

Knowing What Students Know: Formative Assessment and Progress Tracking in Games

Authors

WestEd

Betsy McCarthy, Ph.D., Senior Research Associate

Michelle Tiu, Research Associate

Abstract

The authors, evaluators for the CPB-PBS *Ready to Learn* Initiative, provide an overview of how educational games can leverage the use of formative assessment in the classroom environment to enhance student learning. The paper highlights research around the advantages of using formative assessment in the classroom and identifies examples of games that employ progress trackers from the CPB-PBS *Ready to Learn* Initiative.

Games Allow Educators to Embed Tools for Formative Assessment

Games have the potential to revolutionize student learning inside and outside the classroom, especially in the areas of early literacy and STEM education. When coupled with a new technological tool, progress tracking, games can help parents and teachers use formative assessment with ease to enhance student learning. Games developed through the federally-funded CPB-PBS *Ready To Learn* Initiative are using progress tracking and formative assessment to help improve the math and literacy skills of young children in high-need communities.

Formative assessment is a process used by teachers during instruction that provides feedback on students' learning. Once the teacher has this feedback, she can adjust her teaching and target instruction to best meet students' learning needs. These adjustments during instruction help students to achieve the intended instructional outcomes of the lesson.¹ Research has shown that formative assessment can be a promising tool to help students learn. Formative assessment informs teachers on student understanding of content in a timely manner, allowing teachers to adjust their lessons and pedagogy to improve student learning. However, carrying out formative assessment with traditional classroom tools often requires an impractical amount of time—teachers must gather diagnostic data from each student, analyze it, and provide timely feedback to each student. With the prevalence of new technology in classrooms, technological support can make rich formative assessment feasible for a classroom teacher (National Research Council, 2001).²

Prior research has shown technology-supported formative assessment produces measurable benefits for students. For example, Yeh (2010) found that technology-supported formative assessment enables teachers to provide more individualized instruction, which especially benefited younger students and which was one of the most powerful advantages of new classroom technologies over traditional instructional materials (Yeh, 2010).³ Studies of

¹ Adapted from: FAST SCASS. (2008). *Attributes of Effective Formative Assessment*. Washington, DC: Council of Chief State School Officers.

² National Research Council. (2001). *Knowing what students know: The science and design of educational assessment*. J. W. Pellegrino, N. Chudowsky, & R. Glaser (Eds.). Washington, DC: National Academy Press.

³ Yeh, S. S. (2010). Understanding and addressing the achievement gap through individualized instruction and formative assessment. *Assessment in Education: Principles, Policy & Practice*, 17(2), 169-182.

computer-delivered instruction have highlighted the importance of feedback to the student in promoting learning in math and science. In individual-student environments, feedback most often takes the form of immediate notification of correct or incorrect answers and providing hints to the student on demand. Feedback can also be useful when it is delayed, giving students the opportunity to complete a longer investigation before being notified of their progress (Gweon, Rose, Albright, & Cui, 2007).⁴ Yeh (2009) also found that technology-supported formative assessment is 124 times more cost-effective than class-size reduction policies.⁵

Games Provide Unique Affordances for Formative Assessment

Games provide the opportunity to transform the use of formative assessment in the classroom, by providing unique affordances that other media cannot. Specifically, online gaming lends itself to powerful forms of formative assessment by providing individual and timely feedback on student learning to teachers as well as parents. Many of the products developed through the CPB-PBS *Ready to Learn* Initiative employ leveling and other progress tracking features that can provide teachers with the practical tools needed to bring formative assessment to the home and to the classroom.

Progress trackers are built-in digital tools that monitor and track a student's progress through a game or interactive. Some progress trackers are able to assess individual student performance levels in real-time and provide instant feedback to teachers and parents on children's learning activities. When teachers and parents visit pbskids.org/Lab, they can create an account to track children's progress through math or literacy content in many of the games developed for *Ready to Learn*. At that time, teachers and parents can also choose which technologies and platforms are available in their classrooms or households. With this information, the tracker can, for instance, send parents and teachers emails or text messages with weekly progress summaries for children and view extended offline activity ideas. The tracker will also recognize the various platforms available to the child. Whether a child plays a game online or on a mobile device, the tracker records all of the progress from each platform in a central location.

Progress Tracking Provides Opportunities for Formative Assessment

Games with embedded progress trackers provide parents and teachers with the ability to monitor their child's learning and to access resources that best support the child at specific phases of learning. For example, in the *Curious George's Busy Day* transmedia suite, students earn virtual "stickers" for their sticker book each time they successfully complete a *Curious George* math game on PBS Kids Lab. Parents can log-in to their pbs.org account and see the progress their child has made in the game. By viewing the child's progress via the virtual sticker book, and by checking the progress tracker to see which activities their child played that day, parents are able to determine what skills their child may have mastered or need additional practice with. On the *Curious George* website, there is a link for parents to access "Printables," which are off-line companion activities to the online games. Knowing which games their child has played that day, parents can visit the site and choose the appropriate offline activities to help reinforce learning for their child.

⁴ Gweon, G., Rose, C., Albright, E., & Cui, Y. (2007, July). *Evaluating the effect of feedback from a CSCL problem solving environment on learning, interaction, and perceived interdependence*. Presented at Conference on Computer Supported Collaborative Learning (CSCL-07), Rutgers University.

⁵ Yeh, S. S. (2009). Class size reduction or rapid formative assessment? A comparison of cost-effectiveness. *Educational Research Review*, 4, 7-15.

Similarly, teachers can use progress trackers to acquire data for each student in their class for remediation and re-teaching and to compare all children's progress through specific academic content. In the *Ready To Learn* products, teachers are able to use the immediate feedback from student progress trackers to inform them of the skills their students are struggling with and enable them to create customized additional practice. On the *Curious George* website, teachers are able to access the *Curious George Game Maker*, a tool which allows them to use the templates and graphics from pre-made *Curious George* games their students have already played to create new, customized games that target the specific skills their students need extra practice with. The progress tracker would continue to work in these new versions of the game, allowing teachers to use formative assessment tools in additional lessons.

Design of Progress Tracking Requires Technological and Pedagogical Expertise

Creating effective formative assessment requires game producers to have expertise in both technology development and instructional content. On the technical side, producers must have knowledge of how to embed progress trackers into their games that are capable of capturing and reporting data at key points in the game. On the curriculum side, producers must collaborate with teachers and other educational experts in order to determine what data are useful to parents and teachers, so that they can understand how students are progressing through academic content and where they might need additional support.

There is great promise in developing formative assessment tools for educational games in the classroom and at home. As educational games become more prevalent in school and at home, there are increased opportunities for providing teachers and parents with immediate feedback on student progress, enabling them to better support children's learning.