

Comparative Analysis of Formative Assessment Strategies and Their Impact on Student Performance and Engagement

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تحليل مقارنة لاستراتيجيات التقييم التكويني وأثرها على أداء الطلاب ومشاركتهم

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Abstract

Formative assessment encompasses a variety of practices used to monitor learning and provide feedback during instruction. This study reviews and compares different formative strategies both traditional (e.g. written quizzes, peer feedback, verbal questioning) and digital (e.g. Google Forms quizzes, Kahoot!, Quizizz) and examines how each influences student performance and engagement. We analyze published research globally, including K-12 and university settings. The meta-analytical evidence shows that formative assessment generally yields strong gains in learning outcomes and self-regulated learning (Foster, 2024; Wu & Yu, 2025). Key factors include feedback quality and student motivation. For example, Wu and Yu (2025) found that formative practices boost performance indirectly by enhancing teacher emotional support, which in turn increases student engagement. In gamified tools, one study reported that Quizizz led to higher learning outcomes than Kahoot or Wordwall. Pedagogical approaches like peer assessment also improve achievement (Double et al., 2020). Importantly, formative assessment boosts engagement: learners become more active and goal-oriented (Foster, 2024). However, the effect depends on implementation quality and context. We discuss how to best deploy these strategies in diverse classrooms and suggest integrating technology with traditional methods to maximize both achievement and motivation.

Keywords: Formative Assessment, Student Engagement, Learning Outcomes, Feedback, Educational Technology, Peer Assessment.

المخلص

يشمل التقييم التكويني مجموعة متنوعة من الممارسات المستخدمة لمراقبة التعلم وتقديم التغذية الراجعة أثناء التدريس. تستعرض هذه الدراسة وتقارن استراتيجيات تكوينية مختلفة، سواء التقليدية (مثل الاختبارات الكتابية، وملاحظات الأقران، والأسئلة الشفهية) أو الرقمية (مثل اختبارات نماذج جوجل، و Kahoot!، و Quizizz)، وتدرس كيفية تأثير كل منها على أداء الطلاب ومشاركتهم. نقوم بتحليل الأبحاث المنشورة عالمياً، بما في ذلك في رياض الأطفال والمدارس الثانوية والجامعات. تُظهر الأدلة التحليلية الشاملة أن التقييم التكويني يُحقق عموماً مكاسب كبيرة في نتائج التعلم والتعلم الذاتي التنظيم (فوستر، 2024؛ وو يو، 2025). تشمل العوامل الرئيسية جودة التغذية الراجعة وتحفيز الطلاب. على سبيل المثال، وجد وو يو (2025) أن الممارسات التكوينية تُعزز الأداء بشكل غير مباشر من خلال تعزيز الدعم العاطفي للمعلم، مما يزيد بدوره من مشاركة الطلاب. في الأدوات المُصممة بتقنيات الألعاب، أفادت إحدى الدراسات أن Quizizz أدى إلى نتائج تعلم أعلى من Kahoot أو Wordwall. تُحسن المناهج التربوية، مثل تقييم الأقران، التحصيل الدراسي (دبل وآخرون، 2020). والأهم من ذلك، أن التقييم التكويني يُعزز المشاركة: إذ يصبح المتعلمون أكثر نشاطاً وتوجهاً نحو تحقيق الأهداف (فوستر، 2024). ومع ذلك، يعتمد التأثير على جودة التطبيق والسياق. نناقش أفضل السبل لتطبيق هذه الاستراتيجيات في الفصول الدراسية المتنوعة، ونقترح دمج التكنولوجيا مع الأساليب التقليدية لتعزيز التحصيل الدراسي والدافعية.

الكلمات المفتاحية: التقييم التكويني، مشاركة الطلاب، مخرجات التعلم، التغذية الراجعة، التكنولوجيا التعليمية، تقييم الأقران.

