

Chapter 20

The Role of Animations and Manipulatives in Supporting Learning and Communication in Mathematics Classrooms

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EXECUTIVE SUMMARY

This chapter describes the use of a computer-based animation and manipulatives to support learning and communication of mathematical thinking in a fourth-grade classroom. The educational animation called Overruled, part of the Math Snacks project (mathsnacks.com), was utilized to address the concept of length units. The animation describes a story in which the king and the queen from two different kingdoms (Kingopolis and Queentopia) fell in love and wanted to unite their territories by constructing a bridge. Engineers from each kingdom were responsible for building their side of the bridge. However, each kingdom has its own length unit. Authors follow research based recommendations to use the Overruled animation in mathematics activity with fourth-grade students.

DOI: 10.4018/978-1-4666-2848-9.ch020

1. OVERALL DESCRIPTION

A wide range of tools can be utilized to support communication in mathematics classrooms. For instance, teachers can utilize computer-based animations as tools to introduce students to a specific math concept while promoting classroom discussions. Manipulatives are other tools that, when appropriately used, could also support communication and learning in mathematics classrooms.

The Principles and Standards for School Mathematics guidelines consider communication as a relevant activity in learning mathematics. Specifically, in grades 3-5, “... communication should include sharing, thinking, asking questions, and explaining and justifying ideas. Students should be encouraged to express and write about their mathematical conjectures, questions, and solutions” (National Council of Teachers of Mathematics (NCTM), 2000, p. 194). In addition, the Common Core State Standards for Mathematics (CCSS-M) emphasize the need for students to “justify their conclusions, communicate them to others, and respond to the arguments of others” (CCSSI, n.d., p. 6-7).

This chapter illustrates a short case in which educational animation and manipulatives were utilized to support communication and learning of mathematical concepts during an after-school program. There were twelve fourth-grade students with a score below proficiency in mathematics based on the standardized state test. Five of the students participating in this case were native Spanish speakers. The authors utilized a computer-based educational animation that involves the concept of length measurement, and a broken ruler as a manipulative to help students learn about measuring objects while communicating mathematically.

2. LITERATURE REVIEW

In a position statement about technology and math education, NCTM (2008) indicates technology is an essential tool for learning mathematics in the 21st century, and all schools must ensure that all their students have access to technology. Effective teachers maximize the potential of technology to develop students’ understanding, stimulate their interest, and increase their proficiency in mathematics. (p. 1)

Even though, in mathematics education, technology is usually related to calculators and interactive mathematical software, instructional animations are also great technological tools that teachers can use to foster students’ understanding and interest in mathematics. These animations have been increasingly popular in computer-based education (Hasler, Kersten & Sweller, 2007). Animated materials have the potential to support students’ learning based on their capacity to depict

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