Generative AI in the K–12 Formative Assessment Process: Enhancing Feedback in the Classroom

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Abstract

This paper explores how generative AI can enhance formative assessment practices in K–12 education. It examines emerging tools, ethical considerations, and practical applications to support student learning, while emphasizing the continued importance of teacher judgment and balanced assessment systems.

1 Introduction

The rapid evolution of generative artificial intelligence (AI) tools, such as ChatGPT, Microsoft Copilot, and Perplexity AI, has catalyzed significant opportunities in education. While student adoption of these tools has grown swiftly, many educators remain inexperienced in their use (University of Illinois, Urbana-Champaign, 2024). This disparity underscores the urgency of examining how AI can responsibly enhance teaching and learning.

Formative assessment, understood as an ongoing process of gathering and using evidence to inform instruction, presents a promising domain for AI integration (Hopfenbeck et al., 2023). Persistent challenges—such as large class sizes, variability in teacher expertise, and limited time for individualized feedback—suggest that AI could serve as a valuable partner in extending teachers' capacity. At the same time, integrating AI raises issues of bias, equity, accessibility, and privacy.

2 Defining the Formative Assessment Process

Formative assessment is not a product or event but a planned, ongoing process in which teachers and students collaboratively use evidence of learning to improve understanding and guide instruction (Michigan Assessment Consortium, 2017; Renaissance, 2021). Distinct from summative assessment, which evaluates learning at the end of instruction, formative assessment occurs continuously during instruction, is low-stakes, and prioritizes descriptive feedback to support improvement (Michigan Assessment Consortium, 2017, 2018, 2024a).

Key elements include clarifying learning goals and success criteria, eliciting and analyzing evidence of student thinking, providing actionable feedback, engaging students in peer and self-assessment, and adjusting instruction based on emerging evidence (Michigan Assessment Consortium, 2021).

This process-orientation positions students as active agents of their own learning, co-constructing goals, monitoring progress, and making decisions about next steps.

3 Opportunities and Realities in Implementing the Formative Assessment Process (FAP)

Despite broad support in the literature (Black & Wiliam, 1998; Hattie & Timperley, 2007), several barriers exist in the widespread and effective use of formative assessment. These include:

Time and Workload: Providing high-quality, individualized feedback for large classes is often untenable (Gamlem & Vattoy, 2023). Teachers resort to general or delayed comments, undermining formative intent.

Variability in Teacher Assessment Literacy: Many educators lack adequate training in assessment design and data interpretation (Wylie & Lyon, 2015). Misunderstandings persist, with some equating formative assessment only to ungraded quizzes.

Equity and Contextual Barriers: In some settings, cultural norms, oversized classes, or

limited resources inhibit practices such as peer feedback and student-centered dialogue (Halai et al., 2023).

Sustainability: Designing rigorous tasks, interpreting evidence, and maintaining feedback cycles require expertise and planning time that teachers often lack (Schmoker, 2011).

Without adequate support, formative assessment struggles to scale beyond isolated classrooms. These challenges create fertile ground for AI assistance (Swiecki et al., 2022; Zhai & Nehm, 2023).

4   The Role of Generative AI in the FAP

AI can provide immediate, descriptive, and individualized feedback, increasing both timeliness and frequency (Maksimchuk & Pentón Herrera, 2025). Studies show AI feedback can align well with rubric criteria and reduce teacher burden, though human feedback remains superior in accuracy and tone (Steiss et al., 2024). AI works best in partnership with teachers—offering preliminary feedback that educators review and adapt.

Dialogic interaction is a unique advantage: students can query AI for clarification, examples, or alternative explanations, fostering self-regulation and deeper learning (Mahapatra, 2024). Yet concerns persist about accuracy, tone, and potential bias, underscoring the importance of a "human-in-the-loop" approach (Mollick, 2024).

