



Formative assessment and feedback in the classroom: A review of practices, evidence, and barriers to implementation

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Abstract

Formative assessment, the ongoing evaluation of student understanding during instruction rather than solely at its conclusion, has been described in the literature as one of the most consistently effective levers available to teachers for improving student learning. This paper reviews recent literature on formative assessment and feedback practices in the classroom, synthesizing evidence from meta-analyses and systematic reviews on their impact on achievement, motivation, and self-regulated learning. The review finds converging evidence that formative assessment, when paired with feedback that is timely, specific, and action-oriented, produces measurable gains in student achievement across educational levels, from K-12 reading instruction through graduate study. However, the literature also identifies substantial variation in effectiveness tied to feedback quality, teacher conceptions of assessment, and the degree to which feedback is actually used by students rather than ignored. Emerging research on generative AI as a tool for scaling formative feedback is noted as a promising but still early area of study. The paper concludes with implications for classroom practice, emphasizing the centrality of feedback quality and teacher professional development over the mere frequency of assessment activity, and identifies gaps in the evidence base warranting further research.

Keywords: formative assessment, feedback, student learning outcomes, self-regulated learning, classroom assessment

Introduction

A long-standing distinction in educational assessment separates summative assessment, which evaluates learning at the end of an instructional period, from formative assessment, which is embedded within the instructional process itself and used to adjust teaching and learning in real time. While summative assessment remains the dominant mechanism for grading and certification, a substantial body of research over the past three decades has positioned formative assessment as a primary driver of actual learning gains, distinct from and often more influential than the grading function assessment is popularly associated with.

This review synthesizes recent literature on formative assessment and feedback practices in classroom settings, examining the evidence for their impact on student achievement, motivation, and self-regulation, and identifying the conditions, particularly feedback quality and teacher practice, that determine whether formative assessment translates into improved learning.

Review Approach

This paper adopts a narrative literature review approach, drawing on recent meta-analyses, systematic literature reviews, and empirical studies published primarily between 2022 and 2025, supplemented by foundational conceptual work that continues to shape how formative assessment and feedback are defined and studied. Sources were identified through targeted searches using terms including "formative assessment," "feedback," "student learning outcomes," and "self-regulated learning."

What the Evidence Shows

1. Overall Effects on Achievement

A meta-analytical review synthesizing findings across multiple studies concluded that formative assessment

significantly enhances student achievement, promotes self-regulated learning, and contributes to a more inclusive learning environment, while identifying feedback quality, student engagement, and teacher proficiency as the key factors moderating how large these gains are in practice. This pattern, that formative assessment helps on average but its effect size depends heavily on implementation quality, recurs throughout the broader literature and cautions against treating formative assessment as a uniformly effective intervention regardless of how it is carried out.

More targeted meta-analyses reinforce this conclusion within specific domains. A meta-analysis focused on K-12 reading instruction found that formative assessment practices were associated with measurable gains in reading achievement, while research on self-assessment, a specific formative technique in which students evaluate their own work against criteria, found that its effectiveness depended significantly on how explicit the self-assessment criteria were made to students.

2. The Central Role of Feedback Quality

A substantial portion of the recent literature shifts focus from formative assessment as an activity toward feedback as the mechanism through which that activity influences learning. A systematic review of student perceptions and outcomes of teacher feedback found that high-quality, tailored, and action-oriented feedback positively affects student achievement, motivation, and engagement, whereas feedback that is vague or framed negatively can produce demotivation and avoidance behavior rather than improvement. This distinction, between feedback that students act on and feedback that students disregard, appears central to understanding why formative assessment research shows such variable effect sizes across studies: the presence of feedback alone does not guarantee a learning benefit.

Related research examining teacher beliefs about assessment and feedback found that how teachers conceive of the purpose of assessment predicts their actual feedback practices, and that these practices in turn shape whether students engage with or ignore improvement-oriented feedback. This suggests that improving formative assessment outcomes in classrooms depends not only on training teachers in feedback techniques but also on addressing the underlying beliefs teachers hold about what assessment is for.

