
Preface

This book is for leaders responsible for improving the mathematics achievement of students. The process presented in the following pages will be useful to leaders who want their teachers, grade levels, departments, schools, and districts to successfully build a high-quality mathematics program based upon the five principles identified by the National Council of Teachers of Mathematics (NCTM; 2000): equity, curriculum, teaching, learning, and assessment, as well as the four leadership principles identified by the National Council of Supervisors of Mathematics in the *PRIME Leadership Framework* (NCSM; 2008): equity leadership, teaching and learning leadership, curriculum leadership, and assessment leadership.

To facilitate leaders' actions toward positive change, we present in this book a developmental, sequential process, which is shown in Figure 0.1, Outline of Developmental Stages. While the process unfolds over many months and is long term by nature, we also show mathematics leaders how to effectively focus their time and energy so as to achieve shorter-term goals and objectives. Leaders will find guidance for change initiatives that are small enough to manage, yet large enough to matter. We have incorporated NCTM Principles and NCSM Leadership Principles throughout each stage of the process and offer recommendations that are logical, supported by research, and easy to follow. Suggestions for targeting equity are also provided in discussion of each stage of the model.

The improvement process we describe begins with refining, honing, aligning, and implementing the mathematics curriculum. Curriculum improvement is critical to long-term success and student achievement. In addition, the curriculum is a recognized part of the leader's sphere of influence. Initiating improvement within the mathematics curriculum does not require permission to purchase new programs, to adjust schedules, or to seek outside resources. Mathematics leaders need only to make the decision to begin.

Figure 0.1 Outline of Developmental Stages

Goal: Engaging and Empowering Staff

Leadership Goal: The mathematics leader ensures that processes are in place to empower and engage staff.

A mathematics leader guarantees that:

- Staff is included in decision making.
- Communication structures are in place.
- Dynamics of engagement and empowerment are understood.

Stages for Engaging

Developmental Stage: Articulating the Curriculum

The mathematics leader ensures that the school district, campus, or school has a clearly articulated mathematics curriculum.

A mathematics leader guarantees that:

- The curriculum is aligned to national, state, and local standards.
- All students are given the opportunity to learn appropriate content.
- The scope, sequence, and timeline align to the instructional year.
- The curriculum is rigorous.

Developmental Stage: Implementing the Curriculum

The mathematics leader ensures that the mathematics curriculum is implemented as designed.

A mathematics leader guarantees that:

- The developed curriculum plan is followed.
- Student progress is monitored via ongoing benchmark assessments.

Developmental Stage: Incorporating Effective Instructional Practices

The mathematics leader ensures that effective instructional practices are implemented.

A mathematics leader guarantees that:

- A variety of instructional strategies are used.
- Instructional materials match desired classroom instructional practices.
- Data are used to inform practice.

Stages for Empowering

Developmental Stage: Providing Timely and Targeted Feedback

The mathematics leader ensures that timely feedback concerning curriculum implementation and classroom strategies are provided to appropriate personnel.

A mathematics leader must guarantee that:

- Pertinent data are gathered and used to inform learning.
- Information is targeted to group or specific teacher needs.
- Trust is built throughout the staff.

(Continued)

Figure 0.1 (Continued)***Developmental Stage: Establishing Professional Learning Communities***

The mathematics leader ensures that the professional learning communities are established with suitable organization and structure support.

A mathematics leader guarantees that:

- Staff is provided time to collaborate.
- Staff operates as a professional learning community.
- Staff is provided time to reflect upon teaching and learning.

Developmental Stage: Fostering Professional Development

The mathematics leader ensures that continuous professional development is provided. A mathematics leader guarantees that ideas about mathematical content, instruction, and assessment are relevant, sustained over time, emerge from identified teacher needs, and are directly related to classroom procedures.

The process presented here provides leaders with the guidance necessary to complete one entire improvement cycle—beginning with articulating a curriculum and ending with fostering professional development—while continually engaging and empowering mathematics teachers. Although improvement efforts are inevitably recursive in nature, completing even one improvement cycle can have a significant impact upon mathematics teaching and learning.

The audience for this book encompasses all those who are engaged in mathematics leadership, including K–12 mathematics curriculum specialists, principals, building specialists, department chairs, mentors, coaches, new and emerging leaders, and higher-education faculty who train leaders in mathematics education.

