SCHOLASTIC

RESEARCH UPDATE

An Evaluation of Students' Fact Fluency Using *FASTT Math*®

PROFILE

District: Approximately 400 schools in 30 school districts across the United States
Evaluation Period: September 2008–December 2011
Grades: 2–8
Assessment: *FASTT Math* placement assessments and program usage

STUDENT CHARACTERISTICS

The data described here is representative of students' (N = 51,475) work on *FASTT Math* at 30 school districts across the United States. Figure 1 below depicts the overall distribution by grade range (lower elementary, upper elementary, and middle grades).*

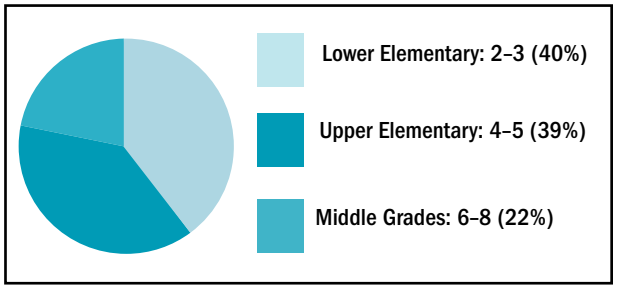

Figure 1. Distribution of students by grade range

OVERVIEW

Implementation Model

FASTT Math is an adaptive technology program that provides individualized instruction for math fact fluency in four operations: addition, subtraction, multiplication, and division. Students are enrolled in one operation in order to learn the number combinations with values from 0–9 or from 0–12. In each *FASTT Math* session, students receive individualized instruction on two to three new facts, followed by independent practice and adaptive fluency games.

FASTT Math can be used anywhere there is a computer, including homeroom, math class, or a computer lab. On-Model *FASTT Math* usage consists of three or more 10-minute *FASTT Math* sessions each week. When computing students' average program usage, approximately one-third of participants in this sample experienced an On-Model implementation of *FASTT Math*.

Participants

Of the 51,475 students, 54% (n = 27,895) were enrolled in Addition, 11% (n = 5,727) were enrolled in Subtraction, 54% (n = 27,894) were enrolled in Multiplication, and 10% (n = 4,977) were enrolled in Division. Approximately a quarter of all students were enrolled in two or more operations. Students enrolled in Subtraction and Division were the most likely to also be enrolled in another operation. On average, students were enrolled in *FASTT Math* for less than one semester. Only students who completed a minimum of 10 lessons for an operation—a threshold by which students have had sufficient opportunities to learn new facts—were included for the purpose of the analyses reported here.

Measures

FASTT Math begins with a fact fluency assessment, which determines the facts on which a student needs instruction. *FASTT Math* tracks student performance on each fact and overall fact fluency within the enrolled operation. After every 30 minutes of program use, or after six log-ins, the software determines a student's current fact fluency.

*Numbers add up to more than 100 due to rounding.

Fact fluency refers to the automatic recall of a math fact, determined by accuracy and speed of response. *FASTT Math* calculates fact fluency by finding the difference in time required for a student to type a presented numeral, such as 21, and the time it takes to determine and type an answer for a fact, such as 7 x 3.

In *FASTT Math*, fluent facts are called "Fast Facts." There are four fluency levels within each operation of *FASTT Math*, as described below:

- **Fluent**: 97% or greater Fast Facts
- **Near Fluent**: 80% or more Fast Facts and fewer than 97% Fast Facts
- **Developing**: 50% or more Fast Facts and fewer than 80% Fast Facts
- **Underperforming**: Fewer than 50% Fast Facts

As students move through an operation and gain more "Fast Facts," their fluency level is expected to improve.

RESULTS

Dosage Effects

Initial placement assessments for all students indicated an average fluency with 30% of the facts for the particular operation. Students in every grade demonstrated improved fact fluency across the four operations, gaining on average 17% more fluent facts. However, the gains varied based on program usage. Students who experienced On-Model *FASTT Math* implementations exhibited greater gains in fact fluency in less time than students who did not have the opportunity to use the program as recommended. The average On-Model student's fact fluency improved 23 percentage points as compared to the average fact fluency for the Off-Model student, improving 14 percentage points. Additionally, students who experienced an On-Model implementation were more likely to improve a full fluency level while the students who experienced an Off-Model usage were more likely to maintain their position in the underperforming fluency level.

Table 1 depicts the outcomes of an analysis for operation-specific fact fluency improvements of students in On- and Off-Model implementations. All students were initially assessed with underperforming or developing fluency levels.

This analysis indicates that it is advantageous for students to experience On-Model implementations of *FASTT Math* since on average they experience greater gains in fact fluency in shorter periods of time.

On-Model Students' Improved Fact Fluency by Grade and Operation

Given the value of an On-Model implementation, these students' results were examined further. Table 2 describes the average increases in fact fluency for students in each grade and each operation. The students described here were all initially assessed at underperforming or developing fluency levels and they experienced an On-Model implementation.

An On-Model implementation of *FASTT Math* consistently results in improved fact fluency across all operations. The results of the 1,530 On-Model fourth-grade students enrolled in Multiplication are noteworthy, with 50% more fluent facts in 15 weeks.

Table 1.
Improvements in fact fluency for On- and Off-Model implementations.

Operation	# On-Model Students	On-Model Fluency Improvement	Time Span (Weeks)	# Off-Model Students	Off-Model Fluency Improvement	Time Span (Weeks)
Addition	4,608	30%	11	13,091	22%	20
Subtraction	1,431	30%	10	2,410	18%	17
Multiplication	4,071	41%	12	14,093	27%	21
Division	1,613	32%	9	1,781	24%	15

Table 2.
Increases in fact fluency for students with On-Model implementations.

Grade	Addition (n)	Subtraction (n)	Multiplication (n)	Division (n)
2	38% (740)	33% (2,252)	33% (72)	41% (11)
3	23% (1,941)	31% (282)	36% (456)	29% (87)
4	35% (885)	31% (395)	50% (1,530)	36% (706)
5	35% (429)	30% (242)	37% (1,100)	31% (409)
6	42% (173)	31% (110)	37% (321)	33% (148)
7	30% (238)	20% (91)	33% (315)	22% (133)
8	26% (202)	20% (59)	36% (280)	26% (119)

CONCLUSION

Students who used *FASTT Math* exhibited improved fact fluency in addition, subtraction, multiplication, and division. These gains are evident for students in all grades. The power of engaging with the program as recommended is evident—the students who experienced On-Model implementations of *FASTT Math* made the greatest gains in the least amount of time.

The results reported here suggest that using *FASTT Math* as recommended can significantly promote students' fact fluency, thereby increasing their likelihood to develop mathematical proficiency in the future. Such robust fact fluency improvements in a relatively short period of time are a valuable outcome and should result in long-term benefits for learners of mathematics.

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