

Teaching Students to Work With, Not Against, AI: A Classroom Model for Critical Literacy in Grades 6-12

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Abstract

Today's secondary classrooms face the challenge of integrating artificial intelligence (AI) in a way that enhances learning rather than undermines it. This article presents a classroom model for developing *critical AI literacy* among students in grades 6–12, emphasizing collaboration with AI tools as learning partners instead of viewing them as threats. Grounded in current research and practitioner experience, the model outlines strategies for incorporating AI into teaching practices while fostering students' critical thinking, ethical reasoning, and creative problem-solving. Key components include mindset shifts toward AI, explicit instruction on AI's limitations and biases, and scaffolded activities where students critically evaluate AI-generated content. This single-author perspective offers practical guidance to help educators prepare students for an AI-enhanced world, with recommendations for implementation and future research on critical AI literacy in K–12 settings.

Keywords: Critical AI Literacy, K-12 Education, AI-Enhanced Teaching

Introduction

Rapid advances in artificial intelligence (AI) are reshaping the educational landscape, prompting both excitement and concern among educators (Kasneci et al., 2023). In the wake of widely accessible generative AI tools, secondary students are increasingly using AI for schoolwork: one recent global survey found that over 80% of students have experimented with AI tools for learning (Digital Education Council, 2024).

Simultaneously, many teachers worry that AI might weaken students' critical thinking or enable academic dishonesty (Schwartz, 2023). Rather than resorting to bans, there is a growing consensus that schools should *teach* students to use AI responsibly and intelligently (Selwyn, 2021; Baker & Smith, 2019). This requires going beyond technical skills to develop students' critical AI literacy – the ability to understand, evaluate, and effectively collaborate with AI systems while recognizing their limitations and ethical implications (Long & Magerko, 2020; Kamperman & Conrad, 2025).

Current research highlights both the potential and the pitfalls of classroom AI integration. On one hand, AI-based tutors and writing assistants can personalize learning and improve achievement when used thoughtfully (Liu et al., 2025). Studies have shown that students who work alongside AI can achieve gains in efficiency and engagement (Atchley et al., 2024). On the other hand, scholars caution that uncritical use of AI may de-skill learners and introduce biases from algorithmic content (Buolamwini & Gebru, 2018; Perrotta & Selwyn, 2020). These divergent outcomes underscore the need for intentional pedagogical strategies. Educators must guide students in treating AI as a *collaborative tool* – a “second pair of eyes” or brainstorming partner – rather than as an infallible answer machine or a shortcut around learning (Bowen & Watson, 2024;

Holmes et al., 2016). To achieve this, teaching practices should evolve to include explicit discussions about how AI works, its appropriate uses, and its moral and practical limitations (Ng et al., 2021; UNESCO, 2021).

This article responds to the urgent educational imperative by proposing a classroom model for critical AI literacy in middle and high school settings. The model is practitioner-oriented, designed by an educator for educators, and grounded in both learning science and emerging evidence from AI-in-education research. It aims to help teachers empower students to work with, not against, AI – leveraging AI's capabilities to enhance learning while keeping students' own thinking at the forefront. After a brief background on critical AI literacy, the article outlines the key components of the model, provides examples of classroom activities, and offers practical recommendations for implementation. All observations and claims are presented from a single-author perspective, reflecting the author's analysis and synthesis of the literature and classroom insights. The goal is to maintain an academic tone rooted in scholarship while delivering actionable guidance for teachers seeking to navigate the new AI-integrated classroom.

Background: Toward Critical AI Literacy in K-12

Defining Critical AI Literacy. The concept of *AI literacy* has been defined as a set of competencies enabling individuals to understand and critically evaluate AI technologies and their impacts (Long & Magerko, 2020). Building on traditional digital literacy and media literacy frameworks, AI literacy encompasses not only knowing how to use AI tools but also understanding how they function and questioning their outputs (Ng et al., 2021).

Recent reviews emphasize four dimensions of AI literacy education: (1) **Knowledge** – understanding fundamental concepts of AI and machine learning, (2) **Use** – the ability to effectively operate AI applications, (3) **Evaluation** – critically interpreting AI outputs and recognizing errors or biases, and (4) **Ethics** – awareness of the ethical and societal implications of AI (Ng et al., 2021; Yang et al., 2023). *Critical* AI literacy goes one step further by embedding AI learning in a reflective, inquiry-based context that encourages students to scrutinize technology’s role in society (Kenny & Antle, 2023). Rather than viewing AI as a neutral tool, a critical approach invites students to ask: Who created this AI system? What data or values might be influencing its responses? Where and when should AI **not** be used (Kamperman & Conrad, 2025)? This critical perspective is vital for empowering young people to navigate AI-informed environments responsibly.

