Enhancing Formative Assessment Practices with Strategic Use of the Activity Builder

Dana Cox[1], **Suzanne Harper**[1]**& Leah Simon**[2]
[1]Miami University; [2]Dayton, Ohio

Abstract

We explore how the Amplify Classroom Activity Builder (AB) enhances formative assessment practices in secondary mathematics classrooms. Drawing on Wiliam and Thompson's (2008) framework, we examine three key formative assessment strategies: engineering effective classroom discussions; providing feedback that moves learners forward; and activating students as instructional resources for one another. Illustrating using the "Fit Fights" lesson, we demonstrate how AB addresses common formative assessment challenges by providing real-time access to student thinking, enabling immediate non-judgmental feedback, and facilitating peer collaboration. We claim that well-designed digital activities can transform classrooms from teacher-centered evaluation to collaborative learning environments where students become active agents in their mathematical understanding, effectively bridging summative assessment tools and authentic formative assessment practices.

Keywords: Formative Assessment, Technology, Problem Solving

1 Introduction

Formative assessment (FA) practice happens in classrooms where teachers use evidence of student learning to make informed decisions about how to move forward in their teaching (Black & Wiliam, 2009). This is different from summative assessment practice, which is used to determine mastery at the conclusion of a lesson or unit. Teachers using FA practices utilize lessons that are designed to elicit student thinking and remain flexible and responsive to what they observe.

Effective formative assessment is not just one quick activity; it's a continuous, multi-step cycle that can be time-consuming and difficult to manage in a classroom. Specifically, it requires careful consideration, design and enactment of tasks that elicit student thinking. It also requires in-the-moment multitasking; teachers need to gather, interpret and analyze evidence of thinking, provide feedback to individuals, and make adjustments to instruction.

The Amplify Classroom Activity Builder (AB) is an online design tool that supports summative and formative assessment practices. From a summative perspective, teachers can design prompts that assess mastery and provide students with immediate feedback, then receive data about their students' progress. However, AB is more than just a way to deliver problem sets or summatively assess what students are able to perform; it can also support FA practices by providing real-time interactive feedback to students and teachers. When combined with well-designed tasks, AB eases the burden of engineering high-quality class discussions that are built on student thinking, opens opportunities for feedback, and empowers students as learning resources for one another. In this paper, we explore that side of AB and illustrate its potential to expand FA practice. In particular, we investigate how a well-designed task can engage students, support learning from mistakes and peers, and provide teachers with data to support instructional decisions. We will discuss new ideas about encouraging students to test and revise their thinking and about capturing auditable trails of mathematical problem solving (Harper & Cox, 2018).

2 Formative Assessment Practice

Teaching is largely about knowing where your students are, setting a goal for where you'd like them to be, and determining how to get there, but that doesn't mean it's all the teacher's responsibility! Wiliam and Thompson (2008) imagined classrooms where teachers and students were collaborative agents, each contributing to the overall success of the classroom. Black and Wiliam (2009) define FA practice as that where evidence of student achievement is "elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited" (p. 9). Wiliam and Thompson's (2008) framework in Table 1 frames five key strategies for FA practices.

Table 1. *Aspects of Formative Assessment (Wiliam & Thompson, 2008, p. 8)*

	Where the learner is going	**Where the learner is right now**	**How to get there**
Teacher	**1** Clarifying learning intentions and criteria for success	**2** Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding	**3** Providing feedback that moves learners forward
Peer	Understanding & sharing learning intentions and criteria for success	**4** Activating students as instructional resources for one another	
Learner	Understanding learning intentions and criteria for success	**5** Activating students as the owners of their own learning	

In achieving FA practice, AB is particularly effective at helping transform the classroom experience into one where student voices are heard. We have selected three of these strategies to highlight how AB can provide an environment where FA can be embedded in instruction. In the following sections, we will expand on strategies 2, 3, and 4.

2.1 Strategy 2: Engineering effective discussions and learning tasks

There is a lot of guidance available for teachers who are engineering effective classroom discussions. The work of Stein et al. (2008) is a seminal framework that describes the five practices of anticipating, monitoring, selecting, sequencing, and connecting student thinking. Identifying student work to display, critique, or compare requires the teacher to have a cohesive storyline in mind and to have access to a wide variety of student thinking.

