

Questioning Assumptions in the Age of AI: Extending Brookfield’s Critical Pedagogy for Workforce Learning Futures

Viktor Wang, (<https://orcid.org/0000-0001-9557-0054>),
California State University, San Bernardino, USA

Abstract

This article extends Stephen Brookfield’s concept of critical thinking as “questioning assumptions” into the context of artificial intelligence (AI)–mediated learning and workforce education. As AI systems increasingly shape how knowledge is produced and consumed, learners face new challenges in evaluating algorithmically generated information that appears authoritative and neutral. The study argues that AI amplifies, rather than reduces, the need for critical reflection by introducing hidden assumptions embedded in data, models, and outputs. Drawing on critical pedagogy, AI literacy, and workforce learning perspectives, the article proposes a framework for critical AI pedagogy that integrates reflective inquiry, dialogic learning, and ethical awareness. It further outlines practical strategies for teaching critical thinking in AI-rich environments. The article concludes that the future of learning depends on learners’ ability to interrogate both human and algorithmic assumptions, positioning critical reflection as a central competency for education and work in the age of AI.

Keywords: critical AI pedagogy; questioning assumptions; artificial intelligence in education; workforce learning; critical reflection

Introduction

The rise of artificial intelligence (AI) in education and workforce learning is transforming how knowledge is produced, accessed, and applied. Generative AI systems, learning analytics, and adaptive platforms are increasingly embedded across classrooms, training programs, and professional development environments, reshaping instructional practices and learner behavior (Holmes et al., 2022; Zawacki-Richter et al., 2019). In workforce contexts, AI is redefining required competencies, emphasizing continuous reskilling, data literacy, and adaptability as essential for navigating dynamic labor markets (World Economic Forum, 2023). As a result, learners increasingly engage with AI not only as a tool but as a primary source of knowledge and decision support.

This shift introduces a critical challenge: growing reliance on AI-generated knowledge that is often treated as authoritative and objective. While AI enhances efficiency and access to information, it may also encourage passive cognition and reduce critical engagement (Selwyn, 2019). When AI outputs are accepted without interrogation, the practice of questioning assumptions—central to critical thinking—is weakened. This raises concerns about diminished reflective judgment, as learners outsource reasoning rather than actively constructing and evaluating knowledge (Kasneji et al., 2023). In both educational and workplace settings, such tendencies may limit higher-order thinking and independent analysis.

Despite expanding research on AI in education, a significant theoretical gap remains. Much of the literature emphasizes technological capabilities and outcomes, with limited attention to how AI reshapes critical pedagogy and the role of educators in fostering reflective thinking (Williamson, 2023). Stephen Brookfield’s concept of critical thinking as “questioning assumptions” provides a powerful lens for examining how individuals challenge dominant ideologies and develop informed perspectives (Brookfield, 2012). However, this framework was developed in predominantly human-centered contexts, leaving open questions about its application in AI-mediated environments.

This article reinterprets Brookfield’s concept of questioning assumptions for AI-mediated learning, examining how assumptions evolve when knowledge is algorithmically generated and how critical reflection must adapt accordingly. By situating Brookfield’s work within contemporary AI contexts, the study extends critical pedagogy to address emerging epistemological and ethical challenges.

The contribution is threefold. First, it bridges critical pedagogy and AI by proposing a framework for sustaining critical thinking in technology-mediated environments. Second, it connects this framework to workforce learning, positioning critical reflection as a core competency in AI-driven contexts. Third, it advances critical AI pedagogy by emphasizing learning designs that promote questioning, dialogue, and reflective judgment. Ultimately, the ability to interrogate both human and algorithmic assumptions is essential for meaningful learning and effective decision-making in the age of AI.

Methodological Approach

This study adopts a conceptual and theory-building approach, integrating literature from critical pedagogy, artificial intelligence in education, and workforce learning. Rather than employing empirical methods, the analysis systematically synthesizes and extends Brookfield’s framework of questioning assumptions to AI-mediated contexts. Through conceptual integration and analytical reinterpretation, the study develops a model of critical AI pedagogy that links critical reflection, AI literacy, and workforce education.

This approach draws on established traditions of conceptual research that advance theoretical understanding through synthesis, critique, and extension of existing frameworks. By identifying gaps in current literature and reconceptualizing key constructs, the study provides a coherent framework to inform both educational practice and future empirical research.

