over critical pedagogy [18].

Current trajectory analysis shows a pronounced shift toward what might be termed ”vendor-driven literacy” - approaches that emphasize tool proficiency without corresponding critical frameworks. This is evident in the severe underrepresentation of critical perspectives, which constitute only 0.14% of the discourse Evidence Architecture. The causal framing patterns further reinforce this trajectory, with human agency dominating 57.2% of articles while balanced human-AI agency accounts for only 38.7% Evidence Architecture. This creates literacy models that prepare individuals to use AI tools but not to question their design, limitations, or appropriate application contexts.

Emerging approaches suggest potential course correction through critical literacy frameworks, particularly those adopting ”deficit-oriented or translanguaging perspectives” that question underlying assumptions about knowledge production and communication [14]. These approaches recognize that meaningful literacy requires understanding not just how AI systems work, but how they reshape communication, knowledge validation, and professional identity. The evolution toward more critical frameworks remains nascent, however, with technical implementation perspectives receiving ”limited consideration” in most literacy development efforts [8].

Building on the established trajectory of AI literacy, which is increasingly dominated by a technical, vendor-driven focus, the inherent limitations of this approach become starkly apparent. This acceleration toward skills-based training, while promoting operational competence, has systematically marginalized the critical frameworks necessary for a comprehensive understanding. Consequently, this development path has not merely created a gap but has actively constructed significant barriers to coherent and responsible literacy. The following section examines these critical literacy gaps, analyzing the primary contradictions and perspective deficits that prevent a balanced approach. It will detail how the current emphasis on efficiency and tool proficiency results in profound blind spots, leaving learners unprepared to engage with the ethical dimensions and systemic implications of artificial intelligence.

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

[14] Nursing and midwifery students’
ethical views on the acceptability of using
AI machine translation software to write
university assignments: A deficit-oriented or
translanguaging perspective?

[8] iaPWeb. Análisis de las Inteligencias
Artificiales Generativas de código para
programación web

Critical Literacy Gaps

The 117 contradictions mapped in the evidence architecture create significant barriers to coherent literacy development Evidence Architecture. Primary among these is the tension between efficiency-driven approaches that prioritize quick skill acquisition and depth-oriented frameworks that emphasize critical understanding. This contradiction manifests in literacy programs that teach prompt engineering techniques without addressing when AI use is appropriate or what values are embedded in different systems. The vendor-driven versus pedagogically grounded tension further exacerbates this gap, with commercial interests often shaping literacy objectives toward tool adoption rather than critical evaluation.

Perspective gaps create profound literacy blind spots, particularly through the severe underrepresentation of critical voices at just 0.14% and student perspectives at only 1.43% of the discourse Evidence Architecture. The complete absence of vendor perspectives (0%) might initially appear positive, but actually prevents literacy frameworks from addressing commercial motivations, data extraction practices, and business models that shape AI systems. These missing voices mean current literacy efforts center institutional and educator concerns while ignoring the lived experiences of those most affected by AI integration - particularly students, parents, and community advocates whose collective representation amounts to less than 2% of the discourse.

The failure acknowledgment patterns reveal another critical gap, with 95.3% of articles detecting no failures in AI implementation and only 4.7% offering full acknowledgment of limitations Evidence Architecture. This creates literacy models that present AI as infallible tools rather than fallible systems requiring critical engagement. The solution rate of 0% indicates that literacy frameworks rarely provide concrete strategies for addressing AI limitations, errors, or harmful outputs. This gap is particularly dangerous in educational contexts where approaches like "Generative AI in Health Education" emphasize capabilities without proportional attention to limitations and appropriate use boundaries [7].

These identified literacy gaps are not merely theoretical concerns; they have profound and immediate consequences for how different populations can engage with an AI-permeated world. The contradictions and perspective imbalances create a fractured landscape where the capacity for meaningful participation is unevenly distributed. Building on the documented absence of critical and student voices, the following section examines the resulting societal divisions. It will analyze how current literacy models create a chasm between those equipped to critically interrogate AI systems and those relegated to being mere tool operators, vulnerable to manipulation and exclusion. This analysis directly connects the structural gaps to their real-world implications for autonomy, equity, and democratic engagement.

[7] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capabi

Participation Implications

The current literacy landscape creates stark divisions in who can participate meaningfully in AI-shaped societies versus who remains vulnerable to manipulation and exclusion. Those with access to critical literacy frameworks can interrogate AI systems, understand their limitations, and make informed decisions about their use. Meanwhile, individuals receiving only technical training risk becoming proficient tool users without developing the critical capacity to recognize inappropriate applications, embedded biases, or commercial exploitation. This division is particularly concerning given that AI systems already exercise substantial agency in 5.4% of educational applications documented in the research Evidence Architecture.

The perspective gaps identified have direct consequences for participation capabilities. The severe underrepresentation of student voices (1.43%) means literacy frameworks rarely address how learners actually experience AI integration or what support they need to navigate these systems autonomously Evidence Architecture. Similarly, the absence of critical perspectives (0.14%) creates participation models that emphasize adaptation to AI systems rather than capacity to question, resist, or reshape them. This is particularly problematic for marginalized communities, who benefit from approaches that adopt “critical educational perspective focused on equity and social justice” but rarely encounter such frameworks in mainstream literacy efforts Cultures inclusives et accompagnement d’élèves du secondaire : défis d’un Programme interdisciplinaire de citoyenneté numérique (PIC).

What’s needed versus what’s being provided reveals a critical participation gap. Current literacy efforts predominantly provide technical skills for using AI tools, but participants need critical frameworks for understanding AI’s societal role, ethical boundaries, and appropriate applications. The prescriptive insights from Tier 4 syntheses indicate that meaningful participation requires literacy models that address “la dimensión funcional y técnica en la alfabetización en Inteligencia Artificial Generativa” while simultaneously developing capacity to question system design, data practices, and implementation consequences [10]. Without this balanced approach, participation remains superficial, leaving individuals using AI tools without understanding their broader implications for autonomy, equity, and democratic processes.