Rich classroom discussion requires tasks that support it. In particular, digital math activities should include opportunities for students to be creative and to demonstrate understanding through multiple ways, each offering unique insights into their mathematical thinking. Designing for creativity means focusing on the ways that students might approach or solve a task, the solutions themselves, or a combination of both. These tasks are more geared to elicit a variety of student responses, which in turn can help elicit discussion. They also create opportunities for feedback that can continue pushing forward the learning.

There are many challenges inherent in structuring classroom discussions to serve in a formative capacity. First, it is useful to have students' thinking documented in a way that facilitates sharing and consideration. Second, during the selection and sequencing stages, it is important to increase participation beyond volunteers; teachers must have access to a wide range of student thinking, which requires efficient and methodical collection. Third, it is important to include incorrect solutions or failed strategies. This is work that can be difficult for students to share and is often work that might be discarded in the learning process.

The AB dashboard tools solve many of these challenges with eliciting and documenting student work. Students do not have to do any additional documentation outside of the activity prompts, the teacher has access to everyone's thinking in real time, and teachers can create snapshots of students' work to save for later–even if students change their responses throughout the lesson. Pacing tools keep students focused and enable teachers to pause and resume lessons. Teachers can engage individual students with interactive feedback chat boxes, anonymize student work to encourage greater participation, and take snapshots of works-in-progress without slowing students down or redirecting their efforts. Further, aggregate views of student work help teachers make decisions about what mathematics needs more focus when pausing or even concluding the lesson.

2.2 Strategy 3: Providing feedback that moves learners forward

Not all kinds of feedback to students are equally effective in promoting mathematical learning and growth. Unlike summative scores that simply rank performance or evaluations that label solutions as merely correct or incorrect, effective formative feedback should engage students in mindful, reflective ways that propel them forward in their mathematical thinking and understanding. As Wiliam (2007) emphasizes, "feedback is formative only if the information fed back to the learner is used by the learner in improving performance" (p. 1075). This distinction highlights the critical difference between feedback that informs versus feedback that transforms learning. Traditional feedback often positions teachers as the primary evaluators, creating a relationship where students become passive recipients of judgments about their work. By strategically shifting the evaluative role from the teacher to AB, this approach frees the teacher to focus on how they can support students in other ways. In this role, the AB functions as a neutral mirror through which students can observe and analyze their mathematical thinking processes. Further, this feedback is immediate; rather than waiting for teacher approval or correction, students can independently examine what they have inputted relative to the expected mathematical outcomes. This enables students to evaluate their reasoning and computational processes, developing crucial metacognitive skills that extend far beyond any mathematical problem.

The power of the feedback the AB provides lies in its ability to cultivate student mathematical independence. When students can examine their work, they increase their capacity to identify gaps in their understanding, recognize patterns, and revise their understanding. This process transforms students from passive learners waiting for external validation into active mathematical thinkers who can monitor, evaluate, and adjust their learning strategies.

Furthermore, this type of formative feedback promotes a growth mindset by repositioning mistakes as learning opportunities rather than failures. When feedback comes from a non-judgmental technological source, students may feel more comfortable experimenting with different approaches, taking mathematical risks, and engaging in the iterative process of problem-solving that characterizes authentic mathematical work. Thus, AB becomes a supportive learning partner rather than an evaluative authority, encouraging students to view feedback as information to guide their next steps rather than a final judgment on their mathematical abilities.

2.3 Strategy 4: Activating students as instructional resources for one another

Activating students as instructional resources for one another requires engineered opportunities for students to express, listen to, and critique mathematical thinking. Student conversation makes thinking and understanding more explicit for the individuals involved and has the added benefit of being observable by a teacher. Further, working in pairs or small groups can increase the cognitive engagement of students, particularly when the task requires careful negotiation and elaboration.

What we are looking for in the design of a task is something that provokes conversation, gives students access to the thinking of classmates, and invites debate or critique. It's important to create a classroom culture where students feel comfortable sharing their mathematical thinking and also know how to receive the thinking of others. This is supported within the structure of AB.

Limiting a pair of students to a single computer encourages meaningful collaboration rather than parallel work, as students cannot simply divide tasks or work independently on separate devices. No matter the task, students must negotiate their mathematical understandings through verbal discussion and physical interaction with the shared interface. They need to articulate their reasoning to convince their classmate, listen carefully to alternative approaches, and work together to resolve disagreements about mathematical concepts or problem-solving strategies. This shared computer setup creates natural opportunities for students to explain their thinking, question each other's methods, and build on one another's ideas, making their mathematical reasoning visible and open to collaborative refinement. The physical limitation becomes a pedagogical advantage, requiring students to slow down, instead of rushing to input answers, and engage in the kind of mathematical discourse that deepens understanding.