Brookfield’s Critical Pedagogy: Core Concepts

Stephen Brookfield’s critical pedagogy has been highly influential in adult education, particularly in framing critical thinking as the process of uncovering and interrogating assumptions. Central to his work is the concept of “hunting assumptions,” a deliberate effort to identify taken-for-granted beliefs that shape how individuals interpret experiences and make decisions (Brookfield, 2012). These assumptions often remain invisible because they are embedded in cultural norms, prior experiences, and institutional practices. Making them explicit

enables learners to examine their validity, consider alternative perspectives, and develop more reflective understandings.

Brookfield identifies three types of assumptions that structure thinking. Paradigmatic assumptions are the deepest and most resistant to change, shaping fundamental perceptions of reality. Prescriptive assumptions concern beliefs about how things should be, guiding judgments about behavior and practice. Causal assumptions are more visible, focusing on cause-and-effect relationships. Together, these categories provide a systematic framework for analyzing how thinking influences learning and decision-making (Brookfield, 2012). Importantly, assumptions are not inherently right or wrong but contextually appropriate, making their examination an ongoing process.

A defining feature of Brookfield's approach is his view of critical thinking as a social process. Rather than occurring solely within individuals, it develops through interaction with others who challenge and expand one's perspectives. Dialogue exposes hidden assumptions and introduces alternative viewpoints, aligning with sociocultural theories that emphasize collaboration in knowledge construction (Vygotsky, 1978). In practice, this requires structured discussion, peer feedback, and collaborative inquiry.

Brookfield also positions critical thinking as a power-aware practice, emphasizing that knowledge and beliefs are shaped by social, cultural, and political forces. Drawing on critical theory, he argues that assumptions are often influenced by dominant ideologies that define what is considered normal or true (Brookfield, 2005). Critical thinking therefore involves not only questioning personal beliefs but also examining their connection to broader systems of power and inequality.

This perspective underscores the importance of linking critical pedagogy to ideology, hegemony, and lived experience. Ideology sustains social arrangements by presenting them as natural, while hegemony ensures these ideas are widely accepted, even by those disadvantaged by them (Gramsci, 1971). Grounding critical reflection in lived experience ensures that it remains relevant and actionable rather than abstract.

In sum, Brookfield's framework equips learners to question assumptions, engage in reflective dialogue, and recognize the influence of power on knowledge. These concepts provide a strong foundation for extending critical thinking into AI-mediated and workforce learning contexts.

AI as a New Epistemic Authority

The rapid advancement of artificial intelligence (AI) has transformed how knowledge is generated, validated, and consumed. Traditionally grounded in human expertise and peer-reviewed processes, knowledge production is increasingly mediated by AI systems such as large language models, recommendation engines, and predictive analytics platforms. These technologies synthesize vast amounts of information and produce outputs that appear coherent and contextually appropriate, positioning AI as a new epistemic authority in education and workforce learning (Floridi et al., 2018; Kasneci et al., 2023).

AI-generated outputs often appear authoritative and objective. Unlike human sources, which are associated with identifiable perspectives, AI presents information with speed, fluency, and confidence, encouraging users to assign it high credibility (Bender et al., 2021). As a result, learners and professionals increasingly rely on AI for explanation and decision support, raising questions about how authority is constructed in digital environments.

However, this perceived neutrality conceals a critical issue: learners frequently fail to question the assumptions embedded in AI outputs. Because AI systems are trained on datasets shaped by historical patterns and institutional biases, their outputs reflect these underlying assumptions, as well as design choices and organizational priorities (Crawford, 2021). When accepted uncritically, such outputs may be internalized without awareness of their origins, leading to a form of epistemic passivity in which questioning and evaluation are diminished.

This problem is compounded by the opacity of many AI systems. Unlike traditional sources, where authorship and evidence can be examined, AI often functions as a “black box,” limiting users’ ability to understand how conclusions are produced (Burrell, 2016). Consequently, critical thinking must extend beyond evaluating content to interrogating the processes that generate knowledge.

From a pedagogical perspective, AI introduces a new dimension to critical thinking. While traditional critical pedagogy emphasizes questioning human assumptions, AI-mediated environments require learners to also interrogate algorithmic assumptions embedded in data selection, model design, and output generation (Williamson, 2023). Recognizing these hidden layers is essential for maintaining intellectual autonomy.

