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Introduction

If you are a teacher leader of mathematics, then this book is for you! Whether you are a novice or a master teacher; an elementary, middle, or high school teacher leader; a rural, suburban, or urban teacher leader; this book is for you. It is for all school site administrators, teacher team leaders, instructional coaches, and central office leaders who support professionals who are part of the K–12 mathematics learning experience.

Leading mathematics so *each and every student* learns the K–12 college-preparatory mathematics curriculum, develops a positive mathematics identity, and becomes empowered by mathematics is a complex and challenging task. Trying to tackle that task by allowing your teachers to work in isolation from their colleagues will severely limit your ability to erase inequities in student learning that exist in your schools. The pursuit and hope of developing your teachers into a collaborative community with their colleagues and moving them away from isolated professional practice are necessary, hard, exhausting, and sometimes overwhelming.

In this mathematics leadership book, you and your colleagues will learn to focus your time and energy on teaching others how their collaborative efforts will result in significant improvement in student learning and promote equity.

What is equity? To answer that, it is helpful to first examine inequity. In traditional schools in which teachers work in isolation, there is often a wide discrepancy in teacher practice. Teachers in the same grade level or course may teach and assess mathematics quite

differently—there may be a lack of consistency in what your grade-level or course-based teachers expect students to know and be able to do, how they will know when students have learned, what they will do when students have not learned, and how they will proceed when students have demonstrated learning. Such wide variance in potential teacher practice among grade-level and course-based teachers then causes inequities in the student learning of mathematics as students pass from course to course and grade to grade. The gap widens.

Equity and PLCs

The good news is you can lead the erasing of the mathematics learning gaps. The PLC at Work™ process is one of the best and most promising models your school or district can use to build a more equitable response for student learning. The architects of the PLC process, Richard DuFour, Robert Eaker, and Rebecca DuFour, designed the process around three big ideas and four critical questions that placed learning, collaboration, and results at the forefront of our work (DuFour et al., 2016). School and district leadership that commit to the PLC transformation process rally around the following three big ideas (DuFour et al., 2016).

1. **A focus on learning:** Teachers focus on learning as the fundamental purpose of the school rather than on teaching as the fundamental purpose.

2. **A collaborative culture:** Teachers work together in teams interdependently to achieve a common goal or goals for which members are mutually accountable.
3. **A results orientation:** Team members are constantly seeking evidence of the results they desire—high levels of student learning.

Additionally, you lead the mathematics teacher teams within a PLC focus on four critical questions (DuFour et al., 2016):

1. What do we want all students to know and be able to do?
2. How will we know if they learn it?
3. How will we respond when some students do not learn?
4. How will we extend the learning for students who are already proficient?

The four critical PLC questions provide an equity lens for your professional work. Imagine the opportunity gaps that will exist if you do not help your colleagues to agree on the level of rigor for PLC critical question 1, What do we want all students to know and be able to do?

Imagine the devastating effects on students if you do not help your faculty reach complete team agreement on the high-quality criteria for the assessments you administer (PLC critical question 2) and the routines your teachers use for how you score those mathematics assessments. Imagine the lack of student agency (their voice in learning) if you do not help the teachers learn how to work together to create a unified, robust formative mathematics assessment process for helping students *own* their response when they are and are not learning.

To answer these four PLC critical questions well requires structures through the development of the *products* you help teams to produce together, and a formative culture through the *process* of how you work with your teams to *use* those products.

The concept of your mathematics teacher teams *reflecting together and then taking action* around the right work is an emphasis in the K–12 *Every Student Can Learn Mathematics* series. The potential actions you and your colleagues take together improve the likelihood of more equitable mathematics learning experiences for every K–12 student. And you must help to lead the teacher teams forward around the right professional work.

The Reflect, Refine, and Act Cycle

Figure I.1 illustrates our author perspective about the process of lifelong learning—for us, for you, and for your students. The very nature of our profession—education—is about the development of skills toward learning. Those skills are part of an ongoing process we pursue together.

More important, the reflect, refine, and act cycle is a *formative* learning cycle we describe throughout all four books in the series. When you embrace mathematics learning as a *process*, you and your students:

- **Reflect**—Work the task, and then ask, “*Is this the best solution strategy?*”
- **Refine**—Receive FAST Feedback and ask, “*Do I embrace my errors?*”
- **Act**—Persevere and ask, “*Do I seek to understand my own learning?*”

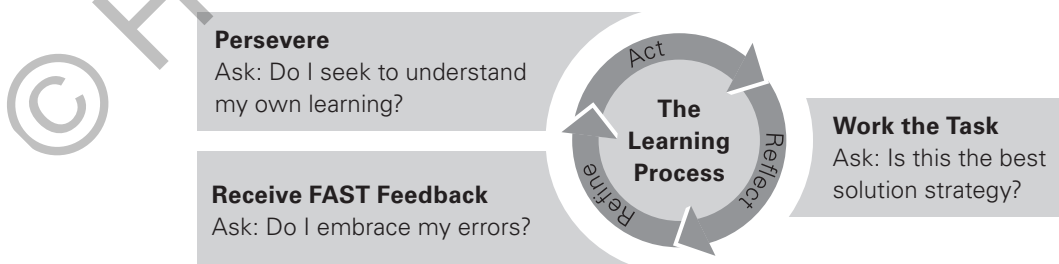


Figure I.1: Reflect, refine, and act cycle for formative student learning.

