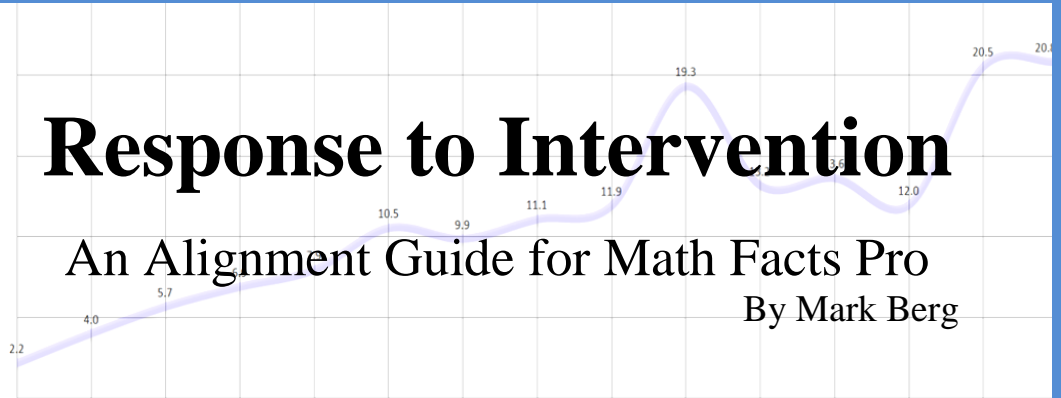# Response to Intervention

An Alignment Guide for Math Facts Pro
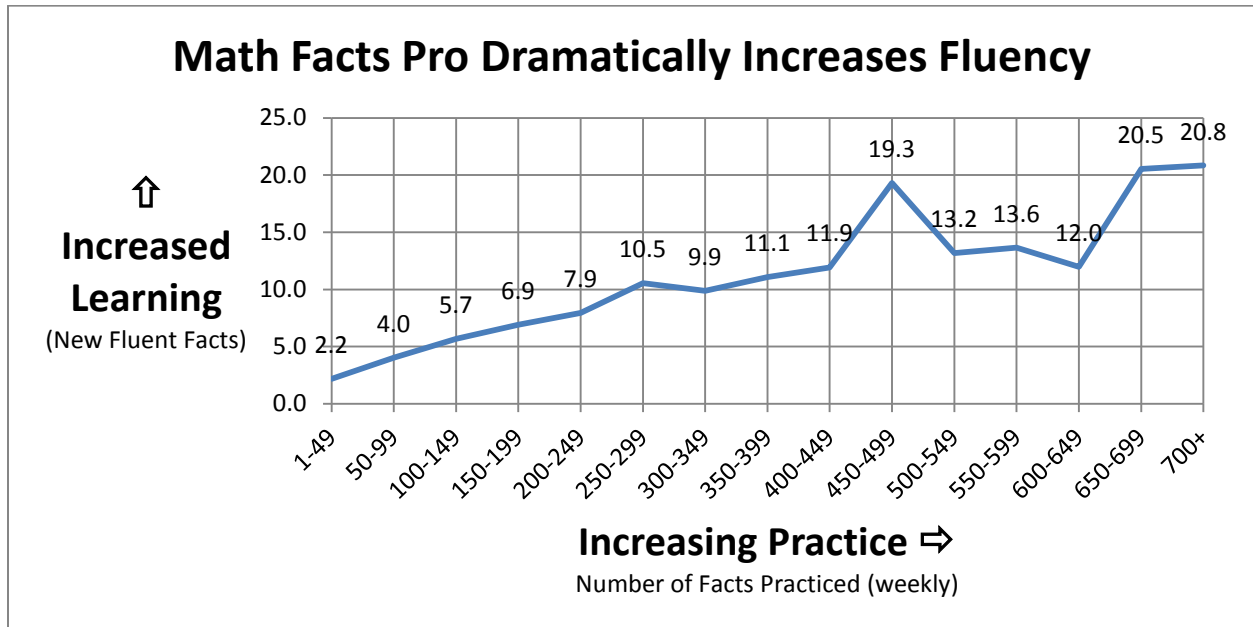
By Mark Berg

Program Description:

The online program Math Facts Pro (MFP) is an intelligent tutor designed to help students in first grade and up achieve fluency (automaticity) in the basic math fact combinations. This moves fact processing out of working memory so the student can focus on problem solving and learning new concepts and skills (Geary, 1994). The following is a list of some of its features:

- Instant feedback. Students immediately know if they were correct or incorrect, but they never see an incorrect answer. Multiple choice is not used, so the student must create, not simply recognize, the correct answer.
- Individualized Fluency Speed. MFP determines the fluency response speed of each student, simply by assuming that their fastest average responses are for facts that are fluent. This allows MFP to distinguish between counting or skip counting and automatic response.
- Appropriate difficulty level. The next fact to be asked is determined by past performance, and is chosen to make practice neither too easy nor too hard, for an average fluency of 90% to 95%, similar to the instructional level in reading (Partnership for Reading, 2001). This results in focused practice on the facts that are the closest to fluent for that student, rather than as yet unknown facts, for which repetition is ineffective (Hasselbring et al., 2006).
- Spaced repetition. Facts to be learned are introduced one at a time, and are moved from short term memory into long term by slowly extending the time between each successive automatic recall.
- Printable results. It is easy for both the student and the teacher to see which facts are fluent today, and how the student is progressing. Teachers can see when intervention is needed, and which fact the student is stuck on.
- Usage monitoring. Teachers can see how much students practiced the previous day/weekend and hold them accountable for practicing.
- Games. Math Fact Scramble helps students develop fact strategies and then make the critical move to fluency (Fosnot & Dolk, 2001), while Contig makes the learning rich by helping students learn to manipulate the facts mentally.