The emergence of AI as an epistemic authority thus challenges existing frameworks of knowledge and learning. Learners must develop the capacity to question not only information but also the systems that produce it, including the social, cultural, and economic forces shaping AI.

Ultimately, AI does not reduce the need for critical thinking; it intensifies it. By introducing new forms of authority and hidden assumptions, AI expands what must be questioned. Addressing this challenge requires integrating critical pedagogy with AI literacy to support informed, reflective engagement with AI-generated knowledge.

Reframing “Questioning Assumptions” in AI Contexts

The emergence of artificial intelligence (AI) as a dominant mediator of knowledge production requires rethinking what it means to “question assumptions.” In traditional critical pedagogy, this process centers on uncovering hidden beliefs embedded in human reasoning. In AI-mediated environments, however, learners must also interrogate algorithmically generated assumptions embedded in training data, models, and outputs. This shift expands critical thinking beyond interpretation to include understanding how knowledge is constructed by machines.

The first dimension of this reframing involves questioning AI-generated assumptions. Because AI systems are trained on datasets shaped by historical patterns, cultural norms, and institutional priorities, they encode assumptions about what counts as relevant or valid knowledge (Bender et

al., 2021). These assumptions operate across data, algorithms, and outputs. Critical literacy therefore requires moving beyond evaluating content to examining how responses are produced—by interrogating data sources, model limitations, and the conditions shaping outputs. Without such scrutiny, AI outputs risk being treated as objective truths rather than constructed representations.

A second dimension concerns algorithmic power and ideology. Although often perceived as neutral, AI systems are embedded within economic, cultural, and political structures (Crawford, 2021). As a result, they can reproduce and amplify inequality, bias, and exclusion. Extending Brookfield’s concept of ideology, algorithmic systems must be understood as sites of power that shape what information is visible and legitimate. For example, recommendation and search algorithms can reinforce dominant narratives while marginalizing alternatives, contributing to misinformation and concentrated epistemic authority (Noble, 2018). Questioning assumptions therefore entails interrogating not only individual beliefs but also the systems that structure knowledge production.

A third dimension addresses the risk of cognitive offloading, as learners increasingly rely on AI to perform tasks associated with critical thinking. While AI enhances efficiency, it may reduce opportunities for reflection and independent judgment (Mollick, 2024). This creates a tension between efficiency and criticality: rapid access to information may come at the cost of deeper engagement. When AI outputs are accepted without question, learners risk developing superficial understanding and weakened evaluative skills.

This tension underscores the need to reconceptualize critical thinking as an active practice in AI-mediated environments. Rather than rejecting AI, educators must design learning experiences that promote critical engagement—encouraging learners to compare AI outputs with other sources, reflect on embedded assumptions, and assess the implications of relying on automated systems.

In sum, reframing “questioning assumptions” in the age of AI requires expanding critical pedagogy to include algorithmic processes and data structures. By addressing AI-generated assumptions, algorithmic power, and cognitive offloading, this approach provides a foundation for developing critical literacy suited to contemporary learning environments.

Table 1
Extending Brookfield’s critical pedagogy in the age of AI

Table 1 summarizes how Brookfield’s core concepts are extended in AI-mediated and workforce learning contexts.

Brookfield Concept	Traditional Meaning	AI-Era Extension	Workforce Application
Questioning assumptions	Human beliefs and perspectives	AI and algorithmic assumptions	Decision-making with AI systems

Critical reflection	Personal and social reflection	Reflection on AI-generated outputs	Judgment and adaptability
Social learning	Peer dialogue and interaction	Human–AI–peer interaction	Team-based problem solving
Power and ideology	Social structures and dominant beliefs	Algorithmic bias and hidden systems	Ethical AI use in workplaces

Table 1 illustrates how Brookfield’s core concepts of critical pedagogy are extended in AI-mediated environments and applied to workforce education, highlighting the integration of theory, technology, and practice.

The first column presents Brookfield’s foundational concepts—questioning assumptions, critical reflection, social learning, and power/ideology—which constitute the theoretical core of critical pedagogy. The second column outlines their traditional meanings, grounded in human cognition, interpersonal interaction, and social analysis.

The third column introduces the AI-era extensions, representing the primary contribution of this study. Each concept is reframed to reflect AI-mediated knowledge production: questioning assumptions expands to include algorithmic and data-driven assumptions; critical reflection incorporates evaluation of AI-generated outputs; social learning evolves to include human–AI–peer interaction; and power/ideology encompasses algorithmic bias and technological systems. These extensions underscore the additional layers of complexity introduced by AI, requiring a broadened understanding of critical pedagogy.