4.1   AI as a Tool for Designing Prompts

Teachers can use AI to generate formative tasks, unpack standards, and create authentic prompts aligned with learning goals (Black & Wiliam, 1998). AI serves as a co-designer, producing first drafts of questions, rubrics, or feedback stems, which teachers refine. Tools like the Kent ISD "AI for Assessment" prompt library exemplify efforts to guide teachers in effectively harnessing AI (Maksimchuk, 2025). Importantly, AI can also flag potential cultural biases in assessment materials.

4.2   AI as a Student Partner in Reflection and Peer Feedback

AI can support student self-regulation by prompting metacognitive reflection and providing personalized explanations. It may also function as a "peer" in giving feedback or serve as material for critique—students assess AI-produced responses, sharpening their understanding of success criteria (Wang & Fan, 2025). Proper training is essential so students engage with AI as a learning aid rather than a shortcut.

4.3   AI for Teachers' Growth

Using AI requires teachers to articulate learning targets and success criteria clearly, reinforcing assessment literacy. Teachers can leverage AI for rubric creation, item analysis, or exploring alternative formative strategies, effectively turning the technology into embedded professional learning (Michigan Assessment Consortium, 2024a). Over time, AI can act as a coaching tool, offering guidance on question quality, instructional adjustments, and data interpretation.

5   Ethical and Equity Considerations

Integrating AI into assessment requires attention to fairness, accessibility, and privacy.

AI outputs may privilege dominant cultural or linguistic norms, disadvantaging English language learners or misinterpreting diverse perspectives (University of Illinois, Urbana-Champaign, 2024; University of Texas at Austin, 2025). Teachers must review outputs critically and guide students in recognizing potential bias.

Accessibility: AI must be inclusive for students with disabilities and multilingual learners, ensuring equitable participation.

Data Privacy: Compliance with FERPA and ethical data practices is essential. Student work and learning data must be safeguarded.

Equity Lens: The Michigan Assessment Consortium's Components of Equitable Assessment Systems (2024b) framework stresses centering equity in AI use. Educators should

ensure AI augments, rather than undermines, fairness in feedback and instructional decisions.

6 Case Studies and Practical Applications

Several examples illustrate AI's formative potential:

- High School English: AI-generated feedback on student writing increased revision cycles and student engagement, though teacher review was still critical.
- Mathematics: Teachers co-designed assessments with AI, generating varied question types aligned with learning targets and identifying misconceptions.
- Science Inquiry: Students engaged AI as a partner in developing and refining hypotheses, receiving iterative feedback during investigations.

Across cases, AI supported timely feedback, diversified assessment strategies, and fostered greater student ownership of learning. Teachers emphasized the importance of guidance, critical evaluation, and contextual adaptation.

7 Recommendations

For School Leaders

- Provide professional development that pairs AI tool use with deepening assessment literacy.
- Ensure equitable access to AI-supported learning tools across all schools and communities.
- Establish clear ethical guidelines for AI use in classrooms.

For Teachers

- Use AI to supplement, not replace, human feedback and professional judgment.
- Involve students in critiquing AI feedback to foster critical thinking.
- Collaborate with colleagues to share effective prompts and strategies.

For Policymakers

- Incorporate AI literacy into educational standards.
- Fund research and pilot programs evaluating AI's impact on formative assessment and equity.
- Address infrastructure gaps so underserved schools can access AI resources.

- Adapt assessment and accountability policies to encourage responsible AI use in classrooms.

8 Conclusion

Generative AI offers a powerful means to strengthen formative assessment by making feedback more immediate, personal, and interactive; supporting teachers in prompt and rubric design; and building assessment literacy among educators. Yet, the promise of AI is balanced by risks related to bias, privacy, and equity.

The future lies in a human-driven, AI-augmented classroom where teachers retain responsibility for instructional judgment, empathy, and relational pedagogy, while AI expands opportunities for feedback, reflection, and differentiation. As the field moves forward, iterative, evidence-based implementation will ensure that AI in formative assessment fulfills its potential to inform and improve learning for every student.

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