Challenges and Opportunities in the Classroom.

Integrating AI into K–12 education presents unique challenges. Secondary students may readily utilize AI writing assistants or chatbots to generate work, but without guidance they risk accepting AI outputs uncritically or misusing them (Selwyn, 2021; Schwartz, 2023). Educators have reported instances of students treating AI-generated text as authoritative fact, unaware that these models can produce inaccuracies or biased content (Baker & Smith, 2019; Bender et al., 2021). There is also concern that easy access to AI answers might short-circuit important learning processes – for example, if a student simply asks ChatGPT for a solution, they may bypass the productive struggle through which deeper understanding develops (Perrotta & Selwyn, 2020). However, when harnessed appropriately, AI can also be a powerful

catalyst for learning. Research indicates that students using AI as a collaborator – for instance, to get feedback on a draft or to explore multiple solution paths – can improve their metacognitive skills and creativity (Atchley et al., 2024; Kasneci et al., 2023). AI tools can free up time from routine tasks, allowing students to spend more effort on higher order thinking and teachers to focus on individualized coaching (Luckin et al., 2016). The key is preparation: students and teachers both need support and training to use AI in pedagogically sound ways (Zawacki-Richter et al., 2019; Starkey, 2020).

Teacher Roles and Professional Competence.

A critical aspect of AI literacy is the evolving role of the teacher. In an AI-enhanced classroom, teachers become vital mentors guiding students’ interaction with intelligent tools (Touretzky et al., 2019). This requires teachers to develop their own competencies in understanding AI and its classroom applications (Starkey, 2020). Professional digital competence frameworks now call for educators to be adept not only with general technology but specifically with AI’s possibilities and pitfalls (Starkey, 2020; OECD, 2021). For example, teachers should know how to evaluate an AI educational app’s claim, how to interpret an AI system’s feedback to students, and how to mitigate issues like algorithmic bias or student data privacy (Buolamwini & Gebru, 2018; UNESCO, 2021). Teachers must also model *lifelong learning* and adaptability, since AI tools and their capabilities are evolving rapidly (Bowen & Watson, 2024). Embracing an iterative mindset – where teachers continuously experiment with AI in teaching, reflect on outcomes, and adjust strategies – is crucial (Kenny & Antle, 2023). With appropriate support and

mindset, teachers can lead by example, showing students how to engage critically and constructively with AI. Against this backdrop, the next section introduces a classroom-tested model that operationalizes these ideas into concrete practices for grades 6–12.

A Classroom Model for Critical AI Literacy

The proposed model is designed to cultivate critical AI literacy by having students actively **work with AI tools** under guided conditions that emphasize reflection and analysis. The model consists of several interrelated components, each addressing an essential element of critical AI engagement. These components can be integrated across the curriculum in various subjects. The focus is on transforming typical learning activities to include AI in a way that enriches learning outcomes rather than undermines them. Below are the key components of the model:

- **1. Mindset Shift to AI as Collaborator:** Both teachers and students begin by reframing their attitude toward AI. Instead of viewing AI purely as a threat to academic integrity or a “cheat,” the class treats AI as a collaborative partner that can augment learning when used thoughtfully (Bowen & Watson, 2024). The teacher explicitly discusses this mindset shift, reinforcing that using AI in class is about *improving* one’s work and understanding, not avoiding it. For example, a teacher might say: *“Just as we consult spell-check or a calculator, we can consult AI for certain tasks – but we remain in*

charge of the final answers”. This collaborative mindset sets a positive tone, reducing fear and encouraging responsible exploration (Atchley et al., 2024). Students are invited to share their prior experiences with AI (if any) and reflect on how AI could assist their learning process in ethical ways.

- **2. Explicit AI Literacy Instruction:** The model incorporates mini lessons to build students’ foundational understanding of how AI systems operate and their limitations. Before students use an AI tool for an assignment, the teacher provides age-appropriate explanations of concepts like: *AI generates content based on patterns in data, AI can make mistakes (“hallucinations”), and AI can reflect biases present in its training data* (Baker & Smith, 2019; Bender et al., 2021). Students might examine simple examples of AI outputs that are incorrect or biased and discuss why that happened. By demystifying AI’s inner workings, students become more critical consumers of its outputs (Long & Magerko, 2020). This component also includes establishing class norms for AI use – for instance, always verify facts from AI with a credible source (Buolamwini & Gebu, 2018), and always disclose when AI was used in an assignment. These norms reinforce ethical and transparent usage, aligning with guidelines from

educational bodies (UNESCO, 2021).