The fourth column connects these theoretical developments to workforce applications, emphasizing competencies such as decision-making, adaptability, collaboration, and ethical AI use. This alignment highlights the importance of integrating critical pedagogy into workforce education, where learners must navigate AI-driven environments and critically engage with both human and machine-generated knowledge.

Critical Thinking as a Social Process in AI Learning

A central tenet of Brookfield’s work is that critical thinking is socially constructed, emerging through dialogue, interaction, and exposure to alternative viewpoints. Rather than an isolated cognitive activity, it develops as learners engage with others who challenge assumptions and introduce new perspectives (Brookfield, 2012). This aligns with sociocultural theories emphasizing interaction and collaboration in shaping understanding (Vygotsky, 1978). Learning is therefore inherently relational, and questioning assumptions depends on diverse voices and shared inquiry.

The rise of artificial intelligence (AI) disrupts this model. Learners increasingly engage with AI systems in place of peer dialogue, using chatbots and automated tools for feedback and guidance.

While these technologies offer efficiency, they risk reducing opportunities for authentic human interaction. AI exchanges may simulate conversation but lack the unpredictability and reciprocity of human dialogue (Floridi & Chiriatti, 2020), potentially weakening the social dimension of critical thinking.

This shift raises concerns about learning in AI-mediated environments. Reliance on AI can limit exposure to contradictory perspectives and reduce the dialogic tension essential for critical thinking. Peer interaction involves negotiation, disagreement, and the articulation of ideas—processes that uncover assumptions and refine understanding (Garrison et al., 2000). In contrast, AI systems often produce consistent responses, creating an illusion of consensus and narrowing perspectives.

AI should therefore augment—not replace—dialogue. It can support learning by generating prompts, presenting alternative viewpoints, and stimulating discussion. Used effectively, AI becomes a catalyst for interaction, encouraging learners to engage with peers and reflect more deeply (Jandrić et al., 2023). Preserving discussion, peer challenge, and multiple perspectives remains essential for sustaining critical awareness.

To achieve this, educators must design learning experiences that prioritize interaction and collaboration, such as structured discussions and peer review. While AI can provide scaffolding, meaningful engagement depends on human facilitation.

In sum, AI presents both opportunities and risks for critical thinking. Ensuring that it enhances rather than replaces dialogue is essential for maintaining the social foundations of critical pedagogy in the digital age.

Implications for Workforce Learning

The integration of artificial intelligence (AI) into workplace environments is transforming decision-making, skill development, and how employees engage with knowledge. These changes have significant implications for workforce learning, particularly for critical thinking and the ability to question assumptions. As AI becomes embedded in organizational processes, workers must adapt to new forms of interaction with technology while maintaining independent judgment.

A key implication concerns AI-mediated decision-making. Employees increasingly rely on AI recommendations and predictive systems for tasks ranging from hiring to financial planning (Autor, 2022). While these tools enhance efficiency, they also introduce the risk of uncritical acceptance. Treating AI outputs as inherently accurate can obscure underlying assumptions, leading to flawed or biased decisions (Crawford, 2021). This risk is especially pronounced in high-stakes contexts, making critical evaluation of AI-generated information essential for responsible decision-making.

A second implication is the growing recognition of critical thinking as a core workforce competency. Employers emphasize skills such as judgment, adaptability, and problem-solving, which cannot be fully automated (World Economic Forum, 2023). Extending Brookfield's

concept of critical reflection to workforce learning underscores its role in enabling workers to question assumptions, consider alternatives, and make informed decisions when AI outputs are incomplete or biased (Brookfield, 2012). In this context, critical thinking complements AI capabilities with human insight.

The need for reskilling further highlights the importance of AI literacy. Workers must not only develop technical skills but also learn to question AI outputs and interpret data critically (Long & Magerko, 2020). AI literacy involves understanding how systems function, recognizing their limitations, and evaluating the quality of their outputs. Without these competencies, workers risk overreliance on AI and diminished independent analysis, making AI literacy essential to lifelong learning and career adaptability.