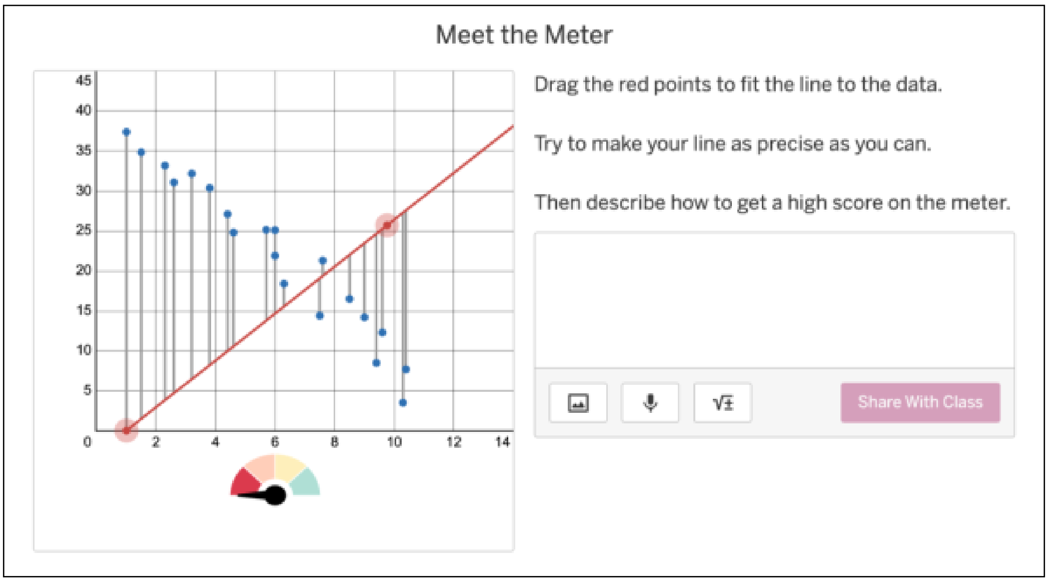
3 *Fit Fights*: An Illustration in Action

A single lesson can often provide multiple types of FA to students and teachers alike. With careful design, teachers can engineer effective classroom discussions that elicit evidence of student understanding (strategy 2) and provide feedback that moves learners forward (strategy 3) while activating students as instructional resources for one another (strategy 4). AB supports this by combining timely student-facing feedback with structures for student collaboration and the teacher dashboard.

We adapted *Fit Fights* (https://classroom.amplify.com/activity/68475b6ece5e2312af006043; Amplify Classroom, 2025), a lesson in AB where students learn about fitting lines to sets of data in scatter plots, to include a few additional moments for FA at the beginning of the activity. Students begin by creating lines to fit given data sets presented in a scatter plot. Then, they reason about what makes a line a good fit for the data. Next, the activity introduces the *Goodness of Fit Meter* as a tool to concretely measure the fitness of a line from least accurate to most accurate through a four-color dial that is red, orange, yellow, and green (see Figure 1). The activity ends with a challenge creator where students create their own scatter plots, then precise lines of best fit for their own and their classmates' scatter plots. You may want to explore *Fit Fights* on your own before continuing, although the teacher dashboard and aggregate views will not be available until you assign it to a group of students.

Figure 1

Introducing the Goodness of Fit Meter *(Amplify Classroom, 2025)*



As your students engage with the activity, the dashboard allows you to monitor their progress from multiple views that provide an overview of where the class is collectively as well as each student's progress. With features that allow you to have access to all student screens, you can pace students through a subset of the screens, pause the lesson for whole-class announcements, and select and sequence student work to present for discussions. Figure 2 shows a dashboard for a sample class. There, you can see the pacing tools at the top of the screen along with the individual responses and screens from each of five students. If you click on a checkbox or mini screen, additional features allow you to snapshot their work or send interactive feedback through a chatbox (see Figure 3).