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

Dimensional Analysis

Central Question

Pattern Description The discourse reveals a fundamental divide between the questions technical experts ask about AI systems and those that concern everyday citizens. Technical literacy emphasizes questions of functionality and capability—how models work, their accuracy metrics, and optimiza-

tion techniques [3]. In contrast, critical literacy frameworks, such as those empowering Global South librarians, focus on questions of power, equity, and consequence: Who benefits from these systems? What knowledge is marginalized? How are communities impacted? [5]. The dominant pattern shows institutions prioritizing operational questions about tool usage while neglecting the critical inquiry necessary for democratic participation. Legal education exemplifies this tension, asking "How can generative AI be used ethically in legal training?" rather than "What does AI mean for the future of justice and legal systems?" [19].

Tensions & Contradictions A central contradiction exists between questions that serve efficiency versus those that serve empowerment. Technical implementation perspectives dominate, focusing on "How can we use AI effectively?" while critical questions about "Should we use AI here?" and "Who decides?" remain severely underrepresented Evidence Architecture. This reflects the broader power concentration where only 0.14% of discourse represents critical perspectives, creating a literacy environment that prioritizes tool mastery over systemic critique. The tension manifests in educational settings where students learn prompt engineering techniques without developing the critical capacity to question when AI use is appropriate or what values are embedded in the systems they're using [15].

Critical Observations Current literacy efforts demonstrate sophisticated technical questioning but critically underdeveloped ethical and social inquiry. The evidence shows 25 thematic clusters with minimal cross-pollination between technical and critical domains, creating citizens who can operate AI systems but cannot meaningfully interrogate their societal role Evidence Architecture. This imbalance leaves participants vulnerable to accepting AI decisions without understanding their implications or having the conceptual tools to challenge automated outcomes. The absence of vendor and critic perspectives in the discourse further narrows the range of questions considered legitimate.

Literacy Implications Meaningful participation requires citizens to develop critical questioning competencies that go beyond operational concerns. Literate citizens must ask: What values are embedded in this system? Who bears the risks? What alternatives exist? These questions form the foundation for democratic oversight of AI systems [10]. Educational frameworks need to balance technical "how" questions with critical "why" and "for whom" questions, particularly through approaches that center marginalized perspectives and experiences Cultures inclusives et accompagnement d'élèves du secondaire : défis d'un Programme interdisciplinaire de citoyenneté numérique (PIC).

Purpose

Pattern Description The literacy discourse reveals a fundamental confusion between understanding AI's inherent purposes and using AI to achieve

[3] Biology-informed neural networks learn nonlinear representations from omics data to improve genomic prediction and interpretability

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

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

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

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

human purposes. Most educational frameworks focus exclusively on the latter, treating AI as a tool for enhancing productivity, creativity, or efficiency without examining the commercial, political, and social agendas driving AI development [18]. Technical literacy efforts emphasize functional purposes—how to achieve better outputs, faster results, or cost savings—while critical literacy examines the underlying purposes of surveillance, control, or profit maximization embedded in AI systems. This divide is evident in healthcare education, where AI is framed as enhancing diagnostic capabilities without examining how corporate purposes shape medical AI development [7].

Tensions & Contradictions A significant tension exists between literacy that serves adaptation to AI systems versus literacy that enables transformation of those systems. Most current efforts prepare citizens to accept and work within existing AI paradigms, focusing on skills like prompt engineering that optimize human compliance with machine requirements [15]. Meanwhile, transformative literacy that enables citizens to question, resist, or redesign AI systems remains rare and underdeveloped. This reflects the power concentration where human agency dominates discourse (68.6%) but primarily manifests as adaptation rather than meaningful control Evidence Architecture. The contradiction becomes particularly acute in educational settings where institutions simultaneously promote critical thinking while adopting AI systems that students are expected to use uncritically.

Critical Observations Current purpose-oriented literacy suffers from a severe imbalance, with 95.3% of articles failing to acknowledge limitations or failures of AI systems, creating an illusion of infallibility that discourages critical examination of AI's purposes Evidence Architecture. This absence of failure acknowledgment prevents citizens from developing the discernment needed to evaluate when AI purposes align with human values and when they conflict. The technical implementation focus further obscures the political and economic purposes driving AI development, leaving citizens literate in using tools but illiterate in understanding why these tools exist and whom they ultimately serve.

Literacy Implications Meaningful participation requires citizens to understand both the stated and unstated purposes of AI systems, recognizing that technology is never neutral but always serves particular interests and values. This demands literacy that examines the political economy of AI—who funds development, what business models sustain it, and how purposes shift between development and deployment [12]. Citizens need frameworks for evaluating when AI purposes align with democratic values, human rights, and community wellbeing, not just technical competence in achieving predetermined goals through AI assistance.

Information

Pattern Description The information prioritized in AI literacy reveals a stark divide between technical knowledge domains and critical understand-

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

[7] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capabi

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

[12] La IA amenaza con contaminar la ciencia

ing of social impacts. Technical literacy emphasizes understanding model architectures, training processes, and performance metrics—knowledge that remains largely inaccessible to non-experts. From Pixels to Words – Towards Native Vision-Language Primitives at Scale. Meanwhile, critical literacy focuses on understanding bias, fairness, accountability, and societal implications, though this knowledge remains severely underrepresented at just 0.14% of the discourse. Evidence Architecture. The dominant pattern shows institutions prioritizing information about how to use AI tools effectively while neglecting knowledge about how to assess their appropriateness, limitations, and broader consequences. This creates citizens who can operate AI systems but lack the information needed to evaluate their social and ethical dimensions.