- 3. AI-Integrated Learning Tasks with Reflection:** Central to the model is designing **authentic tasks** where students use AI as one step in a larger learning process, followed by critical reflection. Rather than assign work that AI could do in one click, the teacher creates activities that require students to *apply* and *evaluate* AI contributions. For example, in a writing assignment, a teacher might require students to use an AI tool to generate a first draft or an outline **and then** improve it significantly using their own skills (Bowen & Watson, 2024). Students would submit the AI's output alongside their revised draft, with a reflection on the changes they made and why (e.g., "The AI's draft lacked depth in analysis, so I added two original examples and cited evidence to support the arguments"). This approach transforms a potential academic honesty issue into a learning opportunity: students practice prompt engineering, critique AI-generated content, and strengthen their editing and reasoning skills (Atchley et al., 2024). Similarly, in a science class, a teacher could have students compare explanations of a concept from the textbook, a vetted website, and an AI chatbot – then discuss which was most accurate or clear and identify any AI errors. Such comparative analysis tasks train

students to assess AI information critically (Kenny & Antle, 2023). The teacher's role is to facilitate reflection by asking probing questions: "*What errors did the AI make? Why do you think it made those? How did your knowledge help you improve the AI's answer?*". These metacognitive discussions are essential for deepening critical AI literacy (Ng et al., 2021).

- 4. Emphasis on Process Over Product:** In this model, **how** students arrive at answers is given as much weight as the answers themselves. By shifting assessment to value process, the model discourages blind reliance on AI outputs and instead rewards critical engagement. For instance, a history teacher implementing this model might assign a research project where students must document their research process, including any AI tools used, and justify their decisions (Kamperman & Conrad, 2025). If a student uses an AI tool to generate a list of sources or to summarize an article, they would need to evaluate each AI-suggested source for credibility and accuracy, and that evaluation becomes part of their grade. This component aligns with assessment recommendations from AI-in-education researchers who propose focusing on the *creation process* (e.g., requiring AI chat transcripts or draft iterations) rather than solely the final essay or exam

answer (Bowen & Watson, 2024; Atchley et al., 2024). By grading the reasoning, fact-checking, and revisions students perform, teachers incentivize thoughtful use of AI and ensure students remain actively involved in learning. The process-centric approach also helps deter misuse: if students know they must explain and defend any AI-derived content, they are less likely to copy AI output unedited or use AI in prohibited ways.

- **5. Critical Evaluation and**

Verification Skills: A pillar of critical AI literacy is learning how to double-check and scrutinize AI-provided information. The model embeds verification steps into class activities. Students are taught strategies like cross-verifying facts with trusted sources, testing AI answers with alternative questions, and recognizing red flags of AI-generated text (such as overly generic language or lack of specific detail) (Buolamwini & Gebru, 2018; Xie et al., 2023). In practice, a teacher might give students an AI-written paragraph containing some factual errors and ask them to find and correct the mistakes using their textbooks or reliable online sources. Another exercise is to provide multiple AI-generated responses to the same question (perhaps from different AI systems or after tweaking a prompt) and have students debate which response is

most credible and why (Atchley et al., 2024). Such activities build students' analytical skills and reinforce that AI outputs are not automatically truth. Students become comfortable saying, *"I won't accept this answer until I've investigated further,"* thereby developing a healthy skepticism that is central to critical literacy (Perrotta & Selwyn, 2020). Over time, students internalize habits of verifying AI-assisted work, which will serve them well in academic and real-world contexts.

- **6. Ethical and Societal Context**

Discussions: Finally, the model incorporates regular class discussions about the broader implications of AI. These discussions tie student experiences with AI tools to questions of ethics, bias, privacy, and the impact of AI on society (Selwyn, 2021; UNESCO, 2021). For example, after using an AI image generator in an art class, students might discuss issues of intellectual property and how AI models learn from artists' work. In an English class, students could debate the fairness of using AI for college essays or analyze a case where AI was used in hiring or policing and examine the consequences (Buolamwini & Gebru, 2018). The teacher's role is to present age-appropriate cases or news stories and facilitate an open dialogue, encouraging students to

consider multiple perspectives and the ethical trade-offs of AI applications (Baker & Smith, 2019). These conversations help students connect what they learn in the classroom to real-world AI issues, fostering a sense of responsibility and agency. Students begin to see themselves not just as users of AI, but as informed citizens who will shape how AI is used in the future. This component reflects the **critical** in critical AI literacy – aiming to produce learners who are critically conscious of technology’s role in society and their power to influence it (Kenny & Antle, 2023).