Figure 2

Dashboard tools with five student responses (Amplify Classroom, 2025)

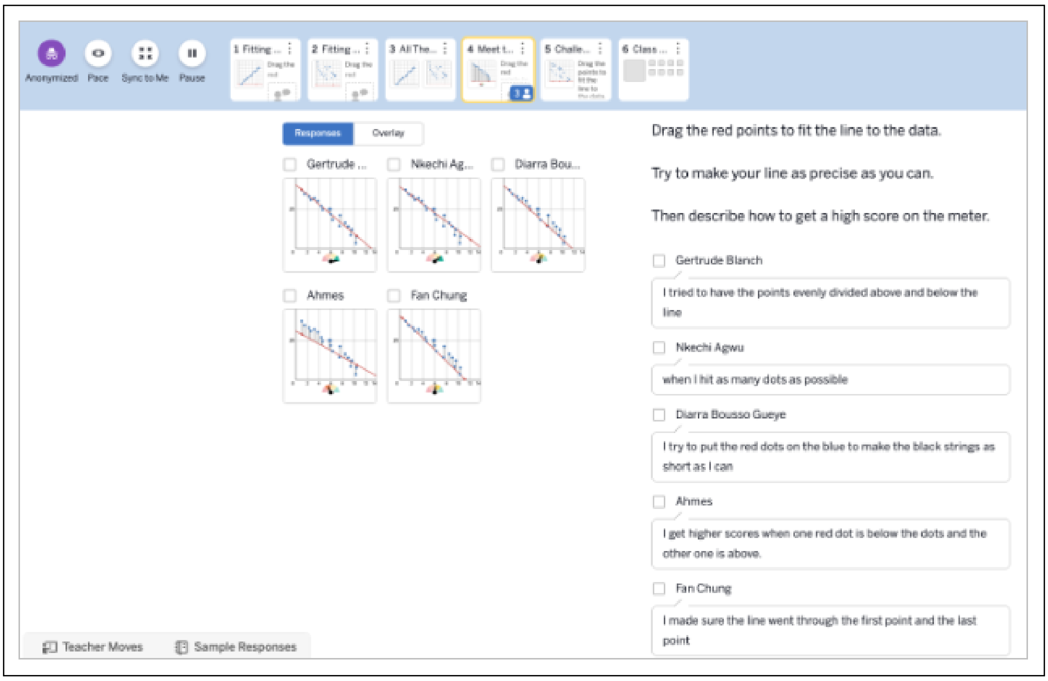
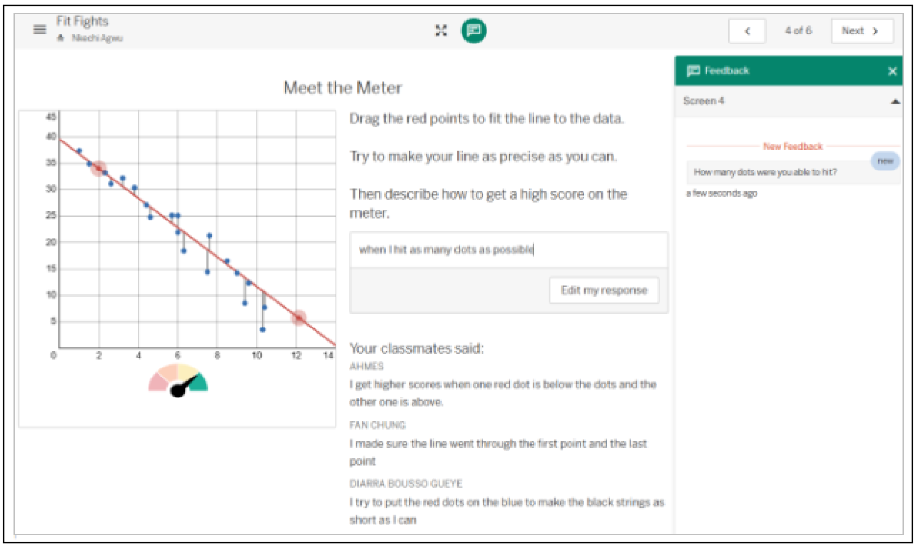


Figure 3

Teacher-provided feedback to an individual student (Amplify Classroom, 2025)



Teachers are not the only ones with access to real-time student thinking in *Fit Fights*. After entering their own ideas on screens 1, 2, and 4, students have access to a limited number of their classmates' responses, shown in Figure 3, so they can learn how a few of their classmates are reasoning. Then on screen 3, students can see all the lines their classmates created, aggregated into a single graph. Here, aggregated student work becomes a data set that enables students to compare and contrast lines of fit and reflect on what makes a line a better fit than another. In both cases, *Fit Fights* is activating students as instructional resources for one another.

