Using the AMC Anywhere Web-Based Assessment System to Examine Primary Students' Understanding of Number Sense

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EXECUTIVE SUMMARY

This chapter discusses how technology can be used to support formative assessment in primary grades mathematics classrooms. There is a specific focus on how technology can assist teachers in conducting formative assessment, how technology may be used to better understand the data produced from regularly engaging in this type of assessment, and how teachers use the data to individualize lesson planning to increase student learning. The chapter specifically examines the Assessing Mathematics Concepts (AMC) Anywhere Web-based assessment tool. This chapter describes a composite kindergarten classroom. This example is intended to illustrate the entire cyclical process of assessing students, analyzing data, and planning and implementing instruction based on the data. The chapter concludes with a discussion and implications for professional development and future instruction.

FORMATIVE ASSESSMENT AND STUDENT LEARNING

The process of formative assessment is intended to provide teachers with constructive and valuable information about their students' understanding, which allows them to receive continuous feedback and use the data from the assessment to revise and modify their instructional plans (Joyner & Muri, 2011; National Council for Teachers of Mathematics, 2000). William and Leahy (2007) note that in the United States the term formative assessment is often used to describe assessments that serve as predictive benchmarks. When formative assessment is defined in this way the assessment becomes more summative and the impact on student learning is minimalized. Harlow and Jones (2004) conducted study students responses to TIMSS questions by conducting extensive exploratory interviewing students. The interview questions revealed in many cases the summative assessment indicated students' had greater understanding of the material than was reflected in their interview responses. Test taking strategies and understanding the questions played a role in both incorrectly and correctly responding to questions. Interviewing individuals to assess their understanding provided in-depth information; the study concluded recommending considerable caution when using the outcomes of international achievement testing to decide educational policy changes and allocation of resources. The information learned from the interviews in this study supports the need for formative assessment.

Formative assessment is meant to produce data that directly impacts individual instruction for each specific learner (Koellner, Colsman, & Risley, 2009); it requires teachers to connect evidence with instruction and understand the trajectory of student learning (Andrade, 2010). Harlan (2007) states the process of doing mathematics is divided into three strands; problem solving, communicating, and reasoning. He suggests that these strands include skills that are embedded in the modern curriculum and are not limited to mathematics. The skills noted are information processing, reasoning, creative thinking, evaluation, and inquiry skills. Harlan asserts formative assessment needs to support and promote these embedded skills. More specifically, the assessment should provide teachers with how far students have reached in relation to goals, assist teacher in the next steps for learning, help students take the next steps, and include students in the decision process. Research suggests effective formative assessments include the extensive use of feedback to encourage an exchange of learning goals between teachers and students and to move forward with instruction that broadens student learning (Baroudi, 2007; Black & Wiliam, 1998; Black, Harrison, Lee, Marshall, & Wiliam, 2004; Heritage, 2007; Hodgen, 2007; Huinker & Freckmann, 2009). Research studies indicate formative assessment has a significant impact on student achievement, especially for students who are performing below grade level standards (Fuchs & Fuchs, 1986). Although