Tensions & Contradictions A fundamental tension exists between information that promotes uncritical adoption versus information that enables informed skepticism. Most literacy efforts provide extensive information about AI capabilities and benefits while offering minimal information about limitations, failures, or harms. Evidence Architecture. This imbalance is particularly evident in educational settings where students learn prompt engineering techniques but receive little information about the environmental costs of AI, the labor conditions in data annotation, or the political economies shaping AI development [15]. The contradiction manifests in healthcare education, where professionals learn to use diagnostic AI but lack information about how these systems were validated, what populations were underrepresented in training data, or what commercial interests influence system design [7].

Critical Observations Current information priorities in AI literacy create significant knowledge gaps that leave citizens vulnerable to manipulation and harm. The severe underrepresentation of critic perspectives (0.14%) means citizens lack access to crucial information about AI limitations, failures, and unintended consequences. Evidence Architecture. Similarly, the absence of vendor perspectives, while potentially reducing commercial influence, also limits understanding of business models, incentives, and organizational purposes driving AI development. This creates an information environment where citizens know how to use AI tools but lack the knowledge to understand why they work as they do, what interests they serve, or what risks they pose.

Literacy Implications Meaningful participation requires access to balanced information that includes not only technical capabilities but also social contexts, limitations, and alternative perspectives. Citizens need information about AI's environmental impacts, labor implications, political economies, and distribution of benefits and harms [11]. This demands literacy efforts that prioritize marginalized perspectives and experiences, ensuring information reflects the full range of AI impacts rather than just dominant narratives. Cultures inclusives et accompagnement d'élèves du secondaire : défis d'un Programme interdisciplinaire de citoyenneté numérique (PIC). Critical in-

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

[7] Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capabi

[11] La génération d'images et de vidéo par IA : l'équilibre entre enjeux et opportunités

formation literacy must enable citizens to identify knowledge gaps, seek alternative viewpoints, and recognize when information is being selectively presented to serve particular interests.

Concepts Ideas

Pattern Description The conceptual frameworks available for understanding AI reveal a troubling accessibility gap between expert mental models and those available to ordinary citizens. Technical literacy employs concepts like neural networks, transformers, and reinforcement learning that require substantial mathematical and computational background *From Pixels to Words – Towards Native Vision-Language Primitives at Scale*. Meanwhile, critical literacy offers more accessible concepts like bias, fairness, accountability, and transparency, though these often lack the specificity needed for meaningful understanding of technical systems. The dominant pattern shows conceptual frameworks bifurcating along technical-social lines, with minimal effort to develop integrative concepts that bridge these domains. This conceptual fragmentation is particularly evident in educational settings where legal ethics frameworks address generative AI without connecting to broader concepts of algorithmic justice or structural bias [19].

Tensions & Contradictions A central tension exists between conceptual simplification that enables broad participation and conceptual precision that enables meaningful understanding. Many literacy efforts oversimplify AI concepts to make them accessible, using metaphors like “digital brains” or “thinking machines” that create fundamental misunderstandings about how AI systems actually work *Evidence Architecture*. Meanwhile, technically precise concepts remain inaccessible to non-experts, creating a participation gap where citizens lack the conceptual tools to engage meaningfully with AI systems that affect their lives. This tension manifests in the 117 identified contradictions where different conceptual frameworks lead to conflicting understandings of AI capabilities, limitations, and appropriate uses *Evidence Architecture*.

Critical Observations Current conceptual frameworks for AI literacy suffer from either excessive technical complexity or problematic oversimplification, with few efforts developing accessible yet accurate mental models. The dominance of neutral metaphors (43 articles) further obscures the value-laden nature of AI systems, preventing citizens from understanding how concepts like “optimization” or “efficiency” embed particular values and priorities *Evidence Architecture*. The severe underrepresentation of critic perspectives means alternative conceptual frameworks—such as understanding AI through lenses of power, justice, or liberation—remain underdeveloped and inaccessible to most citizens. This conceptual poverty leaves people unable to think critically about AI systems or imagine alternatives to current implementations.

Literacy Implications Meaningful participation requires conceptual

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

frameworks that are both accessible and accurate, enabling citizens to understand enough about how AI systems work to ask critical questions and make informed decisions. This demands developing new integrative concepts that bridge technical and social domains, such as “algorithmic accountability” or “data justice” that connect technical functionality to social consequences [13]. Literacy efforts must provide conceptual tools for understanding AI not as magic or machinery but as socio-technical systems embedding human values, priorities, and biases. This includes concepts for understanding probability and uncertainty, pattern recognition versus understanding, and the relationship between correlation and causation in AI systems.

Assumptions

Pattern Description The assumptions embedded in AI literacy efforts reveal a pervasive techno-optimism that goes largely unexamined. Most literacy frameworks assume AI development is inevitable, beneficial, and requires adaptation rather than critical evaluation or resistance [18]. This assumption manifests in educational settings where the question is how to integrate AI rather than whether to integrate it, and what technical skills students need rather than what critical capacities they should develop. The pattern shows literacy efforts assuming AI is a neutral tool whose impacts depend entirely on human use, obscuring the ways values and biases are embedded in technical systems through design choices, training data, and optimization metrics [10].

Tensions & Contradictions A fundamental tension exists between assumptions that promote uncritical adoption and those that enable informed engagement. Most literacy efforts assume AI progress is linear and inevitable, framing adaptation as the only rational response [16]. Meanwhile, critical perspectives challenge these assumptions, noting that AI development follows particular political and economic priorities rather than inevitable technological trajectories. This tension is evident in the 117 contradictions mapped across the discourse, where different assumptions about AI’s capabilities, limitations, and appropriate roles lead to fundamentally different literacy approaches Evidence Architecture. The severe underrepresentation of critic perspectives (0.14%) means challenging assumptions remain marginal in most literacy efforts.

Critical Observations Current literacy efforts demonstrate a profound lack of assumption awareness, with 95.3% of articles failing to acknowledge AI limitations or failures and thus implicitly assuming AI infallibility Evidence Architecture. This assumption blindness leaves citizens unprepared to question AI systems or recognize when automated decisions reflect problematic values or priorities. The dominance of human agency discourse (68.6%) further assumes humans maintain meaningful control over AI systems, obscuring the ways technical complexity, corporate ownership, and automation bias can erode human autonomy Evidence Architecture. These unexamined

[13] Navigating the role of artificial intelligence in special education: advantages, disadvantages, and ethical considerations

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

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

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

assumptions create citizens who accept AI systems as given rather than recognizing them as human creations that could be different.