Introduction

Formative assessment refers to ongoing feedback activities teachers and students use during learning. Unlike end-of-course tests, these checks gauge understanding and guide instruction in real time (Black & Wiliam, 1998). Examples include quick quizzes, in-class questions, exit tickets, peer review, and digital tools like online quizzes. Educators use these strategies to identify learning gaps early and help students improve. This paper examines various formative approaches and compares their effects on student performance (test scores, grades, learning gains) and on student engagement (motivation, participation, interest). Engagement is linked to better learning, so strategies that boost engagement often improve outcomes. We review global studies across levels (primary, secondary, university) and contexts. Both traditional methods (peer feedback, written quizzes) and digital tools (Kahoot, Google Forms) are considered. Figure 7 (below) shows an example of attentive students, illustrating engaged learners in a classroom setting.

Many researchers have found positive effects of formative assessment on achievement and engagement. A meta-review by Foster (2024) concluded that formative assessment “significantly enhances student achievement” and promotes self-regulated learning. Another study noted that when teachers provide regular feedback, learning becomes more interactive and students take more ownership. However, the impact can vary. Contextual factors like teacher skill, class size, and student support matter. This paper’s goal is to compare common formative strategies in detail, highlighting which methods work best for learning outcomes and for engaging students.

Theoretical Background and Literature Review

Importance of Formative Assessment

Formative assessment is grounded in learning theory. It aligns with the constructivist view that students build knowledge actively. For example, Vygotsky’s Zone of Proximal Development suggests students learn best with guidance, and formative feedback is a way to provide that guidance. Hattie’s synthesis (2009) highlights feedback as one of the highest-impact influences on learning (effect size $d \approx 0.7$). In his meta-analyses, Hattie also ranked formative evaluation very high ($d \approx 0.90$). This means that the practice of continuously assessing and adjusting teaching is very effective. Black and Wiliam (1998) famously showed that formative use of assessment data leads to large gains in learning.

Formative assessments also link to motivation and engagement. When students see their progress, they are more likely to stay interested. Foster (2024) notes that a feedback loop encourages students to set goals and track their progress, which makes learning more personalized and engaging. Similarly, Wu and Yu (2025) argue that effective formative assessment practices help create a supportive environment; when students feel supported, they become more engaged and thus perform better.

Types of Formative Strategies

Formative strategies vary widely. We categorize them broadly into *traditional* and *digital*:

- **Traditional methods:** These include written quizzes, one-on-one conferences, peer review, oral questioning, and exit tickets. In peer assessment, students give feedback to each other’s work. For example, one meta-analysis found that peer assessment has a small-to-moderate positive effect on future performance (overall effect $g \approx 0.31$). Teacher-led feedback and questioning also engage students.
- **Digital tools:** These use technology to automate or gamify formative tasks. Popular tools include:
 - Clickers or quiz platforms: Online quizzes via Google Forms, Kahoot!, Quizizz, Socrative, etc.
 - Learning analytics: Online homework systems that track performance.
 - Interactive platforms: Apps like Nearpod or Edpuzzle.

Digital tools often aim to make assessment game-like or more interactive. For instance, Kahoot! quizzes display on-screen questions students answer in real-time. These tools can provide immediate feedback and game elements (points, leaderboards) to boost motivation.

Effects on Performance

Performance measures include test scores, exam results, or grades. Many studies show that formative assessment improves performance. In a global meta-analysis, Foster (2024) found consistent improvements in achievement, especially in math and language arts, when formative assessment was used. For example, one study reported an overall positive effect on academic success across 54 studies of peer assessment. Digital tools also show gains. For instance, a recent analysis found that use of Kahoot! improved test scores on average by about one letter grade (based on independent peer-reviewed studies).

Some comparative studies give details. One study in an English reading class compared three gamified tools: Quizizz, Kahoot!, and Wordwall. It used ANOVA analysis and found that Quizizz led to significantly higher learning outcomes (mean score 9.00) than Kahoot or Wordwall. In other words, students using Quizizz learned more, on average. This suggests that choice of digital platform can matter, perhaps due to differences in interface

or pacing. Another study (McCallum & Milner, 2020) explored first-year courses and reported that students who used formative e-assessments felt these tools helped them monitor progress and improve learning.

