Chapter 17

Supporting the Common Core State Standards in Mathematics through Mathematics Journals

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ABSTRACT

The Common Core State Standards in Mathematics and English/Language Arts necessitate that teachers provide opportunities for their students to write about mathematical concepts in ways that extend beyond simply a summary of how students solve mathematical tasks. This study examined how mathematics journals in a fourth grade classroom supported students’ mathematical experiences and reflected their understanding of concepts. Implications for the use of technology to support mathematics journals are also discussed.

INTRODUCTION

As part of the Common Core State Standards in both English Language Arts and Mathematics (CCSSI, 2011), teachers have been asked to provide opportunities for students to write about mathematical concepts. However, this can be a difficult task given that most teachers have had little experience using writing as a tool to learn and communicate their understanding of mathematics (Totten, 2005). Literacy and writing skills need to be utilized by teachers in their own mathematical work to model for students how to competently write and communicate mathematically. Competent communication of mathematics includes using the symbols of the content along with definitions.

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and/or vocabulary effectively (Franz & Hopper, 2007). To communicate numeric facts and patterns effectively, students should be taught to draw upon concepts and skills from each of the major academic disciplines and develop quantitative literacy (Miller, 2010). Teachers seeking to use writing in their mathematics lessons to develop quantitative literacy may question which type of writing to employ. Many teachers struggle to link writing and mathematics and honor the integrity of both disciplines at the same time (Wilcox & Monroe, 2011). Teachers find the integration of writing easier in the science or social studies classroom, where there is more factual knowledge (Varelas, Pappas, Kokkino & Ortiz, 2008). In mathematics, writing tends to be limited to merely the summary of steps taken to solve a problem, often lacking depth and opportunities for higher-level thinking (Pugalee, 2009).

Writing across the curriculum is a research-based strategy for supporting students’ conceptual understanding (CCSSI, 2011; Pugalee, 2009). Still, writing in mathematics is an area of writing across the curriculum with very little research. With the beginning of implementation of the Common Core State Standards, teachers are called to provide opportunities for students to write about what they are learning in mathematics, science and social studies. It is important for research to examine the influence of mathematics journals on students’ understanding as well as how to best support students’ experiences writing about mathematics concepts.

PURPOSE OF THE STUDY

The purpose of our study is to gain a greater understanding of how the implementation of writing in the mathematics classroom influences student learning. This study plans to answer the following research questions (1) How does the teacher perceive the value of the instructional approach (journal writing in mathematics) and what are the expectations? (2) How do teachers support students’ writing in a mathematics journal? (3) How does writing in a mathematics journal influence students’ understanding of mathematics?

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Theoretical Framework

The research study conducted here is based in a social constructivist framework. Constructivism is a learning theory that suggests an individual constructs meaning and knowledge through their social environment and interaction (Beck & Kosnik, 2006). Constructivist theory stresses the importance of learning being of value for the learner. Writing should be meaningful for children arousing an intrinsic need. Further, writing should be incorporated into a task that is necessary and relevant for life (Vygotsky, 1978). Mathematics lessons are occurring in classrooms each day in the forms of direct instruction, group work, pair activities, and individual work. Each individual learner is constructing meaning from these lessons and assigning their own value and understanding to the concepts presented. Journals will serve to identify the individual’s constructed meanings.

Literature Review

The use of mathematical discourse, both in the spoken and written forms are pivotal to the construction of mathematical concepts and the development of mathematical thinking (D’Ambrosio, Johnson & Hobbs, 1995). Mathematical discourse means the communication of mathematical concepts through speech and writing (Jingzi & Normandia, 2009). The combination of literacy strategies in the mathematics content area, including all types of writing, is becoming an important focus in the classroom. The National Council of Teachers of Mathematics, 2000 has created an objective cen-