These shifts reinforce the link between workforce learning and adaptability. In an AI-driven economy, workers must navigate continuous change and evolving roles. Critical thinking supports this adaptability by enabling individuals to assess new situations and respond effectively (Noe et al., 2014). Through reflective practice, workers develop a deeper understanding of both their roles and the systems shaping them.

Overall, the implications of AI extend beyond technical skills to broader cognitive and reflective capacities. Integrating critical pedagogy into workforce education prepares learners not only to use AI tools but also to interrogate the assumptions underlying them, supporting more informed, ethical, and effective decision-making.

Toward a Model of Critical AI Pedagogy

The rapid diffusion of artificial intelligence (AI) across education and work calls for a coherent model of critical AI pedagogy that integrates Brookfield's emphasis on critical reflection with AI literacy and the demands of workforce education. Rather than treating these domains separately, this model positions critical reflection as the organizing principle linking how learners interrogate knowledge, engage with AI, and apply skills in real-world contexts. It addresses a central challenge of the AI era: enabling learners to use powerful technologies without sacrificing independent judgment.

At its core is Brookfield's concept of critical reflection, particularly questioning assumptions. In AI-mediated environments, this must extend beyond human reasoning to include algorithmic processes and outputs. Learners must examine not only what AI systems produce but also the assumptions embedded in their design, data, and logic (Brookfield, 2012; Williamson, 2023). This expanded form of reflection supports active engagement rather than passive reliance on machine-generated knowledge.

Complementing this is AI literacy, which equips learners to understand how AI systems function, recognize their limitations, and critically evaluate outputs (Ng et al., 2021). Beyond technical competence, AI literacy includes ethical and epistemological awareness, enabling learners to identify bias, assess transparency, and evaluate the implications of AI-generated information. Integrated with critical reflection, it supports informed and responsible engagement with AI.

The third component, workforce education, grounds the model in professional practice. Contemporary workplaces require employees to collaborate with AI, interpret data, and make decisions in complex environments (World Economic Forum, 2023). This demands not only technical skills but also critical thinking, adaptability, and reflective judgment (Noe et al., 2014). Aligning pedagogy with these demands ensures that learning connects theory with application.

Together, these components produce a model characterized by active engagement with AI, dialogic learning, authentic practice-based tasks, and ethical awareness. Learners are encouraged to critique AI outputs, engage in collaborative inquiry, and apply critical thinking in real-world contexts.

This model also redefines the educator’s role. Teachers function as facilitators of inquiry and designers of learning experiences, balancing AI integration with human-centered practices that sustain reflection and dialogue (Holmes et al., 2022).

In sum, integrating critical reflection, AI literacy, and workforce education provides a framework for developing learners who are both technologically competent and critically aware—capacities essential for navigating education and work in the age of AI.

Figure 1. Conceptual model of critical AI pedagogy integrating Brookfield’s critical reflection, AI literacy, and workforce education to support human-centered, reflective learning in AI-mediated environments

