

Research: Division Facts 0 to 81

Study 1

Overview

The purpose of this study was to show the effects of the concrete-to-semiconcrete-to-abstract instructional sequence with regard to teaching *Division Facts 0 to 81*. Three students who were at-risk for having learning disabilities participated. All were performing below grade level in math. Their ages ranged from 10 to 11 years. They were taught by their regularly assigned teacher who used the *Division Facts 0 to 81* program. The measure was the number of division problems that students solved correctly and incorrectly in a minute. A multiple-baseline across-students design was utilized.

Results

During baseline, all three students solved more problems incorrectly than correctly within one minute. For example, Student 1 solved about ten problems incorrectly and three problems correctly per minute during baseline. The cross-over effect occurred during semi-concrete instruction for all three students. (The cross-over effect occurs when a student starts solving more problems correctly than incorrectly.) For example, at the end of semi-concrete instruction, Student 1 solved eleven problems correctly and two problems incorrectly in one minute. Once the cross-over effect had occurred, the students' rates for correct responses continued to increase, and their rate of incorrect responses decreased or remained very low. At the end of the abstract instruction, Student 1, for example, solved 14 division problems correctly and made no incorrect responses within one minute.

Conclusions

This study shows that the concrete-to-abstract instructional sequence can be effective in teaching students at-risk for LD to solve simple division problems. Their rate of solving problems increased as the students progressed through the instructional phases in the sequence. The cross-over effect occurred only after the instruction was instituted as shown by the multiple-baseline design.

Reference

Miller, S. P., & Miller, C. M. (1993). Using data to learn about concrete-semiconcrete-abstract instruction for student with math disabilities. *Learning Disabilities Research & Practice*, 8(2), 89-96.

Research: Division Facts 0 to 81

Study 2

Overview

A field test was conducted that involved 22 teachers and 109 elementary students who were experiencing difficulties learning math. This student group included 102 students with learning disabilities (LD), 5 students with emotional disabilities, and 2 students who were at-risk for school failure. The field test took place in seven school districts in both small-group (less than 7 students) and larger group (7 to 18 students) instructional arrangements. The teachers were trained to use programs in the *Strategic Math Series*. Different groups of students were taught addition facts, subtraction facts, multiplication facts, and division facts, depending on their needs.

Results

The 19 students who received instruction in the *Division Facts 0 to 81* program earned a mean score of 9% on the acquisition pretest and 81% on the posttest. With regard to fluency, the students solved an average of 8 problems per minute during the first abstract lesson and 15 problems per minute at the completion of the program.

Conclusions

The results show that students with learning difficulties in math are able to learn basic division facts through use of the *Division Facts 0 to 81* program. The students acquire division knowledge and improve their ability to solve division facts with fluency.

Reference

Mercer, C. D., & Miller, S. P. (1992). Teaching students with learning problems in math to acquire, understand, and apply basic math facts. *Remedial and Special Education*, 13(3), 19-35, 61.