The *Goodness of Fit Meter*, combined with lines in the graph showing each point's vertical distance from the line of fit (see Figure 1), provides gradual and timely feedback to move students forward in their understanding. At first, feedback is immediate to create space for student exploration and sense-making. Then, feedback is intentionally delayed: students must first create a line of fit before pressing a button to get interpretive feedback. From there, they can revise their response and repeat this process as many times as they want. A "surprise" collaborative element encourages this revision; after students have submitted their lines, the screen will tell students if they have the most precise line of fit in the class.

As students respond to screen 4, you might use snapshots to capture and present four student graphs, one where the *Goodness of Fit Meter* is in each color zone, to facilitate a discussion. This supports engineering effective classroom discussions that are responsive to real-time needs and curiosities of students. Students can notice and discuss the relationships between the data points, lines of fit, and how they are able to get the meter into the green zone. *Fit Fights* is structured to support specific learning goals, but flexible enough that whole class discussions are responsive to and reflective of student thinking.

The activity ends by positioning students once again to be instructional resources for each other. Within a challenge creator, each student plots points on a digital sketch to create a scatter plot, then creates a line of fit for their scatter plot that is in the green zone of the meter. Students then solve each other's challenges by creating lines of fit that land in the green zone of the meter. This can result in a wide variety of challenges that might include scattered points with no clear pattern, a straight line of points, curves, smiley faces, and other creative patterns. Again, student interactions with each other support them to expand their understanding of what lines of fit are, explore different lines that might fit a single data set, and possibly even consider what scatter plots the lines don't fit, foreshadowing future learning. Teachers can utilize the dashboard to highlight unique challenges and solutions that help students further expand their understanding and reflect on their learning throughout the activity.

4 Conclusion

Shifting to a formative assessment culture offers profound benefits that extend far beyond the immediate goal of adapting instruction. First, as students move from performing mathematics to learning, it builds a growth mindset and normalizes mistakes. It also raises student autonomy. Learning is more visible to teachers, but also to the students themselves; they learn to identify their own "stuck points." It also develops self-regulation. Instead of just following a teacher's procedural steps, students learn to ask themselves questions like, "Does this answer make sense?" "What strategy should I use here?" and "What do I understand, and what am I still confused about?" Lastly, it promotes ownership. When students are part of the feedback loop, they are no longer passive recipients of grades. They become active agents in their own education, co-owners of the learning journey.

Fit Fights is just one example that illustrates the power of AB to support FA practices in the mathematics classroom. With these three FA strategies in mind, you can find other ready-made activities to support you and your students. As you search for activities on the Amplify website or by searching for teacher-made lessons, look for activities that fit your FA goals. First, look for activities that ask students to document their thinking within the activity so that you have access to a wide range of thinking on the dashboard. Second, look for activities that cultivate student mathematical independence; students should be able to examine their work to look for gaps, recognize patterns, and revise their thinking. Third, look for activities and tasks that provoke conversation, give students access to their classmate's thinking, and invite debate or critique. It may be uncommon to find lessons that do all this at once, but that isn't necessary for each and every lesson you use. If you want to try designing some yourself, there are tutorials available on the Amplify Classroom website. Any opportunity to learn from students and peers is worth taking!

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Dana Cox is a faculty member in the Department of Mathematics at Miami University. Her research centers on documenting the mathematical thinking of students and teachers, writing curriculum that exposes this thinking for use in instruction, and positioning teachers as knowledge generators. She advocates for empathetic methodologies such as Narrative Inquiry that give voice to research participants and document lived experiences.

Suzanne Harper is a faculty member in the Department of Mathematics at Miami University. Throughout her career, Suzanne has been interested in how technology can transform mathematics education. Her work has evolved from basic implementation of technology tools to more sophisticated examinations of how technology shapes mathematical thinking, mathematical creativity, teacher beliefs, and authentic problem-solving experiences.

Leah Simon is a former high school math teacher and a K-12 digital curriculum designer. Her research interests include mathematical design thinking and the ways in which technology can enhance student learning.