

Preface

Basic facts truly are *the* foundation on which all mathematical computation is based (larger numbers, rational numbers, operations with variables, and so on). However, too many students leave elementary school lacking fluency with the basic facts. Clearly, the historical (and still prominent) approach to teaching basic facts has been ineffective. This is because there are two fundamental flaws in this type of instruction: (1) a lack of attention to strategies, falsely assuming students can go straight from counting (or skip counting) to just knowing the facts; and (2) a lack of effective assessment, falsely assuming that timed tests can provide meaningful data on student mastery of basic facts. Despite the ineffective and potentially damaging effect of these teaching and assessment approaches, basic fact instruction has changed very little over the years. It is time for a change!

This book is structured around five fundamentals for transforming basic fact instruction. These fundamentals are firmly grounded in research and collectively outline a plan for students that results in lasting learning of the facts, without damaging side effects. By exploring the meaning of numbers and operations, describing their thinking, making sense of the strategies of their peers, and engaging in meaningful practice, students eventually reach mastery of the basic facts, all the while becoming empowered to think and act like mathematicians. Chapter 1 provides a brief, clear description of the five fundamentals. Chapters 2 and 3 describe the learning progressions for addition and subtraction facts, including a plethora of strategies, activities, and games, while Chapters 4 and 5 do the same for multiplication and division. The 40+ games in this book (listed at the end of this preface) are *fun*, but that is not why we included them. Games provide the opportunity to talk about strategies, practice a newly learned strategy, and become more efficient at using strategies until

automaticity with the basic facts has been attained. Did you notice how many times the word *strategy* was used in the last sentence? It is that important! This word is often used in many different ways in the classroom, but in this book we only use this term to refer to *thinking* strategies. As you will learn, these thinking strategies are the key to helping students developing lasting fact mastery.

The activities and games featured in this book also serve a secondary purpose: assessment. While students are busy playing games and talking about their thinking, you have an opportunity to employ assessment techniques that will provide far better data than a timed quiz, all the while avoiding the negative impacts of such assessments. Chapters 6 and 7 provide ideas for observation tools, easy interviews, formal interviews, journal prompts, and ways to monitor student progress toward mastery of the foundational fact sets (Chapter 6) and derived fact sets (Chapter 7).

One particular challenge with the basic facts is understanding the myriad of terms: fluency, automaticity, rote memorization, knowing from memory, mental strategies, and mastery. In this book, we focus on the accepted, research-based definition of fluency, which delineates four components: “skill in carrying out procedures flexibly, accurately, efficiently, and appropriately” (National Research Council, 2001, p. 116). This definition expands the focus of mastering facts to include strategies and flexibility, as compared to a focus solely on accuracy and efficiency. Many people, including parents, principals, teachers, politicians, and students, think of fluency as simply being able to say a fact quickly (automaticity). Educating everyone about this more comprehensive notion of fluency is absolutely essential to helping every child learn basic math facts *for life* and feel confident and competent about their ability to do math. Chapter 8 focuses on ways to engage families and other stakeholders in understanding the importance of *fluency*, as well as how they can help their own children become fluent with the basic facts.

Our own advocacy for change, through countless presentations and several journal articles, has resulted in many schools adopting different approaches to teaching basic facts, implementing ideas that are now in this book. These instructional programs and assessment tools have resulted in dramatic change in some schools: more students achieving mastery through games and other activities (as opposed to drill or rote memorization), students becoming more excited about mathematics and confident in their abilities, and teachers feeling that they are doing a better job at preparing their students with the basics. For example, a 2nd grade teacher recently emailed Jennifer this message at the end of the year: “I was a very math-averse teacher who had no idea how to teach students concretely about math. That changed this year

with our focus on explaining reasoning strategies and showing their thinking using a variety of visual models. One of the best compliments I got from a student this year was ‘I love math.’” Teachers at these sites have often asked us, “Will you write a book?” As we pondered undertaking such a task for several years, we realized that a worthwhile book must not only provide explanations but must also be bursting with activities, games, and tools that could be lifted right out of the book and put to use. That is what we have written. We recognize we are asking for fundamental changes to teaching basic facts. We encourage you to reflect on the way in which our five fundamentals align with your school’s basic fact plan and consider how a shift toward incorporating these ideas could affect the learning and experiences of your students. As you identify a focus and a plan, we hope this book will provide you with the activities, games, and tools to support your own basic fact teaching and assessment transformation.