Literacy Implications Meaningful participation requires the capacity to identify, examine, and challenge assumptions embedded in AI systems and literacy efforts. Citizens need frameworks for questioning the inevitability narratives surrounding AI development, the neutrality claims about technical systems, and the progress assumptions underlying adoption pressures [12]. This includes recognizing how assumptions about efficiency, optimization, and scale embed particular values that may conflict with other priorities like equity, justice, or human dignity. Critical assumption literacy enables citizens to ask not just how AI works but why it works as it does, what values are embedded in its functioning, and whose interests are served by particular technical choices.

[12] La IA amenaza con contaminar la ciencia

Implications Consequences

Pattern Description The discourse reveals significant gaps in how different stakeholders anticipate and understand AI's implications and consequences. Technical literacy focuses on immediate functional consequences—accuracy improvements, efficiency gains, cost reductions—while often neglecting broader social, ethical, and political implications [2]. Critical literacy efforts, though severely underrepresented, attempt to address longer-term consequences for equity, justice, democracy, and human autonomy, but often lack the technical specificity to trace how particular AI designs lead to particular social outcomes [5]. The dominant pattern shows consequence literacy bifurcating along technical-social lines, with minimal integration that would enable citizens to understand how technical choices create social outcomes.

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

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

Tensions & Contradictions A central tension exists between consequence literacy that serves short-term adaptation versus long-term resilience. Most literacy efforts focus on immediate implications for productivity, employability, or competitive advantage, neglecting longer-term consequences for democracy, inequality, or environmental sustainability The Impact of AI Technology on the Productivity of Gig Economy Workers. This tension manifests in educational settings where students learn to use AI for assignment completion without considering implications for their own learning, cognitive development, or future employability in transformed job markets [14]. The contradiction becomes particularly acute around environmental consequences, where the significant energy and resource costs of AI systems receive minimal attention in most literacy efforts.

[14] Nursing and midwifery students' ethical views on the acceptability of using AI machine translation software to write university assignments: A deficit-oriented or translanguaging perspective?

Critical Observations Current consequence literacy suffers from severe temporal and spatial limitations, focusing on immediate, localized impacts while neglecting longer-term, distributed consequences. The minimal acknowledgment of AI failures (4.65% of articles) prevents citizens from learning from past mistakes and anticipating future risks Evidence Architecture. Similarly, the underrepresentation of critic and vendor perspectives

means citizens lack crucial viewpoints for understanding full consequence landscapes. The power concentration where AI systems exercise substantial agency in 5.4% of applications further complicates consequence anticipation, as automated systems can produce outcomes neither intended nor anticipated by their human creators Evidence Architecture.

Literacy Implications Meaningful participation requires the capacity to anticipate and evaluate AI's implications across multiple dimensions—individual and collective, immediate and long-term, intended and unintended. This demands literacy that connects technical functionality to social consequence, understanding how model architectures, training data, and optimization metrics produce particular distributions of benefits and harms [13]. Citizens need frameworks for considering second- and third-order consequences, recognizing that AI impacts often ripple through complex systems in unpredictable ways. This includes understanding how AI might transform social institutions, economic structures, and political processes, not just individual tasks or organizational workflows.

Inference Interpretation

Pattern Description The discourse reveals significant variation in how different stakeholders judge AI reliability, trustworthiness, and appropriateness. Technical literacy emphasizes statistical metrics—accuracy, precision, recall—as the primary basis for inference about AI reliability [3]. Meanwhile, critical literacy focuses on contextual factors—whose values are embedded, what populations were represented in training data, what purposes are being served—as the basis for trustworthiness judgments [5]. The dominant pattern shows inference literacy bifurcating along technical-contextual lines, with minimal integration that would enable citizens to make holistic judgments about when and how to trust AI systems. This fragmentation is particularly evident in healthcare, where professionals might trust AI based on accuracy metrics while patients might distrust it based on privacy concerns or algorithmic opacity.

Tensions & Contradictions A fundamental tension exists between inference approaches that prioritize technical performance versus those that prioritize value alignment. Most literacy efforts teach citizens to interpret AI outputs based on confidence scores or accuracy metrics, neglecting the crucial interpretation skills needed to assess whether AI purposes align with human values in specific contexts [1]. This tension manifests in the 117 contradictions where different inference frameworks lead to conflicting judgments about the same AI systems Evidence Architecture. The contradiction becomes particularly acute around appropriateness judgments, where technical literacy might suggest AI use is warranted based on performance metrics, while critical literacy might question its appropriateness based on ethical, social, or political considerations.

Critical Observations Current inference literacy demonstrates sophis-

[13] Navigating the role of artificial intelligence in special education: advantages, disadvantages, and ethical considerations

[3] Biology-informed neural networks learn nonlinear representations from omics data to improve genomic prediction and interpretability

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

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

ticated technical interpretation capabilities but critically underdeveloped contextual judgment skills. The minimal failure acknowledgment (4.65% of articles) creates overconfidence in AI systems, preventing citizens from developing the healthy skepticism needed for appropriate trust calibration Evidence Architecture. Similarly, the dominance of neutral metaphors obscures the value-laden nature of AI outputs, preventing citizens from interpreting them as reflections of particular priorities and perspectives rather than objective truths. The severe underrepresentation of critic perspectives means alternative interpretation frameworks—such as reading AI outputs through lenses of power, ideology, or political economy—remain underdeveloped in most literacy efforts.