Each component above is mutually reinforcing. For instance, treating AI as a collaborator (mindset shift) sets the stage for students to engage sincerely with AI in their assignments, while explicit instruction and ethical discussions provide the knowledge framework to do so wisely. The process-focused tasks and evaluation practice then give students hands-on experience in applying that knowledge. In practice, a teacher might implement the model in a modular fashion, starting small with one or two components and gradually combining them as comfort grows. An illustrative sequence in an English class might be: introduce AI with a mindset discussion and a mini lesson on how a text generator works (Components 1 and 2), then have students use an AI to brainstorm ideas for an essay and reflect on the output’s quality (Components 3 and 5). Students then write the essay themselves, perhaps using AI for editing suggestions, and submit a process log (Component 4), followed by a class debate on whether using AI in writing is

appropriate and where to draw the line (Component 6). Early evidence from the author’s classroom implementations of such sequences indicates that students become more discerning and less likely to misuse AI when these strategies are in place. They report finding AI helpful for generating ideas or checking work, but they also express greater awareness that “*AI can be wrong*” and confidence in “*how to use it the right way*” (informal student feedback, Spring 2025). While systematic research is ongoing, these anecdotal outcomes align with broader findings that critical engagement strategies can mitigate AI’s risks and amplify its benefits in education (Kasneci et al., 2023; Kamperman & Conrad, 2025).

Implementation Considerations for Educators

Adopting the critical AI literacy model requires thoughtful implementation and adaptation to each school context. Based on the author’s observations and related literature, several practical considerations can support success:

Start with Clear Policies: Educators should work with their school leadership to establish clear policies around AI usage in coursework (UNESCO, 2021). Clarity on questions such as “When is AI assistance allowed?” and “How should students acknowledge AI contributions?” creates a safe structure for experimentation. For example, a policy might state that AI-generated text can be used in early drafts or outlines, but final submissions must be students’ own words with sources cited (Schwartz, 2023). By defining boundaries upfront, teachers can incorporate AI without ambiguity or fear of encouraging cheating. As part of policy, emphasize academic integrity in the age of AI – for instance,

treating undisclosed AI-generated work as a form of plagiarism – while simultaneously affirming that *disclosed, critical* use of AI is a valid learning strategy (Selwyn, 2021). This dual message helps maintain rigor.

Professional Development and Support:

Teachers benefit from training and peer support as they implement AI-related activities (Starkey, 2020; Zawacki-Richter et al., 2019). School districts might offer workshops or learning communities for educators to share experiences with AI tools and classroom strategies. If available, instructional technology coaches can assist teachers in piloting AI-integrated lessons, troubleshooting issues, and finding age-appropriate AI resources. Even informally, teachers are encouraged to start small – perhaps testing an AI tool themselves for a task before introducing it to students – and to reflect on the outcomes. Administering short student surveys after an AI-enhanced assignment can provide insights into what students learned and where they faced difficulties, guiding further refinement of the model in practice (Xie et al., 2023). It is also important for teachers to stay updated, as AI tools evolve quickly. Setting aside time for ongoing learning (e.g., following research updates or ed-tech forums on AI in education) will help educators continuously align their practice with the latest understanding of AI’s capabilities and challenges (Bowen & Watson, 2024).

Equity and Accessibility: When implementing AI activities, teachers must be mindful of equity. Not all students may have equal experience or access to AI outside of school. The model should be introduced in a way that brings all learners along. This might involve providing additional scaffolding for students who are less tech-confident, such as step-by-step tutorials for using a particular AI tool and extra practice

in class (Luckin et al., 2016). Additionally, any AI tools used should adhere to student data privacy standards and be accessible to students with disabilities (UNESCO, 2021). If an AI application is not accessible (e.g., a vision-impaired student cannot easily use a certain interface), the teacher should have alternative means for that student to participate or consider different tools. Moreover, discussions about AI’s impact should include diverse perspectives—such as how AI might affect different communities—to ensure all students see the relevance of critical AI literacy to their lives (Kenny & Antle, 2023). This aligns with the broader goal of culturally responsive teaching, recognizing that AI technologies can have unequal effects across society and thus engaging students in examining those issues.