3. Formative Assessment Beyond K-12: Graduate and Higher Education Contexts

A systematic literature review of formative assessment and feedback in graduate studies, synthesizing findings from a large initial pool of studies narrowed to a smaller set of directly relevant research, found that formative assessment accompanied by timely and specific feedback improved conceptual understanding, reduced student anxiety, and enhanced academic performance among graduate students. The same review emphasized that in graduate contexts, formative assessment is valued less for measuring knowledge recall and more for developing higher-order skills such as critical thinking, problem-solving, and teamwork, extending the relevance of formative assessment practice well beyond primary and secondary schooling.

4. Formative Assessment in Specific Subject and Digital Contexts

Subject-specific research illustrates how formative assessment operates in practice. A study examining primary geography teachers' use of formative assessment found that its effectiveness in supporting students' understanding of complex geographic concepts varied according to teacher proficiency and the specific tools used, echoing the broader literature's emphasis on implementation quality over mere presence of formative activity. Separately, a growing strand of research is examining formative assessment within digital learning environments, with some studies reporting that integrating formative assessment into digital platforms enhanced academic enjoyment and self-regulation among students, though this research base remains newer than that for traditional classroom-based formative assessment.

5. Generative AI as an Emerging Tool

A recent strand of literature explores the use of generative AI and large language models to support and scale formative assessment and feedback delivery. This research frames AI-supported feedback as a way to extend the timely, specific, and individualized feedback that the broader literature identifies as central to formative assessment's effectiveness, particularly in large classes where instructors cannot feasibly provide individualized feedback to every student. This area remains at an early stage relative to the more established literature on teacher-delivered feedback, and questions remain about the accuracy, consistency, and pedagogical appropriateness of AI-generated feedback across different subjects and student populations.

Barriers to Effective Implementation

Several barriers recur across the reviewed literature. First, formative assessment requires sustained professional development and adequate resourcing, since teacher proficiency is repeatedly identified as a key moderator of

formative assessment's effectiveness, meaning that formative assessment cannot simply be mandated without corresponding investment in how teachers are trained to design and deliver it. Second, feedback quality is difficult to standardize: written, oral, and digital feedback delivered under real classroom time pressure can easily default to generic or evaluative comments that students find easy to disregard, undermining the mechanism through which formative assessment is thought to work. Third, teacher beliefs about the purpose of assessment, whether primarily as measurement or primarily as a tool for adjusting instruction, shape practice in ways that are not always visible in policy documents mandating formative assessment use, meaning implementation can diverge substantially from policy intent at the classroom level.

Discussion and Implications

The literature reviewed here supports a central conclusion: formative assessment is not inherently effective by virtue of being formative rather than summative; its impact depends on the quality of the feedback it generates and the degree to which teachers are equipped, and believe in the value of, delivering that feedback in a timely, specific, and action-oriented way. For classroom practice, this suggests that professional development investment should focus less on increasing the frequency of formative assessment activities and more on improving the quality and specificity of the feedback teachers provide, alongside addressing teacher beliefs about assessment purpose. For higher education and graduate contexts specifically, the evidence suggests formative assessment's value lies particularly in developing higher-order skills rather than simply reinforcing content recall, which has implications for how formative assessment is designed at that level. The early but growing literature on AI-supported feedback suggests a potential avenue for extending individualized feedback at scale, though this should currently be treated as a supplement to, rather than a replacement for, teacher judgment given the limited maturity of this research base.

Conclusion

Formative assessment and the feedback it generates remain among the most consistently supported levers for improving student learning across educational levels, from K-12 reading instruction to graduate study. The strength of this evidence is qualified by substantial variation tied to feedback quality, teacher proficiency, and teacher beliefs about assessment, meaning that formative assessment's benefits are conditional on how well it is implemented rather than guaranteed by its use alone. Future research would benefit from more consistent measurement of feedback quality across studies, longer-term tracking of whether formative assessment gains persist across school years, and continued evaluation of generative AI tools as this area of practice matures.

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