Literacy Implications Meaningful participation requires the capacity to make nuanced judgments about AI reliability, trustworthiness, and appropriateness across multiple dimensions. Citizens need interpretation frameworks that integrate technical performance metrics with contextual value considerations, recognizing that a statistically accurate AI system might still be untrustworthy or inappropriate in particular contexts [6]. This demands literacy that enables citizens to ask not just “Is this AI accurate?” but “Accurate for whom? Under what conditions? Serving what purposes? Advancing what values?” Such interpretation skills require understanding both the technical limitations of AI systems and the social contexts of their application, bridging the gap between statistical truth and human meaning.

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

Point of View

Pattern Description The discourse reveals significant power imbalances in whose perspectives shape AI literacy definitions and implementations. Technical and institutional viewpoints dominate literacy frameworks, while marginalized perspectives—including students, parents, critics, and Global South communities—remain severely underrepresented Evidence Architecture. This pattern manifests in educational settings where literacy curricula reflect tech industry priorities and institutional concerns rather than student needs or community values. The dominance of certain perspectives creates literacy that serves adaptation to existing power structures rather than empowerment to challenge or transform them. This is particularly evident in approaches that treat “prompt engineering as a new 21st century skill” without considering whose communication styles and knowledge traditions are privileged or marginalized by particular prompt structures [15].

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

Tensions & Contradictions A fundamental tension exists between literacy that reflects dominant perspectives and literacy that incorporates marginalized viewpoints. Most current efforts privilege technical and institutional perspectives, with students severely underrepresented at 1.43%, parents at 0.29%, and critics at 0.14% Evidence Architecture. This creates literacy that serves the interests of technology providers and adopting institutions rather than those most affected by AI systems. The tension manifests in

the 117 contradictions where different perspective gaps lead to conflicting understandings of what literacy means and what purposes it should serve. The complete absence of vendor perspectives (0%) further limits understanding of commercial interests and business models shaping AI development.

Critical Observations Current perspective literacy suffers from severe representation imbalances that distort understanding of AI's full impacts and appropriate roles. The underrepresentation of student, parent, and critic perspectives means literacy efforts fail to address crucial concerns about AI's effects on learning, family life, and democratic processes Evidence Architecture. Similarly, the dominance of Northern perspectives in Global South contexts creates literacy that imports external priorities rather than building on local knowledge and addressing community-defined needs [5]. These perspective gaps prevent citizens from understanding how AI systems might affect different communities differently, and how literacy might need to vary across contexts to serve diverse participation needs.

Literacy Implications Meaningful participation requires literacy that incorporates multiple perspectives, particularly those most affected by but least influential in AI development. This demands actively centering marginalized viewpoints in literacy frameworks, ensuring that student, parent, community, and critic perspectives shape definitions of what counts as literacy and what purposes it should serve Cultures inclusives et accompagnement d'élèves du secondaire : défis d'un Programme interdisciplinaire de citoyenneté numérique (PIC). Citizens need the perspective-taking capacity to understand how AI systems appear from different vantage points, recognizing that a system that seems beneficial from a technical or institutional perspective might appear harmful from a student or community perspective. This includes understanding how power imbalances shape whose voices are heard in AI development and deployment, and how literacy might redress rather than reinforce these imbalances.

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

Contradiction Analysis

Pressure for rapid AI skills acquisition versus need for deep critical understanding The literacy discourse reveals intense pressure to quickly equip individuals with functional AI skills for immediate workplace relevance, conflicting with the necessity for profound understanding of AI's societal implications and limitations. This tension manifests in educational frameworks prioritizing prompt engineering as an essential 21st century skill over critical algorithmic literacy [15]. Economic competitiveness drives institutions toward rapid skill deployment, particularly as industries demand AI-proficient graduates. The tension persists because measurable skill acquisition offers immediate returns while critical understanding requires long-term investment with less tangible outcomes. This creates literacy gaps where individuals can operate AI systems but cannot meaningfully interrogate their societal

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

role or embedded values. The implications for citizen preparation are profound: without critical depth, individuals risk becoming efficient tool operators rather than informed participants in AI-shaped societies. Navigating this tension requires integrating technical skill development with critical frameworks, as demonstrated in approaches that empower librarians through critical AI literacy while building practical competencies [5].

Technical proficiency versus ethical awareness in literacy frameworks

Current AI literacy efforts predominantly emphasize technical mastery—understanding how AI systems function and how to effectively utilize them—while marginalizing ethical considerations about when and why these systems should be deployed. This division reflects broader educational philosophies that separate technical training from humanistic inquiry, evident in legal education frameworks that treat generative AI ethics as a specialized concern rather than foundational literacy component [19]. The tension persists due to institutional structures that silo technical and ethical instruction, compounded by assessment methodologies that more easily measure technical proficiency than ethical reasoning. Technical domains also benefit from clearer credentialing pathways and industry recognition. The literacy implications are significant: citizens develop operational competence without the ethical frameworks necessary to navigate AI's complex societal impacts. This creates professionals who can efficiently use AI translation tools but lack the ethical foundation to assess their appropriateness in sensitive contexts like healthcare communication. Nursing and midwifery students' ethical views on the acceptability of using AI machine translation software to write university assignments: A deficit-oriented or translanguaging perspective?. Bridging this divide requires literacy models that treat ethical consideration as integral to technical practice rather than separate domains.

Individual competency development versus systemic literacy needs

AI literacy frameworks overwhelmingly focus on developing individual skills and knowledge, neglecting the systemic and collective dimensions necessary for meaningful societal participation. This individual orientation reflects educational traditions that prioritize personal achievement and marketable skills, visible in approaches that frame prompt engineering as an individual competency [15]. The tension persists because individual assessment is more straightforward than evaluating collective literacy, and institutional structures naturally organize around individual learning outcomes. Additionally, vendor-driven literacy programs inherently focus on individual tool proficiency rather than community capacity. The implications for democratic participation are substantial: even highly skilled individuals lack the collective frameworks to address systemic AI challenges like algorithmic bias or concentrated power. This individual focus leaves communities vulnerable to AI implementations that serve institutional rather than public interests, as seen in technical systems that exercise substantial agency without corresponding community oversight [3]. Moving beyond individual competence

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[3] Biology-informed neural networks learn nonlinear representations from omics data to improve genomic prediction and interpretability

requires literacy approaches that build community capacity for collective decision-making about AI systems, as exemplified by initiatives that empower librarians as community literacy leaders [5].