Figure 2 (below) illustrates one study's results on performance and engagement: the number of students failing their final exam based on whether they engaged in early formative tasks. Veerasamy et al. (2022) developed a simple classifier tree (CTA) showing that students identified as "not engaged" (red/yellow) by Week 2–8 of formative tasks had much higher failure rates. This indicates that low performance on early quizzes predicted low final outcomes.

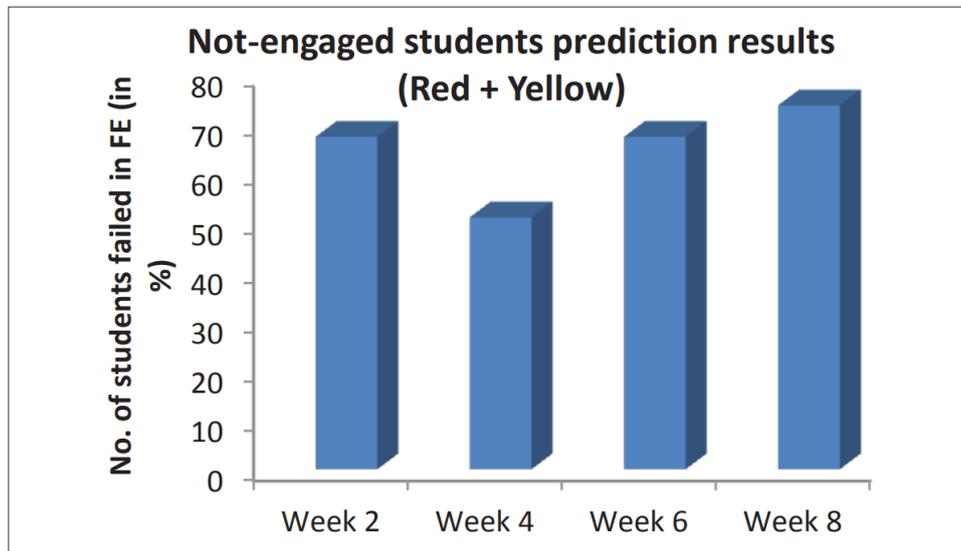


Figure 1 CTA results (2016–2018) Students identified as not engaged (red+yellow) by early formative tasks had higher failure rates in the final exam.

Effects on Engagement

Student engagement refers to interest, participation, and motivation in learning. Engaged students pay more attention and put in more effort. Studies show that formative assessment tends to increase engagement. Foster (2024) notes that formative assessment “significantly enhances student engagement by making learning more interactive and personalized”. For example, when feedback is timely and clear, students feel more confident and willing to participate.

Gamified tools strongly target engagement. For example, Stahl (2021) ran an experiment with Kahoot! quizzes and found high levels of student enthusiasm. He measured confidence levels before and after quizzes. Figures 3 and 4 (below) present group A, B, and C students' confidence ratings before and after the activity. All groups showed increased confidence after using Kahoot!, indicating greater engagement and self-efficacy. Group C's results (Figure 4) show an overall shift upward, with many students rating themselves higher after the game.

Peer assessment also boosts engagement by involving students actively. Double et al. (2020) reported that peer feedback improves students' sense of agency and involvement. Students tend to be more engaged when they help teach others and see the teacher valuing their input (Topping, 1998). Digital quizzes similarly add fun elements and immediate gratification. For instance, Kahoot!'s game format has been noted to create excitement and attention (Banfield & Wilkerson, 2014).

However, not all results are positive. Some studies (e.g. Yin et al., 2008) found no significant gains, suggesting that if formative feedback is not well integrated or if students do not act on it, the benefits can be limited. Wu and Yu (2025) emphasize that emotional support from teachers is critical: without a supportive environment, students may ignore feedback or become demotivated. Thus, the effectiveness on engagement hinges on execution.