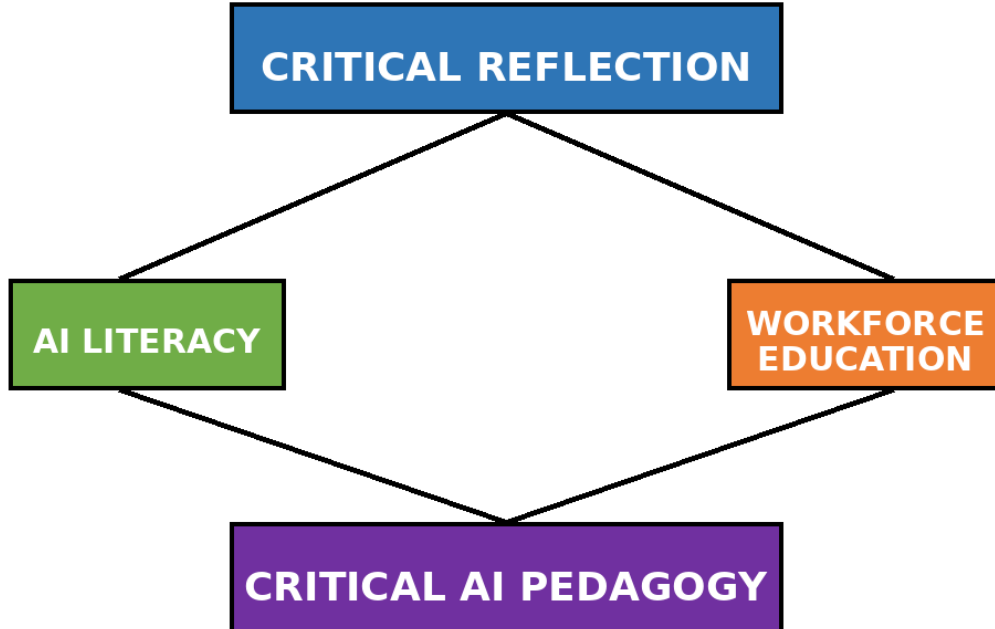


Figure 1 presents a conceptual model of critical AI pedagogy integrating three domains: critical reflection, AI literacy, and workforce education. The model traces a progression from theory to application, emphasizing human-centered learning in AI-mediated environments.

At the top, critical reflection (Brookfield), anchored in questioning assumptions, serves as the theoretical foundation and epistemological core. The middle layer comprises AI literacy and workforce education. AI literacy equips learners to understand how AI systems function, including their limitations, biases, and underlying assumptions, while workforce education represents the applied dimension, preparing learners for contexts shaped by technological change, reskilling, and career adaptability. Together, these domains extend critical reflection by linking theoretical insight with technological awareness and practical relevance.

These elements converge in critical AI pedagogy, the model's central contribution. This integration combines reflective thinking, AI understanding, and workforce alignment into a coherent pedagogical framework. The directional arrows indicate that critical reflection informs both AI literacy and workforce education, whose interaction produces a more adaptive approach to learning.

Overall, the model demonstrates how critical reflection underpins the integration of AI literacy and workforce education. It positions reflection as the central mechanism linking technological understanding with practical application. In doing so, it supports reflective, ethical, and applied learning in AI-mediated environments.

Core elements

A model of critical AI pedagogy rests on four interdependent elements: questioning assumptions, dialogic learning, reflective practice, and ethical awareness. Together, these extend traditional critical pedagogy by incorporating both human and algorithmic dimensions of knowledge.

The first element, questioning assumptions (human and AI), expands critical thinking beyond personal beliefs to include interrogating assumptions embedded in AI systems. Learners must examine not only their own reasoning but also the data, models, and outputs shaping AI-generated knowledge (Brookfield, 2012; Bender et al., 2021). This dual focus ensures that inquiry addresses both human cognition and machine-mediated epistemologies.

The second element, dialogic learning, emphasizes interaction and discourse in knowledge construction. Engagement with diverse perspectives enables learners to challenge assumptions and refine understanding (Garrison et al., 2000). In AI contexts, dialogue remains essential, with technology supporting rather than replacing human interaction.

The third element, reflective practice, involves continuous examination of actions, decisions, and learning processes. Reflection connects theory to experience, enabling learners to evaluate outcomes and adapt over time (Schön, 1983). In AI-mediated environments, this includes assessing how reliance on technology shapes thinking and judgment.

The fourth element, ethical awareness, addresses the social and moral implications of AI use. Learners must recognize issues such as bias, data privacy, and accountability and consider their impact on individuals and communities (UNESCO, 2023). This ensures that AI use aligns with principles of fairness and responsibility.

Together, these elements provide a coherent foundation for critical AI pedagogy. They integrate cognitive, social, and ethical dimensions of learning into a unified framework. This foundation supports thoughtful, collaborative, and responsible engagement with both human and machine-generated knowledge.

Teaching strategies for AI-era critical thinking

Designing instruction for AI-era critical thinking requires adapting Brookfield’s emphasis on questioning assumptions to environments where knowledge is co-produced with machines. The goal is to shift learners from passive consumption of AI outputs to active interrogation, comparison, and reflection. The following strategies operationalize this shift through structured practice.

AI assumption audits: Learners analyze AI responses to identify assumptions in data, framing, and inference. Students prompt AI systems, annotate outputs by tagging paradigmatic, prescriptive, and causal assumptions, and cross-check claims with independent sources. This process develops algorithmic skepticism while highlighting the limits of model-generated content (Bender et al., 2021; Brookfield, 2012).

Comparing human vs. AI reasoning: Students generate parallel solutions—one independently and one using AI—and compare them based on evidence, coherence, context, and ethical implications. This fosters metacognition and calibrated reliance on AI by clarifying where AI adds value and where human reasoning remains essential (Kasneci et al., 2023).