Research / Effectiveness

Math Facts Pro has been shown to be very effective at helping students become fluent with the basic math facts. The average student practicing 250 facts/week (about 5 minutes a day) learns about 5 times as much as one practicing under 50.

Math Facts Pro Dramatically Increases Fluency

⇧
Increased Learning
(New Fluent Facts)

Increasing Practice ⇨
Number of Facts Practiced (weekly)

Data points: 1-49: 2.2, 50-99: 4.0, 100-149: 5.7, 150-199: 6.9, 200-249: 7.9, 250-299: 10.5, 300-349: 9.9, 350-399: 11.1, 400-449: 11.9, 450-499: 19.3, 500-549: 13.2, 550-599: 13.6, 600-649: 12.0, 650-699: 20.5, 700+: 20.8

Population: Included in this study were all students who logged-in and practiced addition for at least three weeks between September 10, 2012 and September 1, 2013. Data from 1,454 students were studied, with a total of 5,831 user week records, beginning with the third week.

Fluency: Each student's fluency speed is unique. It is determined by their fastest average response times. Facts were considered to be fluent if they were answered correctly and fast enough for the given student's speed every time, or with only one miss if attempts were > 3 and < 11, or for 9 out of the last 10 attempts if attempts were > 10. Facts were considered to be newly learned if they did not meet the criteria for fluency until after the first two weeks of practice, and if that fluency was maintained without fail.

Deductions: The data was analyzed week by week to compare the number of new facts learned vs. total weekly facts practiced. On average, students who used Math Facts Pro very little (less than 50 facts practiced/week) learned about 2 new facts/week, while students who used Math Facts Pro about 250 facts/week learned about 5 times as many – an average of about 10 new facts per week. Nothing else was controlled. While it is possible that teachers/parents who caused their students to practice more were also more effective, it is likely that for many the only difference was the extra practice with Math Facts Pro.

Response to Intervention

Tier 1
The primary prevention level of instruction includes a research based core curriculum, universal screening to determine students' current level of performance, differentiated learning activities, and accommodations.

Math Facts Pro's practice is research based and effective. It gives teachers the ability to continually monitor both current performance, including which facts, and how many, are currently fluent. The practice is differentiated and accommodates each student's speed as well as knowledge, ensuring success with practice that is not too easy, nor too hard. Math Facts Pro targets the following Common Core Standards:

CCSS.Math.Content.1.OA.C.6 Add and subtract within 20, demonstrating fluency for addition and subtraction within 10.
CCSS.Math.Content.2.OA.B.2 Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.
CCSS.Math.Content.3.OA.C.7 Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that $8 \times 5 = 40$, so one also knows $40 \div 5 = 8$) or properties of operations. By the end of Grade 3, know from memory all products of two one-digit numbers.

Tier 2
The secondary prevention level typically involves adult led small group instruction, is evidence-based, and involves a clearly articulated, validated intervention.

Math Facts Pro provides the teacher with the information necessary to group students according to which facts they are practicing. For example, a teacher can quickly see who is working on $3 + 4$, pull those students into a group, and help them find a way to remember it. She can also quickly see which students have not made any progress, and therefore likely need help understanding the concept of the operator. As shown above, MFP has demonstrated that it is a valid intervention. Features include: 1) The intelligent tutor adjusts the difficulty to achieve a 90% to 95% fluency rate during practice. 2) Students who have difficulty remembering what they learned the previous day receive additional practice to help them achieve permanent fluency. 3) MFP has many mnemonic videos to provide an extra

memory hook. 4) Games are provided to help students create the fact strategies necessary to learn new facts as well as practice mentally manipulating the facts.

Tier 3
The tertiary prevention level is a more intensive version of the secondary level, using smaller groups and longer or more frequent sessions. It involves at least weekly monitoring of progress.

Math Facts Pro gives the teacher the information needed to intervene directly. Teachers can see at a glance which students have plateaued in their learning, and which facts are causing them trouble. Frequent practice is the key, and teachers can assign practice both in school and after school, and can easily log-in in the morning to see if the practice was done the previous evening.

Summary
At only $1/student/year, we think you will find Math Facts Pro to be the least expensive research and evidence based approach to developing math fact fluency, and well capable of meeting your RtI needs. However, as the research shows, its effectiveness is directly tied to the quantity of practice. That's why it is designed to help teachers monitor not just progress, but amount of practice. We hope that you will give it a try today for free at MathFactsPro.com.

Author
Mark Berg taught grades 3, 5, and 6 for a total of 11 years. He has a masters in Instructional Design and Technology from Emporia State University, and has been researching, designing, and developing MathFactsPro.com for the last 5 years.

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