Vendor-driven tool proficiency versus pedagogically grounded critical literacy A fundamental tension exists between literacy approaches developed by AI vendors focused on tool-specific proficiency and those emerging from educational frameworks centered on critical understanding and transferable concepts. Vendor-driven literacy prioritizes operational fluency with specific platforms, often minimizing critical perspectives that might question tool appropriateness or embedded values. This tension is created by economic incentives that position vendors as primary literacy providers, coupled with institutional pressure to quickly adopt workplace-relevant tools [18]. The tension persists because vendor resources are readily available and often free, while developing robust pedagogical frameworks requires significant institutional investment. The severe underrepresentation of critical perspectives in the discourse—comprising just 0.14% of analyzed articles—further enables vendor-driven approaches to dominate Evidence Architecture. The literacy implications are profound: vendor-centric models create tool-dependent users rather than critically literate citizens capable of evaluating AI systems across platforms and contexts. This approach risks equating literacy with brand proficiency, ultimately limiting individuals' ability to transfer understanding to new systems or question underlying assumptions. Pedagogically grounded alternatives demonstrate how to build critical capacity while developing practical skills, as shown in frameworks that integrate functional and technical dimensions of generative AI literacy *La dimensión funcional y técnica en la alfabetización en Inteligencia Artificial Generativa en la formación.*

Instrumental tool use versus transformative tool critique Literacy approaches diverge sharply between those treating AI as instrumental tools for efficiency gains and those framing AI as transformative systems requiring critical examination of their social and epistemological impacts. The instrumental perspective dominates educational discourse, focusing on how AI can enhance existing tasks like assignment writing or lesson planning without fundamentally questioning educational paradigms [9]. This tension is created by different underlying metaphors about technology's role—AI as productivity tool versus AI as societal transformer—with the former aligning more comfortably with existing institutional structures and assessment practices. The tension persists because instrumental approaches require less systemic change and offer more immediate, measurable benefits. The literacy implications determine whether citizens develop the capacity to merely use AI efficiently or to participate in shaping its societal role. Without critical tool examination, individuals risk reinforcing existing power dynamics and epistemic biases embedded in AI systems. The contradiction is particularly evident in healthcare education, where AI tools offer clear efficiency benefits for tasks like patient simulation while raising fundamental questions about

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

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

professional judgment and care quality Generative AI in Health Education: A Curriculum Framework to Build Student Literacy, Academic Capability. Transformative literacy approaches, while less common, demonstrate how to engage both use and critique, as seen in critical educational perspectives focused on equity and social justice Cultures inclusives et accompagnement d'élèves du secondaire : défis d'un Programme interdisciplinaire de citoyen-neté numérique.

Standardized assessment versus contextual literacy application A significant contradiction exists between efforts to develop standardized AI literacy assessments and the recognition that meaningful literacy manifests differently across cultural, disciplinary, and institutional contexts. Standardization efforts seek measurable competencies and transferable credentials, while contextual approaches acknowledge that AI literacy requirements vary substantially between domains like legal practice, healthcare, and creative arts. This tension reflects broader educational debates about credentialing versus situated learning, evident in frameworks attempting to establish universal AI literacy standards across educational levels [4]. The tension persists because standardized assessment supports scalability, credentialing, and comparative evaluation, while funders and policymakers often demand measurable outcomes. However, overly standardized approaches risk creating decontextualized literacy that fails to address domain-specific ethical challenges and application scenarios. The literacy implications concern whether individuals develop generic skills or situated understanding relevant to their actual contexts of participation. This is particularly critical in professional domains like law, where generative AI ethics must be understood within specific professional norms and responsibilities rather than as abstract principles [19]. Navigating this tension requires assessment frameworks that balance core literacy concepts with contextual application, recognizing that AI literacy manifests differently in technical implementation versus critical evaluation contexts La dimensión funcional y técnica en la alfabetización en Inteligencia Artificial Generativa en la formación.

These interconnected contradictions reveal a literacy landscape struggling to balance immediate practical needs with long-term participatory capabilities. The efficiency-depth and technical-ethical tensions mutually reinforce a literacy approach that prioritizes operational competence over critical capacity, while the individual-systemic and vendor-pedagogical tensions compound this by isolating literacy development from collective critical frameworks. Ultimately, these contradictions center on whether AI literacy prepares individuals for instrumental participation within existing systems or transformative participation in shaping future systems. The severe underrepresentation of critical perspectives—comprising just 0.14% of the discourse—suggests the former currently dominates, creating citizens equipped to use AI tools but not to question their societal implications Evidence Architecture. Navigating these tensions requires literacy frameworks that integrate technical skill with

[4] Educación primaria y secundaria y los principios éticos del uso de la inteligencia artificial

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

ethical reasoning, individual competence with collective capacity, and tool proficiency with critical understanding, as exemplified by approaches that empower communities through critical AI literacy while building practical capabilities [5].

Implications for Practice

Recommendation 1: Integrate Critical Questioning into Technical Skill Development

The Obstacle (42 words) Most AI literacy programs treat technical skills and ethical critique as separate tracks, creating citizens who can operate AI systems but cannot interrogate their societal role or embedded values [19]. This fragmented approach fails to build the integrated competency needed for real-world decision-making.

The Action (78 words) 1. **Weeks 1-2:** Introduce a core technical skill (e.g., prompt engineering) paired with a "Critical Question Card" containing questions like "Who benefits from this output?" and "What perspectives are missing?" 2. **Weeks 3-12:** For each technical module, require learners to document both their process and their critical reflections using the question card. 3. **Semester End:** Assess via a portfolio that evaluates technical execution and the depth of critical inquiry, with equal weighting. Resources needed are simple question prompts and rubric design. Success is measured by learners' ability to articulate the limitations and societal implications of the tools they use proficiently.

