

MATTHEW R. LARSON & TIMOTHY D. KANOLD

BALANCING *the* EQUATION

A GUIDE TO SCHOOL MATHEMATICS FOR
EDUCATORS & PARENTS

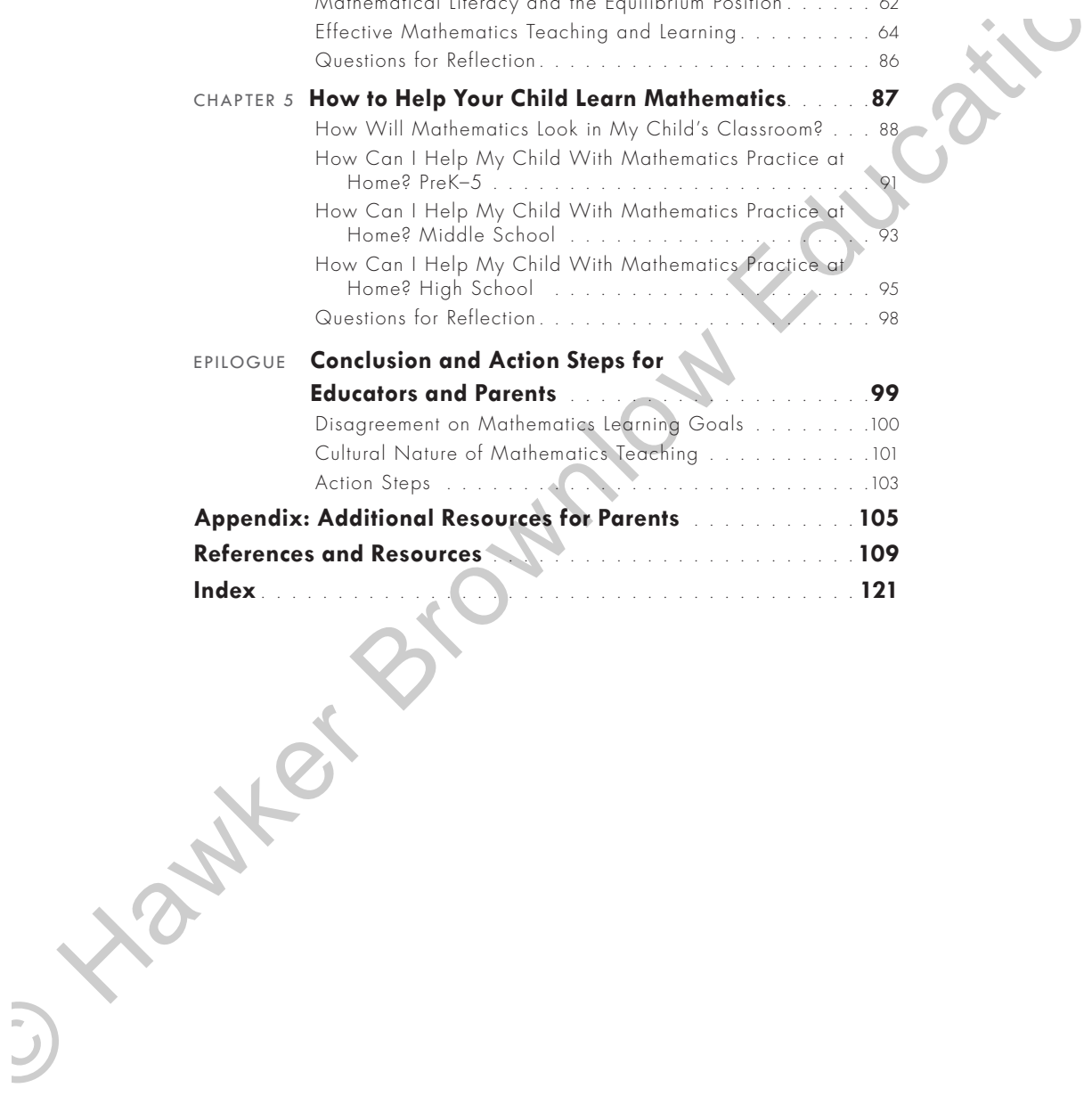


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Introduction

e·qui·lib·ri·um

A state in which opposing forces or influences are balanced.