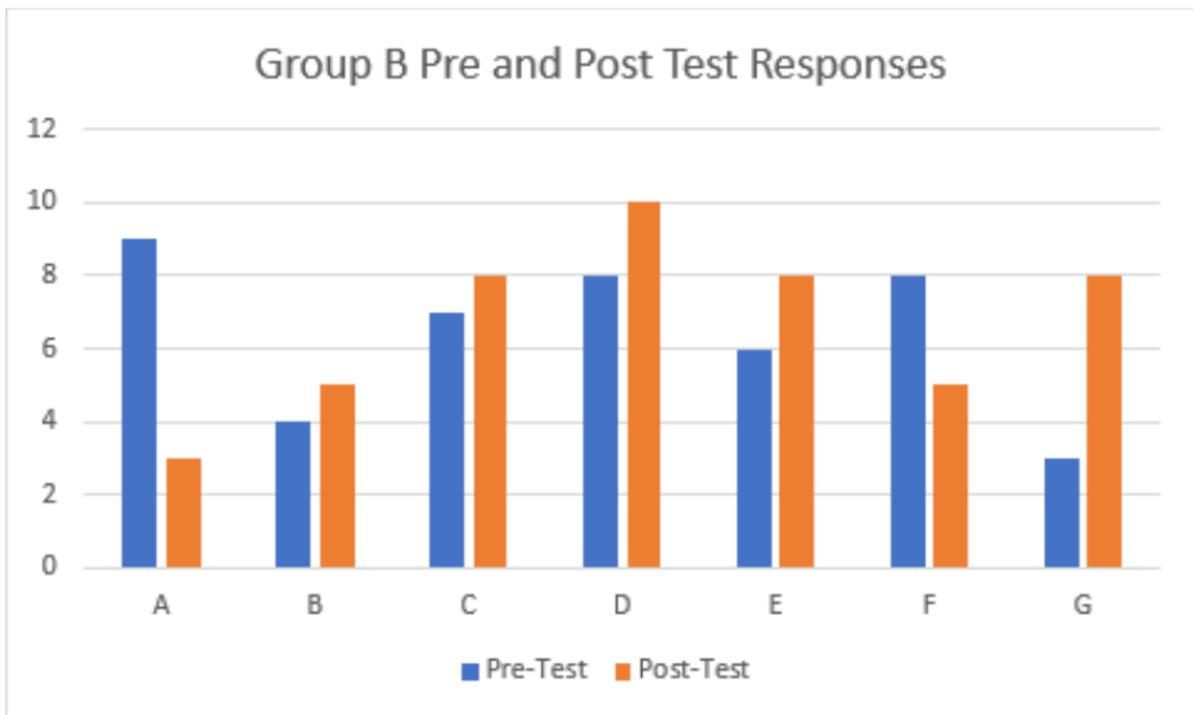
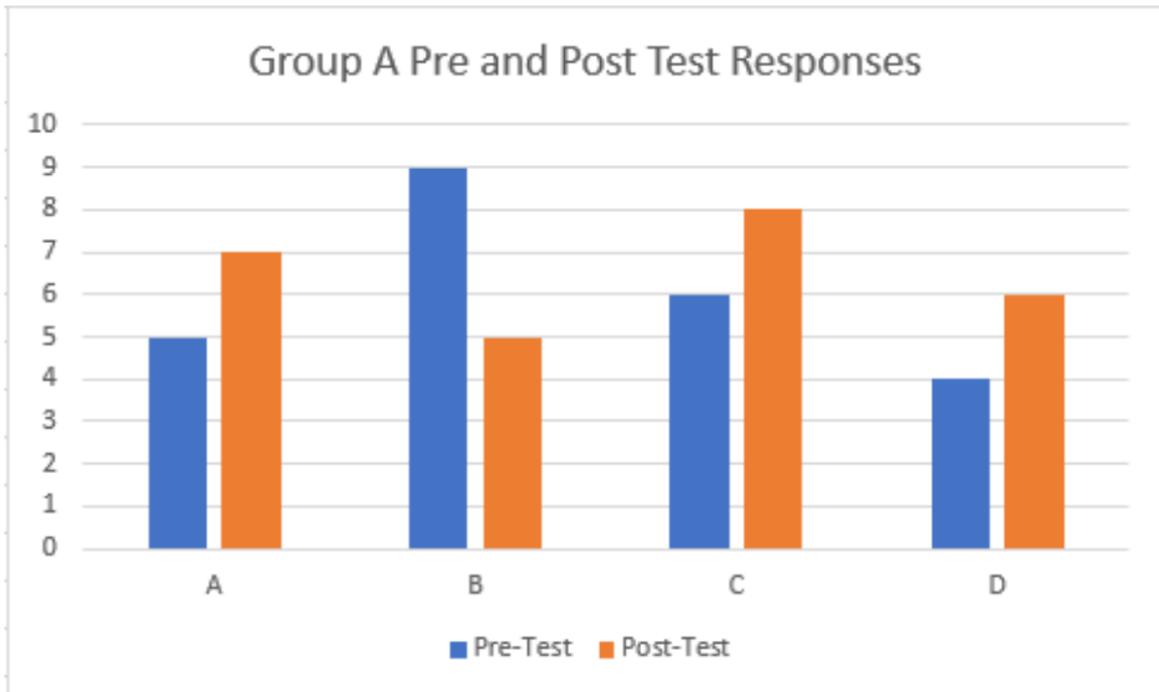