FIGURE P.1 Games in This Book		
Game	Chapter	Targeted Facts
Game 1: Sleeping Bears	2	Sums within 5
Game 2: Bears Race to 10	2	+0, 1, 2
Game 3: Bears Race to 0	2	-0, 1, 2
Game 4: Bears Race to Escape	2	+/- 0, 1, 2
Game 5: Doubles Match-Up	2	Doubles (sums)
Game 6: Doubles Bingo	2	Doubles (sums)
Game 7: 10 Sleeping Bears	2	Combinations of 10
Game 8: Go Fish for 10s	2	Combinations of 10
Game 9: Erase	2	Combinations of 10

FIGURE P.1 Games in This Book—(continued)		
Game	Chapter	Targeted Facts
Game 10: Square Deal	2	10 + ___ facts
Game 11: Lucky 13	3	Sums within 20 (and differences from 13)
Game 12: Sum War	3	Sums within 20
Game 13: Bingo	3	Sums within 20
Game 14: Concentration	3	Sums within 20
Game 15: Dominoes	3	Sums within 20
Game 16: Four in a Row	3	Sums within 20
Game 17: Old Mascot (Old Maid)	3	Sums within 20
Game 18: Diffy Dozen	3	Differences within 12 (comparison)
Game 19: Salute	3	Sums and differences within 20
Game 20: Target Difference	3	Differences within 20
Game 21: Subtraction Stacks	3	Differences of 5 or less
Game 22: Around the House	3	Sums and differences that equal 10 or less
Game 23: Dirty Dozen	3	Sums and differences within 12
Game 24: First to 20	3	Sums and differences within 20
Game 25: Sticker Book Patterns	4	Comparing multiplication representations (groups and arrays)

Game	Chapter	Targeted Facts
Game 26: On the Double	4	2s (doubles) facts
Game 27: Trios	4	5s facts
Game 28: Capture 5 First	4	2s, 5s, 10s facts
Game 29: How Low Can You Go?	4	0s, 1s facts
Game 30: Squares Bingo	4	Squares
Game 31: Multiplication Pathways	4	Foundational multiplication facts
Game 32: Fixed Factor War	5	Doubling
Game 33: Strive to Derive	5	Adding/subtracting a group
Game 34: Crossed Wires	5	Break apart
Game 35: Rectangle Fit	5	Break apart, commutativity
Game 36: The Factor Game	5	Division (finding factors)
Game 37: The Right Price	5	Close-by division facts
Game 38: Multiplication Salute	5	Multiplication and division facts
Game 39: The Product Game	5	Multiplication and division facts
Game 40: Net Zero	5	All four operations
Game 41: Softball Hits	5	All four operations
Game 42: Three Dice Take	5	All four operations

FIGURE P.2 Assessment Tools in This Book	
Title	Chapter
Tool 1: Observation Tools for Foundational Fact Sets	6
Tool 2: Observation Tool for \pm 0, 1, 2	6
Tool 3: Observation Tool for \times 2s, 10s, and 5s	6
Tool 4: Observation Tools for Combinations of 10 and Doubles	6
Tool 5: Observation Tool for \times 5s Facts	6
Tool 6: Two-Prompt Interview Protocol	6
Tool 7: Interview Record for Combinations of 10	6
Tool 8: Interview Record for Multiplication Squares	6
Tool 9: Mastery of Foundational Facts Records	6
Tool 10: Rubrics for Foundational Fact Fluency	6
Tool 11: Journal Writing Prompts for Doubles	6
Tool 12: Foundational Facts Progress Chart for Multiplication	6
Tool 13: Observation Tool for the Making 10 Strategy	7
Tool 14: Observation Tool for Any Multiplication Derived Fact Strategy	7
Tool 15: Observation Tools for Selection of Strategies	7
Tool 16: Observation Tool for Strategies and Mastery for Addition Facts	7

Title	Chapter
Tool 17: Observation Tool for Strategies and Mastery for Multiplication Facts	7
Tool 18: Interview Prompts for Assessing Fluency During Game Play	7
Tool 19: Four Facts Protocol Follow-Up Interview Questions	7
Tool 20: Student Records for Addition	7
Tool 21: Student Records for Multiplication	7
Tool 22: Exit Interview for Addition Facts	7
Tool 23: Holistic Rubric for Basic Fact Fluency	7
Tool 24: A Dozen Writing Prompts for Basic Fact Fluency	7
Tool 25: Progress Monitoring Tool for Addition Facts	7
Tool 26: Progress Monitoring Tool for Multiplication Facts	7

Most, if not all, of the 42 games and 26 assessment tools can be readily adapted to other fact sets and operations (e.g., addition games can be turned from sums into products). So, there are truly more than 100 possible games and tools for you—enough to ensure your students are able to truly develop math fact fluency!