Structured debate with AI outputs: In small groups, students use AI-generated positions as prompts for debate, defending, critiquing, or reframing them with evidence and alternative perspectives. Facilitated discussion ensures rigor and equitable participation, preserving social learning while using AI as a catalyst for dialogue (Garrison et al., 2000; Jandrić et al., 2023).

Reflective journaling on AI use: Learners document their AI use, identify embedded assumptions, and track shifts in thinking. Prompts focus on trust, bias, and application, while periodic synthesis supports the revision of prior assumptions and the development of sustained critical habits (Schön, 1983).

Scaffolded implementation: These strategies are most effective when structured across pre-, during-, and post-activity phases, including orientation to AI capabilities, guided practice, and reflective feedback. Assessment should prioritize assumption identification, evidence quality, and depth of reflection, supported by instructor modeling that makes thinking processes explicit.

Together, these strategies embed critical inquiry into everyday AI use. They encourage learners to move beyond passive consumption toward active evaluation and reflection. In doing so, they

enable learners to balance efficiency with scrutiny while developing transferable skills for academic and workplace contexts.

Institutional and pedagogical implications

The integration of artificial intelligence (AI) into education requires more than incremental change; it demands curriculum redesign and sustained faculty development. As AI becomes embedded in teaching and learning, institutions must move beyond adding tools to existing structures and instead rethink how learning is designed, delivered, and assessed. Curriculum redesign should embed opportunities for learners to engage critically with AI, emphasizing skills such as questioning assumptions, evaluating evidence, and interpreting algorithmic outputs (Williamson, 2023). This requires integrating AI-related inquiry across disciplines rather than confining it to specialized courses.

Equally important is faculty development beyond technical training. Many initiatives emphasize tool use while overlooking the pedagogical implications of AI (Trust et al., 2020). Educators need support in developing critical AI pedagogy, including strategies for fostering engagement, facilitating dialogue, and addressing ethical issues. Ongoing, collaborative professional development—supported by communities of practice—enables educators to share expertise and adapt to evolving technologies (Cox, 2013).

A key shift is the move from tool adoption to critical AI pedagogy. Whereas tool adoption prioritizes efficiency, critical AI pedagogy emphasizes intentional use of technology to support learning, critical thinking, and ethical awareness. This aligns with calls to center human learning and critically examine how technology shapes knowledge and power (Selwyn, 2021).

However, tech-first approaches pose risks. When technology implementation outpaces pedagogical design, learning may become superficial and disengaging. Although AI can enhance efficiency, it cannot replace the relational and reflective processes essential for deep learning (Holmes et al., 2022). Overreliance on AI may encourage passive consumption and reduce opportunities for dialogue and critical inquiry, particularly in online and hybrid environments (Hodges et al., 2020).

To address these challenges, institutions must adopt a balanced approach that integrates technology with pedagogy. This includes prioritizing active learning, fostering interaction and reflection, and ensuring AI supports rather than replaces human engagement. Policies should address data privacy, algorithmic bias, and equitable access, aligning AI use with broader educational values (UNESCO, 2023). Leadership plays a critical role in articulating this vision and allocating resources accordingly.

Ultimately, effective AI integration depends on aligning institutional structures with pedagogical goals. By prioritizing curriculum redesign, faculty development, and critical AI pedagogy, institutions can create learning environments that are both innovative and meaningful, ensuring that technology enhances rather than diminishes human-centered education.

Conclusion

Brookfield's critical pedagogy is more relevant than ever in an era shaped by artificial intelligence. As AI systems become central to knowledge production, the need for critical reflection has intensified. While AI enhances access and efficiency, it also introduces hidden assumptions embedded in data, algorithms, and outputs (Williamson, 2023), requiring critical thinking to extend beyond human-centered inquiry to include interrogation of machine-generated knowledge.

AI does not diminish critical thinking; it amplifies its necessity. Learners must navigate environments in which authority is shared between human and algorithmic sources, making it essential to question both. Without this capacity, uncritical acceptance of AI outputs risks weakening judgment and reducing intellectual autonomy (Bender et al., 2021).

Ultimately, the future of learning depends on the ability to interrogate both human and algorithmic assumptions. Extending Brookfield's framework to AI-mediated contexts ensures that critical pedagogy remains central to developing reflective, informed, and responsible learners.