Research: Division Facts 0 to 81

Study 3

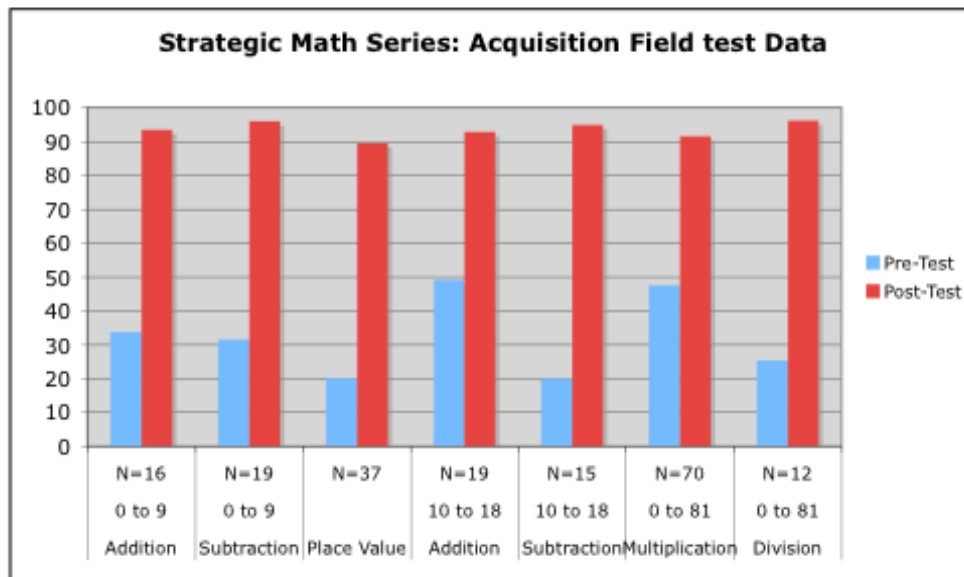
Overview

Multiple field tests were conducted that involved 56 teachers and 248 elementary students who were experiencing difficulties learning math. These field tests took place in seven school districts in self-contained, resource, and general education classes. The teachers were trained to use programs in the *Strategic Math Series*. Different groups of students were taught addition facts, subtraction facts, multiplication facts, division facts, and place value concepts and skills, depending on their needs.

Results

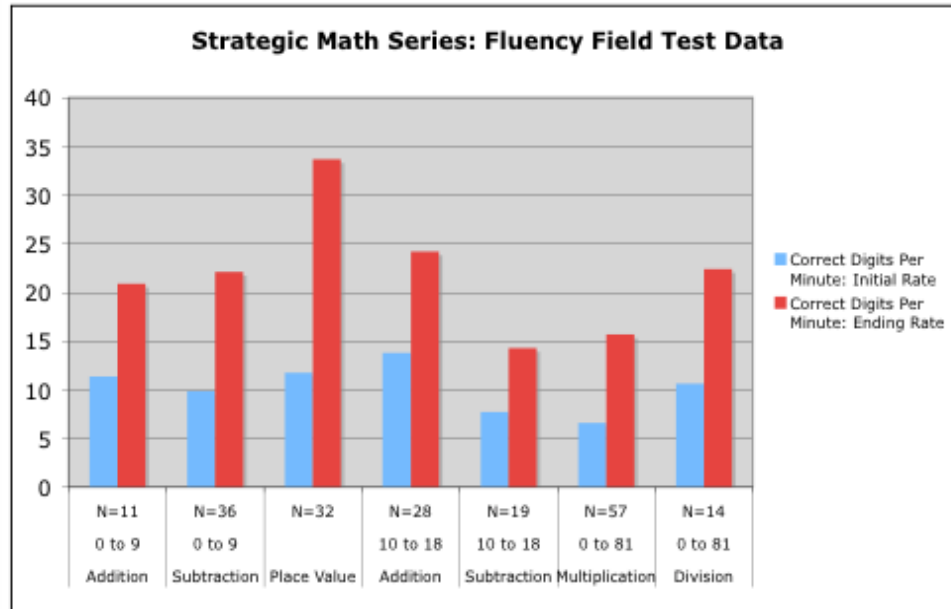
Substantial gains were made by the students in all areas. See the figures below for the results in each math area. Figure 1 shows the results on untimed acquisition tests, and Figure 2 shows the results on timed proficiency tests (i.e., fluency tests). The number of students participating in each field test is shown beneath each pair of bars on the graph.

Figure 1: Percentage of correct answers



Research: Division Facts 0 to 81

Figure 2: Number of digits correct per minute



The results for the *Division Facts 0 to 81* program are shown in the pair of bars at the far-right side of each figure. Students earned a mean score of 25% answers correct on the acquisition pretest and 96% on the acquisition posttest. They produced an average of 11 correct digits per minute in baseline and 22 correct digits per minute after instruction.

Conclusions

The programs in the *Strategic Math Series* produce significant gains in student performance on math acquisition and fluency tests across several areas of mathematics. In addition, these programs all produce socially significant final performances with students earning scores around or above the 90% correct level on acquisition tests in all areas.

Reference

Miller, S. P., & Mercer, C.D. (1998). *Strategic math series trainer's guide*. Lawrence, KS: Edge Enterprises.