Preface

The Sprint is the most powerful educational instrument I've worked with in ten years of teaching. This math race, invented by Dr. Yoram Sagher, professor of Mathematics at Florida Atlantic University, has invigorated masses of students. It centers them on improving their ability to solve problems during a two part, adrenaline-rich, competitive task. It has developed all of my students' number sense because of its focus on patterns, while building their confidence because of the immediate documented success and internalization of concepts. More than anything, the Sprint has helped children look forward to math class because they know it will be a time that they'll feel successful, challenged, and happy.

Dr. Sagher introduced me to Sprints during the summer of 2006 when he visited Folk Arts Cultural Treasures Charter School (FACT) in Philadelphia. FACT had just finished its inaugural year and Dr. Sagher was training me and four other teachers in the implementation of Singapore Math. Our test scores were low and our staff was inexperienced. Still, Dr. Sagher had high hopes for the school and explained that writing and delivering Sprints would be one vehicle for our future success.

At the training, I instantly fell in love with Dr. Sagher's Sprint routine. I loved the rush of adrenaline that came with moving my pencil down the Sprint columns, answering questions as quickly as I could. As Dr. Sagher called out answers, I was thrilled to say "Yes!" over and over again. When he finished, I had fun doing the exercises that he led and was highly motivated to improve my score on the second Sprint.

I was excited to try the routine with my class, but initially the Sprint seemed like little more than a speed drill to energize students. Only after Dr. Sagher explained each step of his invented routine and I immersed myself in writing and delivering Sprints, did I recognize the powerful role they could play in student learning. For two years, I taught the same group of students and during this time I began each class with a Sprint. The class' proficiency level doubled during this span and it would've never been possible without the guidance of Dr. Sagher. The rest of FACT's staff did the same and their efforts yielded similar results.

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Since the 2006 training, I've worked hard to perfect the routine that Dr. Sagher invented. I've written hundreds of Sprints and delivered the routine thousands of times. In the process, I have developed a few theories of my own and done my best to put his teachings and theories in writing while threading in some of my ideas. The Sprint routine, which takes between ten and fifteen minutes to complete, consists of nine major steps:

I. The Initial Sprint begins with the words "On your mark, get set, GO!" or some variation of it. It lasts one minute and simulates a race, in which all students are trying to answer as many questions as they can. The race creates adrenaline. During this time, students ideally have an internal voice saying "FASTER, FASTER, FASTER."

II. At the end of the minute, the teacher says "Stop" and begins calling out answers, with students verbally responding when they get an answer right, e.g. saying "Yes". If the students get the answer wrong, they circle it so that they can go back and fix it if time allows. The teacher continues calling out answers until they stop hearing "Yes." They then ask students to raise their hand if they got one or more right, 2, 3, 4, 5, 6, etc. Students drop their hands as the teacher passes the number they got right. After all hands have dropped, the class recognizes the winner or winners with a round of applause or some other acknowledgement.

III. Students take a few minutes to finish up the remainder of the Sprint to prepare for the second Sprint. This time is also meant to be a cool down for the students, i.e. they should lose the adrenaline that they worked to create during stage one. Teachers should let this continue as long as the majority of the students are engaged in the Sprint. When concentration wanes, it's time to move on to stage four. This is also an excellent opportunity for students who finish early to distribute the second Sprint and materials that will be used during the lesson. Teachers with time restraints might have the students work for just one minute before moving on to the next stage.

IV. The teacher reviews every answer with students verbally acknowledging when they get answers right and saying nothing when they get answers wrong. This stage serves as a confidence-builder and also helps students recognize mistakes, so that they can correct them on the next Sprint.

V. The teacher leads a fast physical exercise while counting by a multiple forward and backward. Adrenaline is again created. Being able to count forward and backward by a number while doing an exercise such as jumping jacks internalizes number facts. The exercises should be short, counting between 10 and 12 multiples of a given number, e.g. 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 20, 18, 16, 14, 12, 10, 8, 6, 4, 2, 0. The teacher paces the class by modeling the exercise in the front of the room with all students looking at them, but they do not count with the students.

VI. The teacher leads a slow-down exercise, such as arm circles, while counting by a multiple forward and backward. This is meant to be a cool down for the students, so that they lose their adrenaline. The teacher again paces the class by modeling the exercise in the front of the room with all students looking at them. Just like the fast exercise, the slow-down exercise is short, counting between 10 and 12 multiples of a given number, e.g. 3-6-9-12-15-18-21-24-27-30-30-27-24-21-18-15-12-9-6-3-0.

VII. The second Sprint is delivered in the same routine as the first Sprint. It lasts one minute and again simulates a race. It is on the same topic as the first Sprint and each problem correlates in degree of difficulty. The race creates adrenaline. During this time, students ideally have an internal voice saying "FASTER, FASTER, FASTER." Since they know how many they answered correctly on the first Sprint, they also have a target number to pass. Problem by problem difficulty correlation is essential so that students have the opportunity to achieve a fair sense of improvement.