Although the book is geared toward mathematics leaders who have a background in mathematics content, we recognize that leaders lacking mathematical content expertise also provide oversight for mathematics programs. This book is intended to meet the needs of principals, curriculum directors, and assistant superintendents of curriculum and instruction who directly supervise mathematics leaders. And, although written as a guide for those in formal leadership positions, anyone involved in mathematics education will find the material beneficial.

NEED FOR LEADERSHIP

The need for informed, proactive leaders at all levels of mathematics education is crucial to ensuring equity and achieving success in implementing

quality mathematics programs, in other words, reaching the high ideals of NCTM and NCSM. *Principles and Standards for School Mathematics* (NCTM, 2000) asserts “There is an urgent and growing need for mathematics teacher-leaders—specialists positioned between classroom teachers and administrators who can assist with the improvement of mathematics education” (p. 375). In addition, there is an urgent need for leadership in mathematics at the principal and district-office levels. Although leadership and professional development are key points in the mission statement, resources for identifying, guiding, and training new, emerging, or existing leaders are difficult to find (NCSM, 2008).

While there are numerous generic resources that suggest actions, strategies, and approaches for educational leaders, resources demonstrating how mathematics leaders can successfully realize NCTM principles and achieve a high-quality mathematics program are scarce (NCSM, 2008). Those that do exist are often not organized sequentially, nor do they embed the recommendations into an on-going plan for improvement. This lack of sequential organization poses problems for leaders. Leaders need more than the lists of isolated, disconnected recommendations found in many resources and state documents. While lists of recommendations can serve as checklists or self-assessments, two questions still remain for mathematics leaders: *Where do I start?* and *What do I do next?*

This guide answers those questions. We begin by identifying from research the knowledge and skills mathematics instructional leaders need in order to have the greatest positive impact on student learning. We have clustered and organized the information so that as mathematics leaders progress through the book, each chapter provides the scaffolding and framework for the next chapter. As stages are presented, the principles are addressed, and leaders progress toward a comprehensive, high-quality mathematics program. A primary function of mathematics leaders is to translate the NCTM Principles into practical actions—actions that are also consistent with the NCSM Leadership Principles. The process presented here will help leaders achieve this goal.

OVERVIEW OF THE BOOK

This book is divided into three parts: Preparing the Foundation, A Leadership Model, and Continuing the Work.

Part I: Preparing the Foundation

Chapter 1, *Understanding and Clarifying Leadership in Mathematics*, explores the correlation between the process presented in this book and

the recommendations of the National Council of Teachers of Mathematics and the National Council of Supervisors of Mathematics.

Mathematics leaders *engage* and *empower* staff in the art of teaching. The theory and research behind engaging and empowering individuals is identified in Chapter 2, appropriately titled Engaging and Empowering Staff. This theme is reinforced throughout the remainder of the book.

Part II: A Leadership Model

In Chapter 3, *Articulating the Curriculum*, leaders engage teachers by working to *articulate* mathematics content and materials, providing a foundation for success by identifying a reasonable and manageable scope, sequence, and timeline for instruction. This work of articulation is done *with* teachers, not *to* them.

Leaders continue to engage teachers by actually *implementing* the curriculum as designed through the processes outlined in Chapter 4, *Implementing the Curriculum*. Implementation, to be successful, is monitored. Monitoring occurs by having educators from all levels and roles actually enter classrooms. Educators use a customized classroom visit form that evaluates only the degree of program implementation, not the teachers.

Recognizing the hard work teachers do is important. Nonetheless, working hard is of little benefit if content is misaligned. And, teaching correct content in appropriate ways is no harder for teachers than teaching misaligned content in ineffective ways. Leaders must help ensure that teachers create horizontally and vertically aligned content. Leaders also work to help teachers develop assessments that align to content. Only when assessments align with content can teaching effectiveness be accurately evaluated. With aligned curriculum implementation underway, the focus of leaders shifts to supporting teachers by utilizing *effective practices*, as described in Chapter 5, *Incorporating Effective Instructional Practices*.

The process up to this point has leaders working to engage teachers in actually teaching what is to be taught, thus assuring adequate opportunity for students to learn. Leaders now shift their focus to empowering teachers by providing timely and targeted *feedback* (Chapter 6), establishing *professional learning communities* (Chapter 7), and fostering worthwhile *professional development* (Chapter 8).

Chapters 6, 7, and 8 discuss how to use meaningful data as a way to effectively analyze and reflect upon instructional and program effectiveness. Teachers and leaders need to have meaningful discussions about student progress. Ideally, these discussions are part of professional learning communities. The accuracy of data is a key to driving beneficial discussions that move beyond inclinations to express opinions about what works and what doesn't work. Without evidence, teachers will just as

likely abandon effective practices as ineffective ones. Teachers and leaders need evidence to indicate whether something worked or not.

