Preface

When we educators discuss student learning of mathematics, there is a consistent reference to teaching with meaning, building a conceptual understanding, drawing on previous experiences, and promoting high expectations for success. We say students need these instructional experiences in order to learn mathematics and to be prepared to use mathematics in the workplace. Why do we assume that teachers and leaders do not need these same experiences when they are asked to learn something new and apply the learning in their classrooms? Mathematics teachers and leaders can only initiate change by starting from their current level of understanding and performance.

This idea of moving forward based on one's current level seems to be frequently overlooked. At a minimum, mathematics teachers and leaders experience some form of professional development on an annual basis. Some of the experiences may be directly related to mathematics content and pedagogy, but most of the training is probably more generic in nature. However, the general consensus is that current professional development training is not transferring into classrooms, since teaching in mathematics classrooms remains static (Boaler, 2008).

Continuation of the status quo has strong negative consequences for the future of the United States (National Mathematics Advisory Panel, 2008). To remain competitive in the global economy, our nation needs many more students who are proficient in mathematics. This outcome is unlikely if meaningful change in mathematics teaching and learning does not occur. Meaningful change results when effective, research-based, instructional strategies are used regularly by all classroom mathematics teachers, understood and emphasized by mathematics leaders, and supported by school administrators.

While it is perhaps easy to dismiss some professional development training or activities as not beneficial or useful, there is far too much professional development to categorize every training or activity as such. Something is missing on the sending end, receiving end, or both. There is an

absence of "glue" to make the training "stick." This glue, in our opinion, has to do with understanding the ultimate purpose of the training or activities. The theme or rationale for what the professional development learning is intended to do is missing.

Of course, a goal of professional development is to improve the art of teaching with an outcome that more students learn mathematics, thus obtaining equity. While very good and noble, this idea is not specific enough to impact the current instructional strategies being used in classrooms. Furthermore, the focus is on teachers' actions and not on the ensuing students' responses. Teachers may plan and present dynamic lessons, but if students are not participating, only the teachers are involved in the mathematics.

Certainly, teachers' actions are very important but only in light of how students respond to those actions. Efforts at change need to encompass both teachers and students. We believe the key to effective instruction is making thinking visible in mathematics classrooms. For thinking to be visible, both teachers and students must be equally engaged in learning activities. In this book, we show teachers how to achieve this classroom condition and use visible thinking to increase student learning.

OVERVIEW OF THIS BOOK

This book is organized into four parts. In Part I, we establish the foundation for understanding the purpose and rationale for visible thinking. Chapter 1 explains and defines visible thinking and offers supporting research for the concept. Chapter 2 offers the current research on thinking and learning with several themes that thread their way through effective teaching and learning practices. Chapter 3 provides the current reality of mathematics instruction and how some current initiatives may actually hinder thinking.

Part II focuses on how to promote visible thinking in mathematics classes. Chapter 4 explains the relationships among instructional strategies, the resulting actions, and the classroom conditions, all of which directly depend on visible thinking to be effective. Chapter 5 offers very specific suggestions for planning for and achieving long-term instructional improvements in mathematics classrooms. These long-term goals are followed by short-term objectives offered in Chapter 6. The chapter provides a sequential and developmental way for teachers and leaders to effectively initiate and sustain change. Chapter 7 describes our instructional model designed to support long-term goals and short-term objectives.

The three chapters in Part III show how to implement our instructional model at different grade levels. Each chapter offers three problems and

supporting lessons based on making thinking visible. Chapter 8 focuses on kindergarten through Grade 2 mathematics, Chapter 9 on Grades 3 through 5, and Chapter 10 on Grades 6 through 8. The book concludes with Part IV, in which Chapter 11 offers advice for ensuring that visible thinking is initiated in mathematics classrooms and that leaders and administrators are working to assist teachers in achieving mathematics success for every student.

INITIATING PROGRESS

Mathematics teachers, leaders, and administrators can no longer leave mathematics learning, achievement, and success to chance. Instructional strategies offered during professional development must first be screened to determine whether they are effective—and then actually implemented. If the strategy warrants spending valuable professional development time to learn, and is designed to help students, then the strategy is worth using in classrooms.

The key to success in student learning in mathematics classrooms lies in making thinking visible. To show how this can be done, throughout the book we have provided numerous examples and scenarios using mathematics problems. The examples not only demonstrate for teachers, leaders, and administrators what visible thinking looks like in mathematics classrooms, but also guide teachers in adapting traditional problems to promote visible thinking. The scenarios present situations in which visible thinking leads to immediate and effective teacher intervention strategies.

Making thinking visible in mathematics classrooms is very doable. We offer a sequential and developmental plan for beginning with current practices—whatever these may be—and gradually, but steadily, initiating successful instructional changes into mathematics classrooms.