VIII. At the end of the minute, the teacher calls out answers, with students verbally responding when they get an answer right, e.g. saying "Yes". The teacher continues calling out answers until they stop hearing "Yes." They then ask students to raise their hand if they got one or more right, 2, 3, 4, 5, 6, etc. Students drop their hands as the teacher passes the number they got right. After all hands have dropped, the class recognizes the winner or winners with a round of applause or some other acknowledgement.

IX. The teacher repeats the same recognition procedure for improvement, prompting the class to raise their hand if they improved by one or more. This stage is confidence building, especially for lower performing students, who often don't feel successful in class. It's likely that the same few students will always answer the most correctly. By recognizing improvement, all students get the chance to be recognized by their classmates. Teachers who don't want their students to reveal how many

answers they got right, might only choose to recognize students who improve or nobody at all.

Each stage of the Sprint is vital to the routine, but I spend more time thinking about the ninth step in the process than any other. If the goal of education is for every student to realize their potential then self-improvement goes far to defining this. To stimulate improvement, I sometimes give students an extra second or two on the second Sprint, so that they're likely to get a few more problems right. This can build confidence and enthusiasm. I'm careful not to give more than a few seconds, however, because if they recognize the extended time, then they will feel no accomplishment in their improved score.

To see the Sprint routine being delivered visit: rramosgroup.com/sprints

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The routine alone does not set the Sprint apart from other math drills. It is in its intelligent design and sequence of delivery that the Sprint is superior to computer-generated worksheets and other speed drills. Sprints are aligned to individual lessons in the Singapore Math curriculum and have been written to account for a large range of skill levels. Sprints also contain sequences that help students learn to recognize patterns and methods for solving problems on their own. For example, solving the addition sentence 9 + 2 can help a student solve problems like 29 + 2, 49 + 2, and 89 + 2.

Patterns with gradual jumps in complexity help students develop deeper number sense by recognizing number relationships and tricks on their own without them ever being taught. The addition sequence below illustrates this.

1. 9+2 =
2. 19 + 2 =
3. 29 + 2 =
4. 39 + 2 =
5. 79 + 2 =
6. 59 + 2 =

Another advantage that the Sprint has over other math skill sheets is that, problem-by-problem, the degree of difficulty correlates between the two Sprints, as shown in the five-problem sample below.

Sprint A

1. 2+1 =
2. 4+1 =
3. 6+1 =
4. 7+2 =
5. 17 + 4 =

Sprint B

1. 3+1 =
2. 5+1 =
3. 7+1 =
4. 6+2 =
5. 16 + 5 =

Because the first and second Sprints are roughly equal in difficulty, students can feel a significant sense of improvement if they do better on their second Sprint.

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During my first year of delivering Sprints, I often found that a few students struggled to get past the first couple of problems. Thus, the students who needed the most practice were getting the least. These same students were becoming less enthusiastic about Sprints and weren't looking forward to math class. Feeling that this worked antithetically to the purpose of the Sprint, I started rewriting them each time a student didn't get at least a quarter of the problems correct. Then, whenever I wrote a new Sprint, I tried to make the first quadrant (problems one through 11) very easy so that every student could complete it in a minute, thus feeling successful.

Conversely, some of the Sprints were too easy for the strongest students, who were finishing before the minute was up. These students started losing interest in performing well on the second Sprint, because they knew there was no possibility to improve their score. So, each time a student completed a Sprint in under a minute, I rewrote the fourth quadrant (problems 34-44) to make the problems challenging enough that the strongest students couldn't finish. To keep the Sprint progressing in difficulty, I

made the second quadrant (problems 12-22) harder than the first quadrant, but still easy, and the third quadrant (problems 23-33) on grade level.

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Managing each stage in the Sprint routine can be very difficult for kindergarten and first grade teachers at the beginning of the school year. Helping students figure out by how many they improve can be especially tricky. However, students in these grade levels can still benefit from efficient, focused practice on learned topics and exposure to number sequences and patterns. Some kindergarten and first grade teachers begin the year by letting the students work on Sprints untimed, without calling out answers. Then, throughout the year, they gradually introduce the steps of the nine-stage routine.

The Sprint structure that I outlined allows for many hybrid routines, but there are a few basic rules to keep in mind. The most important rule is that the Sprint being delivered is always a topic that the students have already mastered. Since the goal of the Sprint is to internalize concepts, introductory lessons and skill review are practices or trainings for the Sprints, which simulate games or races. In this metaphor, the teacher is a coach, the students are players, and the Sprint is a contest. It is the coach's job to prepare their players for the contest. During my first couple years of teaching Singapore Math, I would often study a lesson in the textbook, write a Sprint that corresponded to it, and then spend several lessons preparing the students for its content. When I felt that every student was comfortable with the topic, I would deliver the Sprint.