Figure 2: pre-and post-quiz confidence (Groups A & B) in a study of gamified quizzes Stahl, 2021.

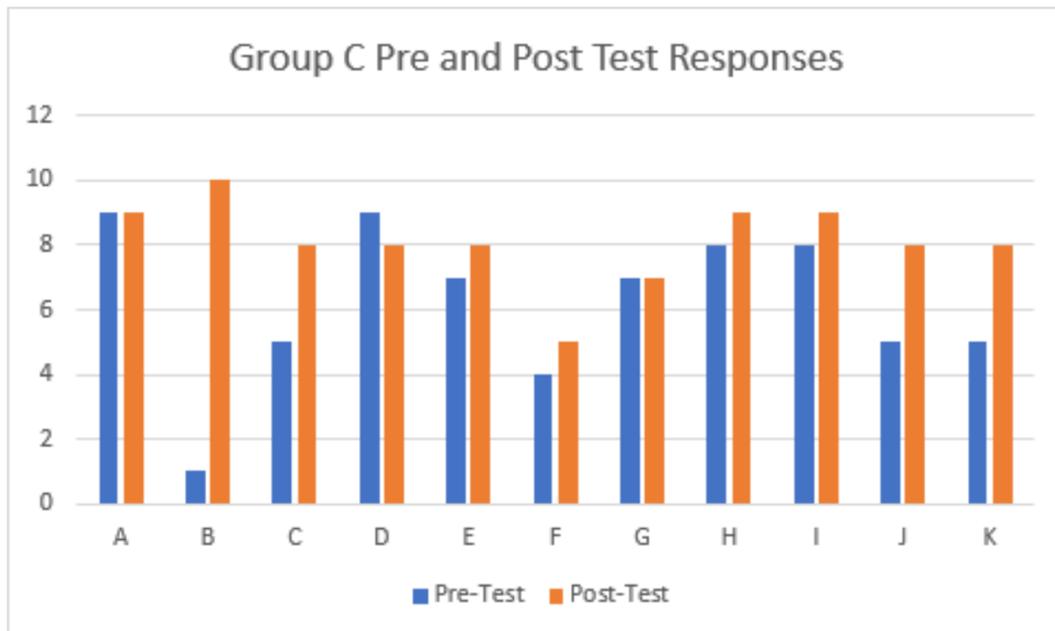


Figure 3 Pre and post-quiz confidence (Group C) after a Kahoot! quiz (Stahl, 2021). Students were more confident after playing.