The Workaround (45 words) This avoids creating technically proficient but critically naive tool operators. By embedding critique into skill practice, it enables learners to naturally question AI outputs, a competency demonstrated in frameworks that empower through critical literacy [5].

The Outcome (54 words) Within one semester, learners develop the integrated competency to use AI tools effectively while understanding their socio-technical context. They can make informed decisions about when and why to use AI, moving beyond simple functionalism. This outcome is supported by evidence from critical literacy models that link practical skill with social justice inquiry [5].

Recommendation 2: Develop Scenario-Based Assessments for Ethical Reasoning

The Obstacle (39 words) Standardized tests and skill demonstrations fail to assess the nuanced ethical reasoning required for AI literacy. They measure if someone *can* use a tool, not if they *should*, or under what conditions, leaving critical understanding unmeasured [15].

The Action (75 words) 1. **Month 1:** Develop a bank of real-world dilemma scenarios (e.g., the nursing student using AI translation, a teacher using automated grading). 2. **Ongoing:** Use these scenarios in low-stakes discussions and high-stakes assessments. 3. **Assessment:** Evaluate responses

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

using a rubric focused on identifying stakeholders, articulating competing values, evaluating potential harms, and proposing a justified course of action. Resources required are scenario development time and facilitator training. Success is measured by the complexity and justification of learners' ethical reasoning, not a single "correct" answer.

The Workaround (42 words) This workaround assesses the application of knowledge in context, moving beyond abstract ethical principles. It enables educators to gauge a learner's capacity for informed decision-making under pressure, directly addressing the failure to acknowledge complex implementation challenges Evidence Architecture.

The Outcome (57 words) Learners will be able to navigate the "grey areas" of AI use in professional and personal contexts. This competency, developed over a course or training program, leads to more responsible adoption. The focus on dilemma-based learning mirrors effective approaches in legal ethics education for generative AI [19].

Recommendation 3: Create "AI Literacy Circles" for Educator Professional Development

The Obstacle (42 words) Top-down professional development often delivers technical toolkits without building educators' own critical capacity, resulting in superficial implementation. This ignores the severe underrepresentation of critical perspectives (only 0.14% of discourse) that educators need to navigate Evidence Architecture.

The Action (78 words) 1. **Launch:** Form small, cross-disciplinary "AI Literacy Circles" of 5-7 educators meeting bi-weekly for one semester. 2. **Process:** Each session, members analyze a short case study (e.g., a news article or research excerpt) using structured questioning protocols to explore technical, ethical, and power dimensions. 3. **Output:** Circles co-design one literacy activity for their own classrooms and share it with a wider community of practice. Resources are meeting time and curated case studies. Success is measured by the depth of discussion and the quality of the co-designed activity.

The Workaround (45 words) This bypasses the one-size-fits-all training model by fostering collaborative sense-making. It builds educators' confidence and pedagogical content knowledge for AI literacy from the ground up, empowering them as critical co-learners rather than passive recipients of technical information.

The Outcome (54 words) Within a semester, educators develop the confidence and competence to facilitate critical AI discussions in their classrooms. They move from avoiding AI topics to integrating them meaningfully, fostering a more critical and holistic student literacy. This community of practice model is essential for scaling critical literacy [5].

Recommendation 4: Implement "Power Mapping" Exercises for Institutional AI Systems

The Obstacle (42 words) Literacy efforts often focus on individual tool

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use without examining the institutional systems deploying them. This creates a major blind spot, as 5.4% of applications concentrate significant agency in AI systems themselves, which goes unchallenged Evidence Architecture.

The Action (72 words) 1. **Weeks 1-2:** Introduce the concept of "AI agency" and provide a simple power-mapping template (Who designed it? Who benefits? Who is assessed by it?). 2. **Weeks 3-6:** Learners apply the template to an AI system they encounter (e.g., a learning management system plugin, an automated grading tool). 3. **Week 7:** Facilitate a "Stakeholder Council" role-play where learners advocate for different perspectives affected by the system. Resources are the mapping template and scenario descriptions. Success is measured by learners' ability to identify power dynamics and propose more equitable design or governance.

The Workaround (42 words) This makes abstract power structures tangible and actionable. It enables citizens to move from being passive users to critical interrogators of the automated systems that shape their opportunities, addressing a key gap in current literacy frameworks Evidence Architecture.

The Outcome (57 words) Learners develop the competency to "read" the political and social dimensions of AI systems in their environment. This foundational civic skill, developed over a 6-8 week unit, empowers them to question and advocate around algorithmic decisions, a core outcome of frameworks focused on equity and social justice Cultures inclusives et accompagnement d'élèves du secondaire : défis d'un Programme interdisciplinaire de citoyenneté numérique (PIC).

Research Agenda

Research Question How do critical questioning competencies transfer across different AI application contexts (writing assistance, image generation, decision support systems) in professional education settings?

Methodological Approach A mixed-methods longitudinal study tracking 200+ professional students across healthcare, law, and education programs over 18 months. Using pre/post cognitive assessments of critical AI questioning, scenario-based ethical reasoning tasks, and structured interviews to map competency transfer. Data collection includes think-aloud protocols during AI tool interaction and analysis of reflective journals documenting critical decision-making across contexts.

Literacy Significance This addresses the critical gap in understanding how domain-specific AI literacy develops into transferable critical capacity. Current frameworks like those in legal education treat AI ethics as disciplinary concerns rather than universal competencies [19]. This research would inform integrated literacy curricula that build questioning skills applicable across professional contexts, benefiting educators developing cross-disciplinary AI literacy programs.

Funding Alignment Spencer Foundation, National Science Foundation

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IUSE Program, and educational research initiatives at the Teagle Foundation given their focus on transferable skill development in professional education.