—NEW OXFORD AMERICAN DICTIONARY,
THIRD EDITION

We love mathematics. We love students—all of the roughly fifty-four million going to school in the United States each year. We love and admire mathematics teachers. And we deeply appreciate the critical role that parents play in their children’s education. We know it is every parent’s desire for his or her child to succeed in learning mathematics. We also believe it is every educator’s desire—teachers, administrators, teacher leaders, central office personnel, and school board members—to see each and every student in his or her school or school district succeed in learning K–12 mathematics. And yet, this goal of mathematics success for each student is often very difficult to achieve.

We are parents or relatives of parents; we have been mathematics teachers and have served as teacher leaders; and we have dedicated our entire professional lives in the service of K–12 mathematics education. We have witnessed student, parent, and teacher frustration, and we also have observed student, parent, and teacher joy when students effectively learn mathematics.

This is why it has been so hard for us to observe K–12 mathematics education under attack (Common Core or otherwise) by vitriolic rhetoric and a confusing lack of accurate information.

Why are we writing this book? It is our desire to provide information and insight that you can use to help you and your colleagues, friends, and relatives to better understand the answer to what should be a simple question: What do we want our students to know and be able to do, and how should they learn it as part of their K–12 mathematics education?

This book is for you, the educators: teachers, administrators, school board members, mathematics program leaders, instructional coaches, university professors—every individual responsible in some way for K–12 mathematics education.

This book is also for you, the parents. We use the term *parents* broadly to include grandparents, other family members, guardians, friends, and neighbors of the students in our communities. These individuals not only care about student success in mathematics but also may have questions about effective mathematics instruction and what is taking place in their local schools based on what they see or hear in the media.

Educators and parents can both effectively use this book. Educators may use this book as a tool to deepen their understanding of effective mathematics instruction and discuss it with their colleagues in professional development settings or book studies. They may recommend the book to parents or use it with them directly to help parents better understand the outcomes and instructional strategies for mathematics learning and why these outcomes and strategies are important. Finally, concerned parents may read this book on their own to deepen their understanding of mathematics education and recommend it to their friends and neighbors who have questions about the mathematics education taking place in their schools.

We hope this book will serve you well as you deepen your understanding of mathematics education and influence your friends, fellow parents, or professional colleagues to help ensure all students have access to high-quality instruction in mathematics.

The Purpose of This Book

We initially started writing this book to clarify misunderstandings regarding the Common Core State Standards (CCSS), which the state

governors commissioned in April 2009 (National Governors Association Center for Best Practices [NGA], 2009). However, it became much more than that for us. We want to ensure that the hope and promise for improving K–12 mathematics teaching and learning, which characterized the first few years after 2010, is not lost on students.

We wrote this book with future high school graduates in mind, those living in your neighborhoods or on your street. We do not want those students, and every current or future graduating class of students around them, to regress to a mathematics curriculum from the 1980s and early 1990s. Many of the mathematics curricula of that era, with respect to instructional approach, content, and assessment practices, simply failed to represent the needed state of equilibrium, and as a result, consistently failed to serve students well enough.

We define *equilibrium* in mathematics education as a program that has “balanced the equation” in its instructional approach to blending procedural fluency, conceptual understanding, and problem solving—an approach in which students learn *how* to do mathematics, *why* mathematics works, and *when* to apply mathematics. A program that has “balanced the equation” not only approaches *how*, *why*, and *when* with equal intensity, but also views them as mutually supportive and necessary to mathematical literacy. This equilibrium, or balance, with respect to mathematics education, will be fully defined in chapter 4.

A program that has “balanced the equation” not only approaches how, why, and when with equal intensity, but also views them as mutually supportive and necessary to mathematical literacy.

Our purpose is to refocus the mathematics education discussion in which educators and parents engage with each other: your friends, neighbors, colleagues, and other local school district educators. Your conversations must move away from misinformation, misguided rhetoric, and extremes (often the stuff that grabs the headlines or characterizes tweets and Facebook and Instagram posts) that do nothing to improve mathematics teaching and learning in U.S. classrooms. Instead, we propose moving toward a discussion of the elements of mathematics instruction that result in significant increases in student learning.

Our purpose is to provide both educators *and* parents with accurate information and research that support the future learning of our students. We seek to do the following.