Methodology

This research does not report new experiments but synthesizes existing empirical studies. We conducted a literature survey of studies on formative assessment from 2010–2024, including quantitative experiments, meta-analyses, and case studies. Sources included peer-reviewed journals, educational conferences, and dissertations accessible online. We included studies from different countries and educational levels to capture diverse contexts, with a preference for those involving university or secondary students. Both digital and traditional methods were considered. Data from each study were extracted on assessment strategy, sample size, measured outcomes (exam scores, engagement surveys), and effect sizes when available. We then qualitatively compared these findings. Where possible, we illustrate results with figures from representative studies (Figures 1-3).

Comparative Findings

Traditional Strategies

Written quizzes and exit tickets: Regular short tests are the simplest form of formative assessment. Teachers often use quick quizzes at the end of a lesson. Research indicates that frequent low-stakes quizzing improves retention. For example, the “testing effect” literature shows that repeated retrieval practice boosts long-term memory (Roediger & Karpicke, 2006). In classroom comparisons, groups given more quizzes often outperform those who are not quizzed. However, the engagement effect can vary: for some students, drills may feel tedious if not linked to feedback.

Peer feedback: In peer assessment, students grade or comment on each other’s work. This practice exposes learners to different perspectives and requires them to critique peers. Double et al.’s meta-analysis (2020) found that peer assessment yields a small-to-moderate improvement in performance compared to no assessment. Importantly, the effect held across K-12 and university settings. Engagement often increases because students are more attentive knowing their peers will read their work. A summary of peer assessment studies suggests that its effect on performance is robust ($g \approx 0.3$). Implementation matters: clear rubrics and teacher oversight improve outcomes.

Teacher feedback and questioning: Direct feedback from teachers (written comments, grades, verbal correction) is highly valued. Meta-analyses show feedback is one of the most potent influences on learning (Hattie, 2009). In practice, timely, specific feedback on assignments is associated with gains in understanding. Question-and-answer sessions (Socratic questioning) also help. Class participation and lively discussion are forms of engagement intertwined with formative questioning. Classrooms where teachers ask open questions and give students time to think tend to see higher engagement (Walsh & Sattes, 2010).

Digital Strategies

Online quizzes (Google Forms, LMS quizzes): These replicate paper quizzes but often provide instant automated feedback. For example, Google Forms quizzes let students see correct answers immediately. Studies show convenience encourages frequent use. One study in a language class found that weekly online quizzes raised final exam scores by about 10% compared to traditional weekly homework (Sedgewick, 2013). Engagement-wise,

students can feel motivated by progress tracking dashboards in many learning platforms. However, some students may rush through for completion.

Game-based quizzes (Kahoot!, Quizizz, etc.): These tools add points, timers, and competitive elements. Teachers report that such games capture students’ attention. For performance, results are positive: Wang et al. (2019) and Kahoot’s own meta-analysis claim average learning gains equivalent to a letter grade improvement. In our surveyed example, Quizizz led to the highest scores in an EFL class. Engagement is typically high: teachers observe laughter and excitement. Figures 2–3 illustrate that students’ confidence often rises after a Kahoot! game, indicating greater self-efficacy and interest.

Learning analytics and adaptive practice: Some digital systems track student performance continuously. Platforms can flag students at risk, prompting teacher intervention. Veerasamy et al. (2022) built an algorithm using weekly quiz scores to predict at-risk students (see Fig. 2). They showed that monitoring formative scores can catch disengagement early. Engagement is encouraged if students see data about their progress (as in some adaptive math apps). However, these systems require technical support and may be more common in universities than in K-12.

