ABSTRACT

The purpose of this action research was to evaluate the implementation of technology integration with multiplication concepts (i.e., repeated, arrays, and decomposing numbers) for struggling third grade mathematics students. This study incorporated the use of virtual manipulatives and student think-aloud recordings to measure students’ conceptual understanding of basic multiplication. This study focused on two overarching research questions. The first question explored how technology integration with multiplication concepts (i.e., repeated addition, arrays, and decomposing numbers) impacted student understanding. The second question explored how students select and explain strategies for solving multiplication problems. Data collection consisted of teacher-made pre- and posttests with virtual manipulatives and student think-aloud recordings. Data analysis incorporated an evaluative mixed-methods approach using objective assessment data with paired-t test and constant comparative method. After transcribing, reviewing, and coding data, overlapping themes emerged, including students’ conceptual understandings, students’ conceptual misunderstandings, and students’ correct methodology with careless errors.

Findings revealed that virtual manipulatives significantly improved participants’ conceptual understandings of all three given multiplication strategies. The impact of virtual manipulatives is reflected in the increased percentages of students who demonstrated conceptual understanding of the three strategies from the end of week one to end of the innovation. Conceptual understanding for each of the strategies, (i.e., repeated addition, arrays, and decomposing numbers) increased by 40 percent over the course of this innovation.

In addition, the impact of virtual manipulatives is reflected in the increase of correct answers from the pretest to posttest. On average, the number of correct problems increased by 16.8 from pretest to posttest (t(9)= -11.45, p < 0.001). Statistically, the innovation increased the average number of correct problems from 3.7 on the pretest to
20.5 on the posttest.

The student think-aloud self-recordings provided valuable insight into students’ developing conceptual understandings, and consequently helped guide and direct remediation throughout this innovation. By listening to their own recordings, students were able to evaluate their work, identify mistakes, and correct careless errors before turning in their recordings. Consequently, the think-aloud recordings promoted student self-reflection and were essential in providing specific, individualized instruction for all participants.

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