References

- Autor, D. (2022). The labor market impacts of technological change. *Journal of Economic Perspectives*, 36(1), 3–30.
- Bender, E. M., Gebru, T., McMillan-Major, A., & Shmitchell, S. (2021). On the dangers of stochastic parrots: Can language models be too big? In *Proceedings of the 2021 ACM conference on fairness, accountability, and transparency* (pp. 610–623). ACM. <https://doi.org/10.1145/3442188.3445922>
- Brookfield, S. D. (2005). *The power of critical theory: Liberating adult learning and teaching*. Jossey-Bass.
- Brookfield, S. D. (2012). *Teaching for critical thinking: Tools and techniques to help students question their assumptions*. Jossey-Bass.
- Burrell, J. (2016). How the machine 'thinks': Understanding opacity in machine learning algorithms. *Big Data & Society*, 3(1), 1–12. <https://doi.org/10.1177/2053951715622512>
- Cox, M. D. (2013). The impact of communities of practice in support of early-career academics. *International Journal for Academic Development*, 18(1), 18–30.
- Crawford, K. (2021). *Atlas of AI: Power, politics, and the planetary costs of artificial intelligence*. Yale University Press.
- Floridi, L., & Chiriatti, M. (2020). GPT-3: Its nature, scope, limits, and consequences. *Minds and Machines*, 30(4), 681–694. <https://doi.org/10.1007/s11023-020-09548-1>

- Floridi, L., Cowls, J., Beltrametti, M., Chatila, R., Chazerand, P., Dignum, V., & Vayena, E. (2018). AI4People—An ethical framework for a good AI society. *Minds and Machines*, 28(4), 689–707.
- Garrison, D. R., Anderson, T., & Archer, W. (2000). Critical inquiry in a text-based environment: Computer conferencing in higher education. *The Internet and Higher Education*, 2(2–3), 87–105.
- Holmes, W., Bialik, M., & Fadel, C. (2022). *Artificial intelligence in education: Promises and implications for teaching and learning*. Center for Curriculum Redesign.
- Hodges, C., Moore, S., Lockee, B., Trust, T., & Bond, A. (2020). The difference between emergency remote teaching and online learning. *EDUCAUSE Review*.
<https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning>
- Jandrić, P., Knox, J., Besley, T., Ryberg, T., Suoranta, J., & Hayes, S. (2023). Postdigital research in the time of AI. *Postdigital Science and Education*, 5(2), 285–312.
- Kasneci, E., Sessler, K., Küchemann, S., Bannert, M., Dementieva, D., Fischer, F., & Kasneci, G. (2023). ChatGPT for good? On opportunities and challenges of large language models for education. *Learning and Individual Differences*, 103, 102274.
<https://doi.org/10.1016/j.lindif.2023.102274>
- Long, D., & Magerko, B. (2020). What is AI literacy? In *Proceedings of the 2020 CHI conference on human factors in computing systems* (pp. 1–16). ACM.
<https://doi.org/10.1145/3313831.3376727>
- Mollick, E. (2024). *Co-intelligence: Living and working with AI*. Harvard Business Review Press.
- Ng, W., Leung, D., Chu, S. K. W., & Qiao, M. S. (2021). Conceptualizing AI literacy: An exploratory review. *Computers and Education: Artificial Intelligence*, 2, 100041.
- Noe, R. A., Clarke, A. D. M., & Klein, H. J. (2014). Learning in the twenty-first-century workplace. *Annual Review of Organizational Psychology and Organizational Behavior*, 1, 245–275.
- Noble, S. U. (2018). *Algorithms of oppression: How search engines reinforce racism*. NYU Press.
- Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. Basic Books.
- Selwyn, N. (2019). *Should robots replace teachers? AI and the future of education*. Polity Press.
- Selwyn, N. (2021). *Education and technology: Key issues and debates* (3rd ed.). Bloomsbury.

Trust, T., Carpenter, J. P., & Krutka, D. G. (2020). Moving beyond the LMS: Designing for technology-rich learning environments. *TechTrends*, 64(2), 193–201.

UNESCO. (2023). *Guidance for generative AI in education and research*. UNESCO Publishing.

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Williamson, B. (2023). *Education, data and the rise of AI: Critical perspectives on digital learning*. Routledge.

World Economic Forum. (2023). *The future of jobs report 2023*. World Economic Forum.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education. *International Journal of Educational Technology in Higher Education*, 16(1), 39.