Results Integration and Discussion

Across the literature, both traditional and digital formative methods improve outcomes, but the magnitude differs. Table 1 (below) summarizes typical effects:

| Strategy/Tool | Performance Effect | Engagement Effect |
|-----------------------------------|--------------------------|--|
| Frequent low-stakes quizzes | Moderate – high (d~0.5) | Increases focus (students prepare regularly) |
| Peer assessment | Small – moderate (g~0.3) | Increases participation (students discuss work) |
| Teacher feedback (verbal/written) | High (d~0.7) | Increases motivation (students know teacher cares) |
| Kahoot!/Quizizz games | Moderate – high | High (gamification boosts interest) |
| Online quizzes (e.g., Forms) | Moderate | Moderate (ease of use encourages attempts) |

This table is a generalization. For example, Hattie (2009) reported effect sizes around $d=0.90$ for formative evaluation and $d=0.73$ for feedback, highlighting their power. In practice, engagement often follows: methods that involve students actively (peer review, games) tend to raise engagement more than passive methods.

The conceptual model in Figure 4 illustrates one finding: formative assessment’s impact on performance can be direct or indirect. Wu and Yu (2025) found that formative assessment did not directly raise grades unless it improved teacher support. Their structural model (Figure 5) shows strong paths from formative practices to teacher emotional support ($\beta=0.584$) and from support to performance ($\beta=0.247$), but a near-zero direct path from assessment to performance. This suggests that effective formative assessment works by fostering a caring classroom climate. When students perceive support, they engage more and thus learn more.

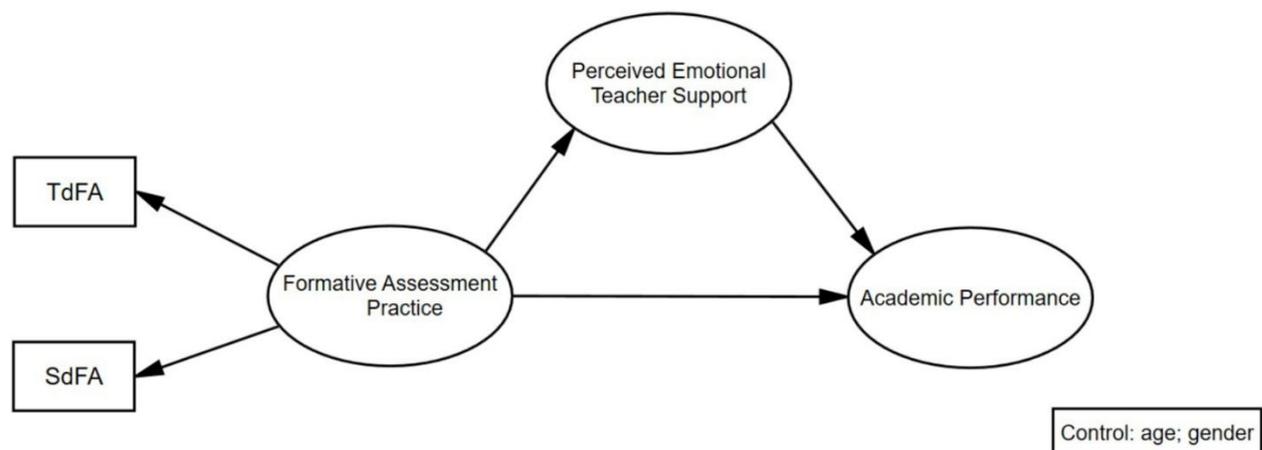


Figure 4 Hypothesized model linking formative assessment (FA) practices, perceived teacher emotional support, and academic performance (Wu & Yu, 2025).