When delivering Sprints, teachers should use a stopwatch to create the theater of a race. More than being an easy way for the teacher to keep track of time, stop watches help build enthusiasm and adrenaline. Adrenaline builds long-term memory, which is the aim of the Sprint routine. Teacher theatrics can go far to generating this. Heeding Dr. Sagher's recommendation, I spent one school year wearing a baseball cap whenever I delivered Sprints. My students seemed to like it and seeing the hat made them more excited than they otherwise would have been.

When choosing Sprints, I try to select ones that my weakest student can get at least 11 right and my strongest student can't finish. I wrote each of the Sprints in this collection with that rule in mind. From time to time, however, some students will finish Sprints in under a minute. So that they're able to continue working for the entire minute

and still have a chance to improve, I designate a multiple to count by and post it permanently on the chalkboard. Whenever I hear an affirmative response on the last answer of a Sprint, I immediately begin counting by the designated number, resuming the same student-teacher answer-response that takes place during the Sprint. Each correct multiple counts as one point. For example, if a student answers 44 problems correctly and counts by 12s to 72 (12, 24, 36, 48, 60, 72) their score is 50 points – 44 Sprint answers plus six multiples.

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As a classroom teacher, I constantly seek ways to build enthusiasm for Math. One of Dr. Sagher's suggestions to accomplish this is to encourage struggling students to take home the next day's Sprint. This way, they can practice at home and perform well the next day. The worst thing that can happen, Dr. Sagher says, is that a child will go home and memorize 88 problems. There is only one rule – the Sprint has to stay at home, so that no one will have an unfair advantage on the day it's delivered. In my classroom, I designate a table space where students can take the next day's Sprint. Occasionally, when I notice a student who I think needs a confidence boost, I recommend that they take one home to practice. Stronger students also take them home from time to time in hopes that they'll be able to beat a classmate who frequently wins.

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There's no limit to how many Sprints a teacher can deliver during the course of a school year, but they should rotate a minimum of ten so that the students aren't overly familiar with the Sprint before they take it. When creating this collection of Sprints, I studied the K-6 standards edition lesson by lesson and wrote out a Sprint to correspond to many of the units and chapters. This, of course, created a surplus of Sprints. While teachers are likely to deliver Sprints most days, it's unlikely that they'd use more than 30 or 40 during the course of the year. Giving the same Sprint at intermittent times throughout the year serves as an excellent review of previously learned concepts, so long as they're not repeated too frequently. Starting on the first day of school, I make a list of every Sprint I deliver. Once the list reaches ten, I start back at the beginning and continue rotating through the list whenever I'm not introducing a new Sprint into the rotation.

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The collection of Sprints in this book far exceeds what a teacher needs for a school year. Third grade alone consists of 93 Sprints and it's doubtful that any teacher would use that many. However, the vast collection allows teachers many options to keep Sprint topics fresh and interesting. Those that teachers choose not to use as Sprints can be used as class work, homework, summer work, or even lesson planning guides. Thus, this collection of Sprints can still be a useful resource, even if a teacher never conducts the Sprint routine.

One of the first times that Dr. Sagher observed me teach, he emphasized the need to create practice problems so that struggling students could build confidence without getting frustrated. The Singapore Math textbook series is filled with example problems that quickly jump in complexity. There is also an underlying assumption that students have mastered all previous skills leading up to the lesson that they're working on. This, of course, isn't a reality. I've taught many sixth graders who don't feel comfortable simplifying fractions and/or haven't mastered their times tables. I've also worked with a lot of second graders who add by counting on their fingers. I considered skill gaps such as these in every Sprint that I wrote and often use them as practice problems so that struggling students get more repetition than their textbook and workbook provides. Having the Sprints loosely divided into four quadrants of complexity – very easy, easy, moderate, and difficult – allows teachers the flexibility to differentiate class work and/or homework all on the same worksheet. A strong student might do problems 23-44, while a weaker student completes problems one through 22.

Beyond student practice, Sprints can also be used as a lesson planning resource for teachers. During the 2010-11 school year, I worked as a Math Specialist at Santa Catalina School in Monterey, California. I was brought in to help implement the Singapore Math program, but due to scheduling restraints, I often didn't have the chance to help teachers create lesson plans. As a compromise, I sometimes directed teachers to study Sprints that corresponded to the lessons that they were teaching. Because the sequences are carefully thought out and scaffold in difficulty, the Sprint can serve as a guide for direct instruction and later fluency practice.

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- *Bill Davidson*
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About the Author

photo by Marc Howard, Santa Catalina

Bill Davidson has been a teacher for the past eleven years. He has taught in Philadelphia, Los Angeles, Southern Sudan, and Monterey, California. Since 2006, he has specialized in Singapore Math. His teaching and program development have been featured in the *Philadelphia Inquirer* and the *Monterey Herald,* and he has given Singapore Math presentations and workshops throughout the nation. In 2009 he was chosen for the ACE (Appreciating Charter Educators) award, which recognizes teachers who improve student achievement, use innovative and creative instructional strategies, and make a difference in the lives of students. In 2010, he taught a continuing education course for teachers at Neumann College in Aston, Pennsylvania - *Mathematics and Visualization Across the Disciplines: Applying the Singapore Method.*