With the development of an articulated curriculum, implemented curriculum, effective strategies, and accurate data, teachers can engage in worthwhile and meaningful dialogues in professional learning communities. In some cases, leaders may have difficulty establishing professional learning communities due to budgetary concerns, scheduling concerns, or district-level concerns. For these reasons, we discuss establishing professional learning communities in Chapter 7 rather than at the beginning of the process. Mathematics leaders can do much to effectively engage and empower their staffs and can have tremendous, positive impact on student learning and achievement while working towards the long-term goal of establishing professional learning communities. If professional learning communities are thwarted, leaders can move forward to professional development (Chapter 8) that targets teachers' needs and is supported by data. By this time, a process will have been established to monitor the results of professional development and ensure that it has the desired impact.

Part III: Continuing the Work

Chapter 9 focuses on how students learn mathematics. Various tools help teachers facilitate students' ability to move from concrete stages to symbolic stages in mathematical learning. Active engagement is a key factor and involves student collaboration and making student thinking visible in the classroom.

The goal for leaders is to use their considerable influence to impact what happens in the mathematics classroom and to close the achievement gap. In working through the stages presented in this book, engaging and empowering staff members are critical features of that plan. Chapter 10 reminds leaders that the model presented here is cyclical. Continuous improvement of a mathematics program requires leaders to reevaluate over time.

ANSWERING LEADERSHIP QUESTIONS

The material in each chapter of this book asks and answers three important questions:

1. What is expected of mathematics leaders?
2. What are mathematics leaders to do?
3. What can mathematics leaders use?

The sections titled “What Are Leaders Expected to Do?” offer explanations of current research, providing a rationale and explanation for upcoming leadership actions. The “Leaders Ensure . . .” sections actually guide leaders through actions that achieve established expectations. The final sections, “Resources That Leaders Can Use,” suggest additional recommended resources.

USING THE BOOK AS A GUIDE

As mentioned previously, the chapters in this book reflect a carefully ordered, sequential process that will lead to success in teaching and learning. Each chapter paves the way for the succeeding one—the knowledge, skills, and actions within the chapters overlap one to the next. With each stage, teachers and leaders become more actively engaged and more empowered. When the last stage, *Fostering Professional Development*, is reached, the entire process recycles at a richer and more fulfilling level as an engaged and empowered staff begins anew by reconsidering, reevaluating, and reforming a curriculum.

Leaders can use this book in a number of ways:

- to serve as a planning guide for school improvement efforts;
- to serve as a study guide for large or small groups;
- to serve as a reflective tool;
- to serve as a lens for focusing on areas needing improvement;
- to serve as a guide for developing new or future leaders; or
- to serve as a resource for verifying or comparing other resources.

Figure 0.1, *Outline of Developmental Stages*, may be used as a tool for leaders as they reflect upon the work of the school or district and evaluate where they have been and where they are going. The clarifying statements beneath each developmental stage can assist in maintaining a dual focus on both a long-term plan and short-term objectives.

Although some leaders may be tempted to skip a stage, each identified stage is crucial to student success in mathematics. Skipping a stage, such as developing an aligned curriculum, will ultimately undermine improvement efforts.

DEVELOPING FUTURE LEADERS

Current leaders can use this resource to develop and mentor new mathematics leaders who will understand and implement the principles identified

by NCSM. The knowledge and skills discussed in the following pages are foundational for developing future leaders. As leaders use the book in a transparent, explicit, and inclusive manner, the training of future leaders is a tremendous by-product of their actions. Empowering and engaging staff members in the work of improving mathematics education builds invaluable leadership knowledge and skills. While undertaking this work with mathematics teachers, leaders will note that some teachers eagerly assume various supportive roles in the change initiatives. These teachers are likely to emerge as team leaders, department heads, or mathematics resource specialists in formal or informal ways. Some will become part of the leadership teams that help a district move toward the NCTM Principles and maintain such a focus in the future. In this way, the book serves a dual role for promoting leadership. First, it serves as a guide for current mathematics leaders, and second, by engaging and empowering staff in the improvement process, it provides the foundation that helps secure and foster future mathematics leaders.

The entire process is designed to instill hope for thousands of mathematics leaders and teachers working every day for betterment of their students. It can be done, and you can make it happen. In whatever way you choose to use this book, we encourage you to keep moving forward.