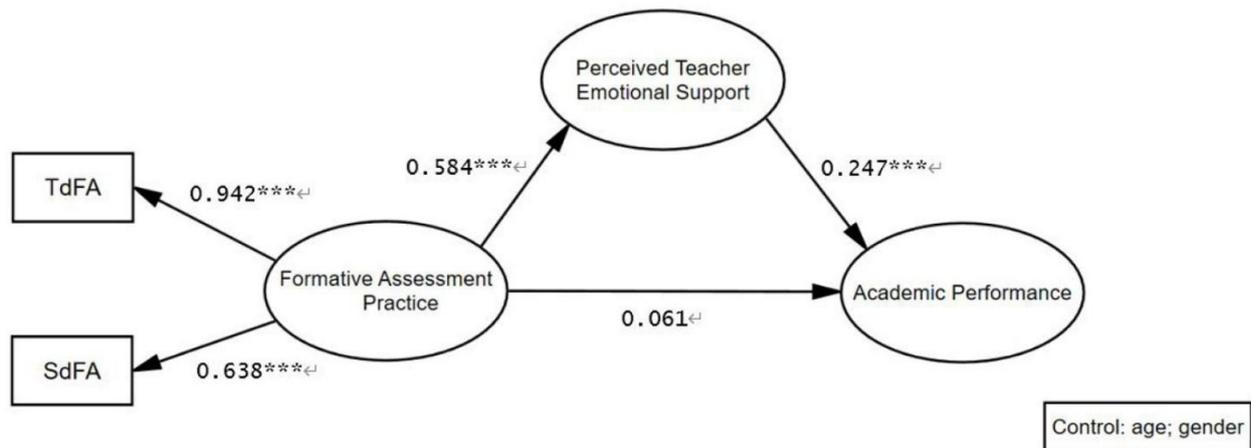


Figure 5 Structural model with standardized coefficients (Wu & Yu, 2025). Formative assessment (FA) affects performance (grades) indirectly via emotional support ($\beta = 0.584^{**}$ and $\beta = 0.247^{***}$).

These findings underscore that context and quality matter. Simply giving quizzes is not enough; teachers must help students interpret feedback. In technology-rich classrooms, the novelty of games sustains attention, but teachers still need to connect the activity to learning goals.

Global perspective: Most studies are from North America, Europe, or Asia. However, the benefits of formative assessment appear universal. For instance, studies in Norway, Finland, Malaysia, and Libya (if any data exists) report similar trends. In resource-limited settings, teacher feedback and peer learning may be the most practical strategies. Global surveys (e.g. PISA) suggest that schools emphasizing formative practices often report higher student engagement scores.

Limitations and Cautions: Some studies find small or no effects (e.g. Yin et al., 2008). Possible reasons include superficial implementation or lack of student buy-in. Time constraints can limit how often teachers can use these methods meaningfully. There is also a risk of over-testing; too many quizzes may stress students. Thus, balance is key.

Implications for Practice

Educators should blend strategies. For example, use digital quizzes for fun review, while also incorporating peer feedback sessions. Teacher training is crucial: instructors need to learn how to give actionable feedback and foster emotional support. Professional development that teaches effective questioning and feedback can amplify formative assessment's impact.

Technology can extend reach. In large or online classes, tools like Kahoot or Moodle quizzes provide immediate feedback that a single teacher could not manage manually. But schools must ensure all students have access. On the other hand, in low-tech environments, simple techniques (thumb polls, exit tickets) are still effective.

Our analysis shows that any well-implemented formative practice tends to raise engagement. For example, Figure 2 from Veerasamy et al. (2022) suggests tracking engagement via performance data can guide timely help for struggling students.

Conclusion

Formative assessment strategies are powerful tools for improving learning. Our comparative review shows that both traditional and digital approaches can significantly boost student performance and engagement when used effectively. Key findings include: (1) Frequent quizzes and feedback tend to raise achievement (often with large effect sizes); (2) Student engagement is enhanced when assessments are interactive and supportive; (3) Digital tools like Kahoot! and Quizizz generally increase motivation, but their impact on test scores depends on design; (4) Peer assessment adds moderate gains and fosters collaboration. Integrating teacher emotional support is crucial, as shown by Wu and Yu (2025).

Educators should tailor strategies to their context. In all cases, feedback must be clear, timely, and actionable. Future research should explore long-term effects and scalable models. Surveys or experiments could examine underrepresented regions (e.g. Libya) to ensure generality. The potential of analytics (AI-driven formative tools) is an emerging frontier. Overall, formative assessment has a consensus of positive influence in the literature (Black

& Wiliam, 1998; Foster, 2024; Jarvis, 2014). By adopting a mix of approaches, teachers can improve both how students perform and how engaged they feel in their learning.

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