Screencasting and Early Mathematics Learning

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Introduction

Screencasting is a digital recording process that captures an individual’s actions on a computer screen and accompanying sounds and speech (Educause, 2006; Udell, 2005). For many years, educators have produced screencasts to share information, offer feedback to students, and support literacy skills (Soto, 2015; Sugar, Brown, & Luterback, 2010; Seror, 2012; Lu, Ottenbreit-Leftwich, Ding, & Glazewski, 2017). More recently, teachers and researchers have begun to recognize the potential educational benefits of having students produce screencasts of their own thinking and learning. As mobile technologies such as iPad® devices become more common in elementary classrooms (Lu, Ottenbreit-Leftwich, Ding, & Glazewski, 2017), screencasting applications (apps) like Explain Everything™ and ShowMe offer opportunities to support and strengthen learning and teaching in early mathematics. Research suggests that when students use screencasting apps to record their own mathematical problem-solving strategies, students may develop deeper understandings of mathematical concepts, and teachers may gain greater insight into students’ mathematical thinking (Thomas, 2017). This brief describes the potential that screencasting offers for supporting early elementary mathematics learning.

How screencasting may support mathematics learning

When solving mathematics problems, students can use screencasting apps to create videos that capture their visual illustrations and markings on the screen, as well as audio narration of their thinking as they work. With some apps, such as Explain Everything, students can use a virtual whiteboard to draw pictures, add images to their screen, annotate images, or import digital modeling tools to help them work through a problem (Burns, 2014). “Screencasting technology captures student solutions in real time and in a format that contains their written work, gestures, and verbalizations all in one” (Soto, 2015, p. 243). Recordings can be stored and used in a variety of ways by students and teachers in the classroom and in professional development contexts.

Screencasting has been cited as a promising way to get the most out of mobile technologies in the classroom (Soto, 2015). Screencasting aligns with the National Council of Teachers of Mathematics (NCTM) Tools and Technology Guiding Principle¹ (Soto, 2015; Thomas, 2017) and can help support

¹The NCTM Tools and Technology Guiding Principle states that “an excellent mathematics program integrates the use of mathematical tools and technology as essential resources to help students learn and make sense of mathematical ideas, reason mathematically, and communicate their mathematical thinking” (NCTM, 2014, p. 4).
the Common Core State Standards (CCSS) for Mathematical Practice, particularly MP3: “Construct viable arguments and critique the reasoning of others” (Burns, 2014; Thomas, 2017). Under these standards and guiding principles, students should be able to explain their mathematical thinking, which includes using “grade-appropriate vocabulary” to describe their problem-solving strategy and their rationale for choosing that strategy, while modeling their process for solving the problem (Burns, 2014). In alignment with NCTM and the CCSS, students can use mobile technologies to generate screencasts that communicate their mathematical thinking, showcase their reasoning in new ways, and offer teachers unprecedented access into their mathematical thought processes (Soto & Ambrose, 2014; Soto, 2015).

**Potential benefits of screencasting for student mathematics learning**

Research suggests that when students generate explanations for how they solve mathematics problems, they develop stronger understandings of the mathematics they are learning. To maximize the impact of screencasting technology on student learning, students should strive to explain how they solved the problem, with a justification for why they chose that strategy (Kazemi & Stipek, 2001). Students may learn more when their explanations include not only clear verbal communication of their problem-solving strategy but also visual representations, such as mathematical symbols or drawings, to demonstrate their understanding and reasoning (Kazemi & Stipek, 2001; Schleppegrell, 2010). Students benefit when they are encouraged to reflect and create more than one representation and solution strategy when completing mathematical tasks (Soto, 2015).

According to Soto and Hargis (2014), screencasting can be “empowering” because it “helps engage students, promotes their individual understanding, and creates an environment for self-regulation and reflection” (p. 33). Because students can record their own problem-solving processes and replay the recordings, they have an opportunity to reflect on their work, self-correct when necessary, and rerecord a better quality explanation. Screencasts can offer students helpful ways to see and hear their own thinking, which may support them in becoming more independent mathematical problem solvers and help build metacognitive skills. By allowing students to produce audiovisual artifacts that they can review and share with others, screencasting may encourage students to take greater ownership over their learning (McLeod, Lin, & Vasinda, 2012; Thomas, 2017).

In many classroom settings, teachers might not be able to give every student adequate time to share their solution strategies and describe their mathematical thinking to the class (Soto, 2015). Therefore, not every student will have equal opportunity to engage in mathematical discussions. When screencasting technology is available to individual students, however, it can give all students an opportunity to voice and record their ideas as they work through the problem. Students are then able to share their recordings and describe their mathematical thinking with others, in partnered or small-group activities, during full-class discussions, and/or with their teacher (Larsen, McCormick, Buffington, & Louie, 2017). In Soto’s (2015) investigation, students often “attended to the potential audience as they constructed their mathematical explanations” (p. 245) by taking on a teaching persona. Because there is evidence that students explain themselves more clearly and thoroughly when they have an audience, Soto suggests that students may put more care and attention into crafting clear explanations of their mathematical thinking knowing that someone, a classmate or teacher, will review their screencast. This attention and precision, Soto claims, can help students further develop their understanding and potentially increase mathematical learning overall.

**Potential benefits of screencasting for mathematics teaching**

Screencasting technology provides teachers with access to students’ mathematical thinking by offering not just a student’s final answer but also insight into their thought processes as they worked through the problem (Soto, 2015; Thomas, 2017). This added insight can help teachers pose questions or prompts to elicit student thinking (Soto & Ambrose, 2014), engage in formative assessment, individualize instruction, and plan future lessons (Larsen, McCormick, Buffington, & Louie, 2017; Thomas, 2017). As research carried out by Soto and Hargis (2014) revealed: “Because these screencasts captured student thinking as it unfolded, we were able to identify exactly when and how students’ thinking went wrong and help them immediately. We also gained insights when students started solving problems incorrectly but then changed their thinking. We could see what they erased and why. We could also see how they counted or distributed objects” (p. 33).

Not only can screencasting offer valuable insight into student thinking for individual teachers, teachers are also able to share these recordings with each other and use them as a tool for professional development. Screencast recordings can serve as artifacts to generate discussion among teachers about best classroom practices. Screencasts can also demonstrate students’ trajectories of mathematical thinking and understanding across grades, which can help inform instruction at different levels. Utilizing screencasts as a professional development tool brings students’ voices into teacher professional development. Some teachers have reported that they appreciate “seeing/hearing examples of student work” as part of professional learning.
activities (Soto & Ambrose, 2014, p. 12). Likewise, because the screencast recordings are rooted in their own practice and reflective of what's happening in their classrooms, the use of screencasts in professional development has been reported to give teachers a sense of ownership over the content of their professional learning and help teachers build community around their shared classroom experiences (Soto & Hargis, 2014).

**Conclusion**

Screencasting can be a valuable tool for both student and teacher learning (Soto & Ambrose, 2014). The process of recording, reviewing, and sharing a problem-solving strategy through screencasts allows students the opportunity to communicate their mathematical thinking, justify their reasoning, and reflect on and improve their solutions in a way that may foster deeper mathematical understanding. Screencasts of students’ problem-solving strategies offer teachers greater insight into students’ thinking that can help inform instruction, improve assessment, and enrich teacher professional development. When used with strategies that support mathematical discourse and in contexts that encourage students to explain their problem-solving approaches, screencasting activities align with standards and guiding principles of mathematics education, offer students new opportunities to demonstrate their understanding, and provide teachers with unprecedented access into student thinking and artifacts that can enhance professional learning.

**References**


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