- ♦ Explain why we need to raise our expectations for effective teaching and learning of mathematics *immediately*
- ♦ Show how debates in mathematics education have a long history, are somewhat cyclical, and have only served to foster a state of near continual disequilibrium and dysfunction toward the successful teaching and learning of K–12 mathematics
- ♦ Explain why parents must expect and support effective mathematics teaching and learning for their children during this era of mathematics reform—the CCSS initiative era
- ♦ Define mathematical literacy and illustrate the effective elements of great mathematics instruction that leads to improved student learning
- ♦ Outline how educators *and* parents can help each child successfully learn mathematics and offer actions they can take to support improved mathematics teaching and learning

Evidence indicates that most people in the United States get their information about education and schools from family and friends—not from research literature or experts (West, Whitehurst, & Dionne, 2011). So although this is not a research or academic book per se, we cite some of the peer-reviewed research and literature that support the points we make. We do not rely on mere opinion.

Peer-reviewed research is the most credible evidence—well above opinions often read in someone’s blog or tweets or stories that appear in the media—because prior to publication, individuals of similar expertise review the work. The peer-review process helps ensure high standards of quality, and the arguments in this book are based on peer-reviewed literature. We present for you not opinions, but facts. We cite the research so you know with confidence that our arguments are based both on evidence of current U.S. student achievement and on the research-informed actions educators and parents are taking that make a significant difference for K–12 learning in every school community.

An Overview of the Book

Part I of this book consists of chapters 1–3. We wrote these chapters primarily for educators. However, we hope that parents also will find it informative when thinking about why the mathematics education their children receive should be different from their own experiences growing up. We highlight information for parents in these three chapters in feature boxes; we believe this information will help parents guide their children in their journey through mathematics.

Chapter 1 discusses why change is necessary, specifically why the status quo with respect to much of mathematics teaching and learning is currently insufficient—that is, not nearly good enough for *all* of those fifty-four million students.

Chapter 2 offers a brief history of mathematics education to demonstrate that debates about this topic have a long history—a history cycle of disequilibrium between two opposing forces. This disequilibrium must end if we hope to ever seriously improve mathematics teaching and learning for every student.

Chapter 3 presents the Common Core debate. We separate the debate about standards *testing* (very controversial in some parts of the country) from the actual implementation of *content* and *process* standards (less controversial but more widely misinterpreted). We help focus the debate on facts and research, not opinion and misinformation, and we show that the correct expectation for K–12 mathematics curriculum, instruction, and assessment should be the balanced pursuit of a *state of equilibrium*. By *equilibrium*, we do not mean to imply that effective mathematics programs are at rest; rather, that within effective mathematics programs, the beliefs (or views) of traditionally opposing forces are *balanced*.

We help focus the debate on facts and research, not opinion and misinformation.

Part II of this book includes chapters 4 and 5, which we wrote primarily as a guide for parents and the expectations they should advocate for regarding K–12 mathematics teaching and learning in their children’s schools. However, these two chapters also serve as a guide for educators to help check the quality of their professional work for effective

mathematics teaching and learning. In these two chapters, we provide feature boxes to inform and guide educators.

Chapter 4 defines mathematical literacy, highlights elements of mathematics programs that are in a state of equilibrium, and describes essential features of effective mathematics instruction—the instructional strategies parents should expect their child’s classroom teachers to employ. These are the strategies teachers try to pursue, and local administrators and school board members expect, in order to gain significant increases in student learning and success in mathematics.

Chapter 5 offers suggestions on how parents can help their children learn mathematics at home and at school and how educators can support every parent in this pursuit.

We wrote the epilogue to both educators and parents. It offers our reflections on why common standards are necessary to prevent inequity and why the instruction mathematics educators and parents expect students to receive must change and why that change is so challenging to implement. In addition, we offer actions educators and parents can take to improve mathematics learning outcomes for all students. The hope is that whether students graduate from high school and walk across that stage in 2020 or 2028 or 2034 or beyond, the efforts educators and parents make today to improve mathematics education will result in better learning opportunities for every student. Ready? Let’s go!

PART I

The primary audience for part I is educators. However, we believe there is much in part I that is of interest to parents as they seek to understand the need to change how we have traditionally taught mathematics, the impact of the history of mathematics education in the United States and how it influences education debates, why common standards are so important, and why mathematics educators must expect more of their students.

We hope the following chapters will guide educators in evaluating the quality of their mathematics programs and practices. Parents will find numerous feature boxes titled “Reflections for Parents.” They can use this information to enhance their personal knowledge development, in discussions with other parents, or for participation in group study such as PTA meetings or a school mathematics task force.