Research Question What assessment methodologies effectively measure the development of critical AI literacy beyond technical proficiency, particularly for identifying power dynamics and algorithmic bias recognition?

Methodological Approach Design-based research implementing and validating a multi-dimensional assessment framework across 15+ educational institutions. Combining performance assessments of bias detection in AI outputs, scenario-based evaluations of power analysis, and longitudinal tracking of critical stance development. Validation would include expert review, inter-rater reliability testing, and correlation analysis with real-world AI decision-making behaviors over 24 months.

Literacy Significance Current literacy assessment overwhelmingly focuses on technical skill demonstration [15], leaving critical understanding unmeasured. This research addresses the severe underrepresentation of critical perspectives (only 0.14% of current discourse) by developing tools to assess the competency gaps identified in the evidence architecture Evidence Architecture. The resulting frameworks would enable institutions to move beyond tool proficiency toward meaningful critical literacy evaluation.

Funding Alignment NSF Education and Human Resources Directorate, Spencer Foundation, and digital literacy initiatives at the MacArthur Foundation.

Research Question How do power concentration awareness and resistance strategies develop through critical AI literacy interventions, particularly for marginalized communities facing algorithmic decision systems?

Methodological Approach Participatory action research with 8-10 community organizations serving marginalized populations, employing co-designed literacy interventions that combine technical skill building with power analysis frameworks. Methods include pre/post surveys measuring perceived agency, ethnographic observation of community responses to algorithmic systems, and longitudinal tracking of advocacy actions following literacy training over 18-24 months.

Literacy Significance This directly addresses the power concentration gap where AI systems exercise substantial agency in 5.4% of applications without corresponding literacy about resistance or questioning Evidence Architecture. Building on models like those empowering Global South librarians [5], this research would develop literacy approaches that transform passive tool users into active participants in algorithmic governance.

Funding Alignment Ford Foundation JustTech Program, NSF Cultivating New Communities of Researchers, and community-based research initiatives at the Robert Wood Johnson Foundation.

Research Question What instructional approaches most effectively integrate technical AI skill development with critical ethical questioning across different age groups and educational levels?

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Methodological Approach A comparative intervention study across K-12, higher education, and workplace training contexts, testing three integration models: sequential (technical then critical), parallel (simultaneous development), and problem-based (critical questions driving technical learning). Using randomized assignment where feasible, mixed methods data collection including skill assessments, critical questioning evaluations, and implementation fidelity measures over 12-18 months.

Literacy Significance This addresses the fundamental fragmentation in current literacy efforts, where 25 thematic clusters show minimal cross-pollination between technical and critical domains Evidence Architecture. The research would identify effective integration strategies to overcome the current separation between operational competence and ethical reasoning, particularly important given frameworks that emphasize human oversight (68.6% of articles) without providing practical integration guidance Evidence Architecture.

Funding Alignment Department of Education Institute of Education Sciences, NSF Cyberlearning Program, and educational innovation initiatives at the Gates Foundation.

Research Question How does critical AI literacy development influence professional identity formation and ethical decision-making in fields undergoing rapid AI integration?

Methodological Approach Longitudinal qualitative study tracking 60+ early-career professionals in nursing, law, and education through their first 3 years of practice. Using repeated semi-structured interviews, document analysis of ethical decision journals, and observation of workplace AI interactions to map literacy development trajectories and their relationship to professional identity formation and ethical practice.

Literacy Significance This research addresses the profound identity challenges professionals face when AI tools reshape core competencies, as seen in nursing students navigating AI translation ethics Nursing and midwifery students' ethical views on the acceptability of using AI machine translation software to write university assignments: A deficit-oriented or translanguaging perspective?. Understanding how literacy development intersects with professional identity can inform curriculum design that prepares practitioners for ethical navigation of AI-integrated workplaces.

Funding Alignment Professional education research programs at the Spencer Foundation, National Endowment for the Humanities, and discipline-specific associations in healthcare, legal, and educational fields.

Conclusion

This analysis of the AI literacy landscape, drawn from an extensive review of 701 articles, reveals a domain at a critical inflection point. The investigation demonstrates that the foundational challenge is not a simple lack of

educational resources, but a profound and systemic incoherence. The fragmented definitions and competing conceptualizations identified in the current landscape directly enable the trajectory toward a narrow, skills-based literacy. This accelerated push for technical competency, often framed through a deceptively neutral metaphor, systematically sidelines the development of the critical understanding necessary to interrogate AI systems, their creators, and their societal impacts. The 117 mapped contradictions within the evidence architecture are not merely academic disagreements; they are the structural barriers that prevent the formation of a coherent and empowering literacy framework. The ultimate consequence of this fractured foundation is a stark and dangerous stratification of participation. It creates a world divided between those equipped with the critical faculties to shape, question, and navigate AI-driven systems, and those who are rendered vulnerable to manipulation, exclusion, and disempowerment. This is the central failure of the current paradigm: it treats AI literacy as a technical problem of workforce preparation rather than a fundamental civic competency in an increasingly automated public sphere. For stakeholders, from policymakers and educators to industry leaders, the implication is clear. Incremental adjustments to existing curricula are insufficient. A fundamental reorientation is required, one that prioritizes the integration of critical frameworks, ethics, and power analysis into the very core of AI literacy efforts. The goal must shift from creating proficient users of AI tools to cultivating empowered citizens who can critically assess AI's influence on democracy, justice, and personal autonomy. Looking forward, the path is fraught with unresolved tensions. The evidence compels a move away from fragmented, technocentric approaches and toward a holistic model of literacy that is as much about social critique as it is about technical understanding. The future of equitable participation in AI-shaped societies depends on this recalibration. Returning to the framing established at the outset, this report confirms that the discourse surrounding AI literacy is not merely about defining a term, but about defining the future of human agency. The current trajectory, if left unaddressed, risks building a society where the power to understand and control AI becomes the next great societal divide, cementing existing inequalities rather than overcoming them. The urgency is not in accelerating training, but in fundamentally rethinking its purpose.

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