Assessment and Feedback: Educators implementing this model will likely need to adjust their assessment practices. As noted, grading the process and reflection is key. Teachers might develop rubrics that allocate points for evidence of critical thinking, such as the thoroughness of a student’s fact-checking of AI content or the insightfulness of their reflections on using AI. For example, a rubric criterion could be “Quality of AI Use Reflection: The student identifies specific strengths and weaknesses of the AI output and explains clearly how they addressed them.” Providing regular feedback to students on these aspects will reinforce the learning goals (Atchley et al., 2024). It’s important to reassure students that *struggling* with an AI tool or finding an error is not failure; rather, it is expected and part of the learning. Teachers can normalize this by publicly acknowledging when an AI tool made a mistake in a demo and praising students who caught it. This helps students feel comfortable being critical and not blindly deferring to the AI. Over time, as

students become more adept, assessment can gradually hold them to higher standards of critique and independence (Xie et al., 2023). Initially, for instance, a teacher might give full credit as long as a student identified *some* issue with AI's output, but later on the expectation might be to catch more subtle issues or to draw on external evidence in their critique.

Iterative Refinement: Finally, implementing critical AI literacy should be seen as an ongoing, iterative process. The author's experience revealed that some strategies worked better in certain subjects or grade levels than others, requiring adaptation. For example, middle school students might need more concrete examples and shorter AI activities to maintain focus, whereas high school students could handle more complex, open-ended AI projects. It is advisable to start with a pilot unit or a single class project incorporating the model, then collect feedback from students about what they learned and how they felt. Teachers can use that feedback to refine instructions, choose different AI tools, or adjust the balance between AI use and non-AI work (Kasneci et al., 2023). Collaboration with colleagues is also valuable - teachers can compare notes on how students responded to various AI tasks and share successful prompts or discussion questions. School leaders should encourage a culture of safe innovation, where teachers feel free to experiment with AI pedagogy and openly discuss both successes and failures. Given that the integration of AI in K–12 education is still relatively new, educators collectively are learning what best practices look like (Yang et al., 2023). This model is offered as a starting framework that will evolve over time as more classrooms adopt critical AI literacy approaches and contribute their insights.

Conclusion

Artificial intelligence is rapidly becoming part of the everyday educational experience, and it is imperative that students learn to engage with AI critically, ethically, and productively. This article, written from a sole-author perspective, has presented a classroom model aimed at fostering critical AI literacy in grades 6–12. The model encourages educators to guide students in working *with* AI tools through a structured approach that includes mindset shifts, explicit literacy instruction, reflective AI-integrated assignments, process-focused assessment, and discussions of AI's broader impact. By implementing these strategies, teachers can help students move beyond treating AI as a simple shortcut or an adversary. Instead, students learn to see AI as a powerful resource that, when approached with skepticism and thoughtful oversight, can augment their learning and creativity (Bowen & Watson, 2024; Atchley et al., 2024).

Maintaining an academic tone, this work has drawn on emerging research and practical examples to demonstrate how critical AI literacy can be cultivated in real classrooms. The evidence so far suggests that when students are taught to question AI outputs, verify information, and reflect on the role of AI in their work, they become more engaged and responsible learners (Ng et al., 2021; Kamperman & Conrad, 2025). They also develop future-ready skills: the ability to collaborate with intelligent technologies, the discernment to spot errors or biases, and the ethical grounding to consider the consequences of technological choices (Kenny & Antle, 2023; Perrotta & Selwyn, 2020). These competencies will be increasingly important as AI continues to permeate higher education, the workforce, and civic life.

For practitioners, the classroom model offers a pathway to integrate AI in instruction without compromising academic integrity or rigor. It provides concrete steps and precautions that any teacher can adapt to their subject and student group. Of course, the model is not a static solution but a framework to be refined. Ongoing research is needed to formally assess learning outcomes of critical AI literacy interventions, such as measuring improvements in students' critical thinking or ethical reasoning skills over time (Xie et al., 2023; Yang et al., 2023). Additionally, as AI tools evolve – for instance, as they become more interactive or multimodal – educators will need to update their strategies and perhaps add new components to the model (Kasneci et al., 2023). The hope is that this work inspires further dialogue and experimentation among educators, researchers, and policymakers to collectively shape how AI is used in education.

In summary, teaching students to work with, not against, AI is a realistic and worthy goal. It shifts the narrative from fear and prohibition to empowerment and education. By equipping students with critical AI literacy, we prepare them to navigate a world where AI is ubiquitous – enabling them to harness AI's benefits while remaining vigilant about its drawbacks. As one student reflected after a semester of critically using AI in class, *"I've learned that AI can help me be more creative, but I always have to put my own brain into it and not just trust the AI"*. This synthesis of human judgment and AI assistance is exactly what we should strive for. Education in the age of AI should neither ignore the technology nor surrender to it but rather guide students in a thoughtful partnership with intelligent tools. The model presented here is one step toward that vision, demonstrating how educators can lead the

next generation to become critical thinkers and ethical innovators in a world with AI.

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