
Preface

American students are losing ground in the global mathematical environment. There, we said it. Now that we've put it on the table, we assume you're not surprised. If you bought this book, you probably feel it in your mathematical bones, so to speak. That knowledge gnaws at teachers, administrators, board members, and politicians; it is a truth that is slowly eating away at the American student's chances of taking the mathematical lead in deep thinking.

We are a world leader, with government-funded public education, highly trained teachers, a vast majority of involved parents, and millions of students who genuinely want to learn. How can we be so far behind the rest of the world mathematically?

The answer is quite simple: because our students have a weak number sense. Many students know how to *do* the math but do not know how to *think through* the math. There is an enormous difference.

As educators, we kept asking ourselves one question: How can we empower American students to think? That question, and many more, drove us toward research, and through our research we discovered a movement that is basically uncharted territory in American classrooms but is the driving force in many of the same countries that consistently outscore us. That movement is called *numeracy*.

This book is the result of over 10 years of research in the field of numeracy. Using this research as a springboard, we've tried everything offered in this book in the math classroom. What we discovered was staggering: When offered the opportunity, students were empowered to think critically and became truly numerate. In this book, we lay a clear and well-researched path that we hope will empower teachers to fill their mathematics instruction with numeracy and deep thinking. Research mixed with practical ideas is, in our opinion, a magical brew for teachers.

The focus on literacy over the last decade has positively affected American education, of that there is no doubt. But our question is, why did America wait so long to commence our literacy initiative when New Zealand and Australia had been reaping the benefits for years? We fear America is repeating the same mistake in mathematics. We cannot allow

that to happen; we must look to countries consistently outscoring us on international tests and investigate what they're doing. The time is now for us to use the knowledge gained through the literacy focus and the use of literacy strategies and merge them with deep thinking and sense-making in mathematics—no matter what math concept is being taught.

What makes a student numerate? Numeracy encompasses deep thinking, meaning-making, and sense-building. Students, when numerate, do not simply do math; they are taught how to think through the math. As a nation, we have our students do math, then do the same math over and over until it is memorized. More often than not, students are not encouraged to think through the math and make sense of it. Many students don't know when they have a wildly wrong answer.

Nationally, our students need to be taught that, when mathematicians process, they have an inner conversation with the math; they listen to the voice in their heads as they process, allowing them to construct a true understanding of the math—numerate understanding. Only when they have an inner conversation (questioning, visualizing, and making connections) will they notice when their answer is illogical or where they went wrong in their calculations.

We invite you to roll up your sleeves and help us revolutionize American mathematics instruction—one classroom at a time.