Research: Addition Facts 10 to 18

Study 1 - Overview

The purpose of this study was to show the effects of the concrete-to-semiconcrete-to-abstract instructional sequence that is used in all programs in the *Strategic Math Series*. More specifically, this study showed the effects of the instructional sequence with regard to teaching *Addition Facts 10 to 18*. Three students with learning disabilities participated. All were performing below grade level in math. Their ages ranged from 7 to 9 years. They were taught by their regularly assigned teacher who used the *Addition Facts 10 to 18* program. The measures were the number of addition 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 three problems incorrectly and zero problems correctly per minute during baseline. The cross-over effect occurred during concrete instruction for two students and during semi-concrete instruction for the third student. (The cross-over effect occurs when a student starts solving more problems correctly than incorrectly.) For example, at the end of concrete instruction, Student 1 solved three problems correctly and one problem incorrectly per 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 8 addition problems correctly and had no incorrect responses per minute.

Conclusions

This study shows that the concrete to abstract instructional sequence can be effective in teaching students with LD to solve addition problems. Their rate of solving problems increases as the students progress through the instructional phases in the sequence. The cross-over effect occurs only after the instruction is 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. Leaming Disabilities Research & Practice, 8(2), 89-96.

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Strategic Instruction Model®
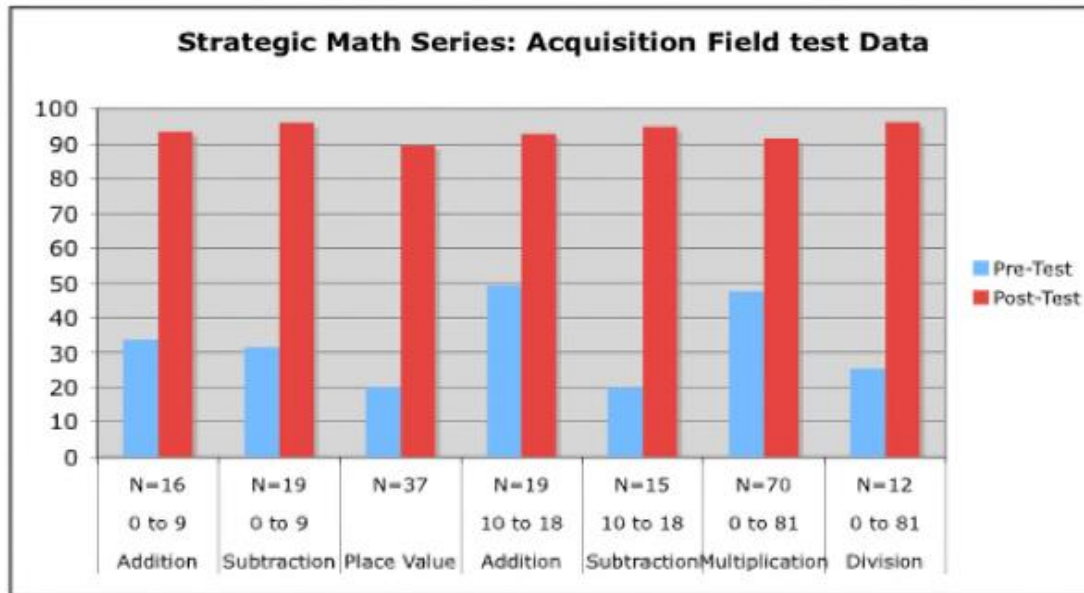
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Study 2 - Overview

Multiple field tests were conducted that involved 56 teachers and 248 elementary students who were experiencing difficulties learning math. The 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.
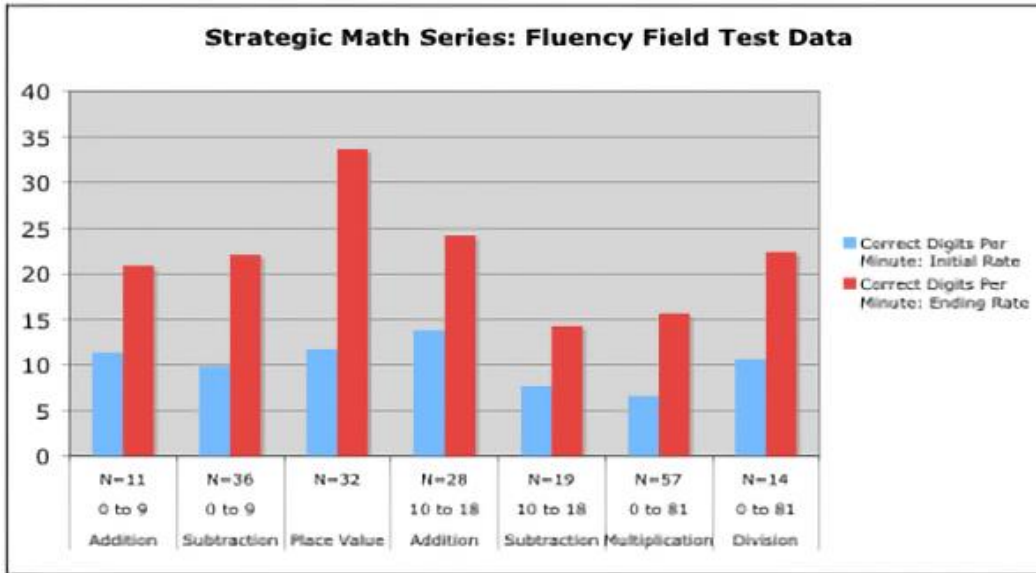
Results

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: Students' percentage scores on untimed math tests.

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Figure 2: Number of digits correct per minute on timed fluency tests.

The results for the *Addition Facts 10 to 18* program are shown in the fourth pair of bar graphs in each figure. Students earned a mean score of 49% correct answers on the acquisition pretest and 93% on the posttest. They had an average of 14 correct digits per minute in baseline and 24 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% level on acquisition tests in all areas.

Reference
Miller, S. P., & Mercer, C.D. (1998). Strategic Math Series professional developer's guide. Lawrence, KS: Edge Enterprises.