The intent of the *Every Student Can Learn Mathematics* series is to provide you with a systemic way to structure and facilitate the deep team discussions necessary to lead an effective and ongoing adult and student learning process each and every school year.

Mathematics in a PLC at Work Framework

The *Every Student Can Learn Mathematics* series has four books that focus on a total of six teacher team actions and two mathematics coaching actions within four primary categories.

1. *Mathematics Assessment and Intervention in a PLC at Work*
2. *Mathematics Instruction and Tasks in a PLC at Work*
3. *Mathematics Homework and Grading in a PLC at Work*
4. *Mathematics Coaching and Collaboration in a PLC at Work*

Figure I.2 (page 4) shows each of these four categories and the two actions within them. These eight actions focus on the nature of the professional work of your teacher teams and how they should respond to the four critical questions of a PLC (DuFour et al., 2016).

This book in the series provides a leadership focus on your coaching actions so that the six teacher team actions can become a reality. Your work begins by deciding who exactly should be working in your collaborative teams for mathematics to develop the team actions described in figure I.1.

Most commonly, your collaborative teams will consist of two or more teachers who teach the same grade level or course, and the support personnel such as resource teachers for those students. Through your focused work in helping your teachers address the four critical questions of a PLC, you provide every student in your grade-level or course-based teams with equitable learning experiences and expectations, opportunities for sustained perseverance, and robust formative feedback, regardless of the teacher he or she receives.

If, however, there are singleton (lone teachers who do not have a colleague who teaches the same grade level or course) teachers in your school, you will have to determine who it makes the most sense for them to

work with as you strengthen their lesson-design and student-feedback skills. Leadership consultant and author Aaron Hansen (2015) suggests the following possibilities for creating teams for singletons.

- Vertical teams (for example, a primary school team of grades K–2 teachers or a middle school mathematics department team for grades 6–8)
- Virtual teams (for example, a team comprising teachers from different sites who teach the same grade level or course and collaborate virtually with one another across geographical regions)
- Grade-level or course-based teams (for example, a team of grade-level or course-based teachers in which each teacher teaches all sections of grade 6, grade 7, or grade 8; the teachers might expand to teach and share two or three grade levels instead of only one to create grade-level or course-based teams)

About This Book

In *Mathematics Coaching and Collaboration in a PLC at Work*, we explore two specific actions for your professional work as a coach within the collaborative culture of a PLC.

1. **Coaching action 1:** Develop PLC structures for effective teacher team engagement, transparency, and action.
2. **Coaching action 2:** Use common assessments and lesson-design elements for teacher team reflection, data analysis, and subsequent action.

In the chapters of part 1 of this book, you will explore different leadership development practices and several leadership strategies or actions. You will discover how becoming strong in these practices and strategies promotes effective team leadership. In part 2, you will examine numerous protocols to support teacher team reflection and continual growth by helping your mathematics teacher teams to engage in *action research*—a cycle of analyzing evidence of student learning during and after a unit of mathematics instruction and assessment.

So how do you coach and lead meaningful change and improvement initiatives in mathematics at the classroom level? This book provides a guide to coaching actions that provide the greatest benefit for sustaining deep change with each mathematics team and includes

Every Student Can Learn Mathematics Series Team and Coaching Actions Serving the Four Critical Questions of a PLC at Work	1. What do we want all students to know and be able to do?	2. How will we know if students learn it?	3. How will we respond when some students do not learn?	4. How will we extend the learning for students who are already proficient?
Mathematics Assessment and Intervention in a PLC at Work				
Team action 1: Develop high-quality common assessments for the agreed-on essential learning standards.	■	■		
Team action 2: Use common assessments for formative student learning and intervention.			■	■
Mathematics Instruction and Tasks in a PLC at Work				
Team action 3: Develop high-quality mathematics lessons for daily instruction.	■	■		
Team action 4: Use effective lesson designs to provide formative feedback and student perseverance.			■	■
Mathematics Homework and Grading in a PLC at Work				
Team action 5: Develop and use high-quality common independent practice assignments for formative student learning.	■	■		
Team action 6: Develop and use high-quality common grading components and formative grading routines.			■	■
Mathematics Coaching and Collaboration in a PLC at Work				
Coaching action 1: Develop PLC structures for effective teacher team engagement, transparency, and action.	■	■		
Coaching action 2: Use common assessments and lesson-design elements for teacher team reflection, data analysis, and subsequent action.			■	■

Figure 1.2: Mathematics in a PLC at Work framework.

insights and tools for lesson study, embedded coaching, and a response to evidence of student learning from the common unit assessments.

In this book, you will find discussion tools that offer questions for reflection, discussion, and action about your mathematics practices and routines. You are invited to write your personal leadership story in the *leader reflection* boxes as

well. To help you reflect on current progress in your collaborative team work that this book and the series as a whole describe, you can use the Mathematics in a PLC at Work Rating and Reflection Tool (page 109–110) to evaluate areas of strength and weakness in your current mathematics professional work and future efforts. You will also find some personal stories from the talented authors of this series. These stories

provide a glimpse into the authors' personal insights, experiences, and practical advice connected to some of the strategies and ideas in this book.

The K–12 *Every Student Can Learn Mathematics* series is steeped in the belief that the decisions and daily actions of classroom teachers of mathematics matter.

Classroom teachers have the power to decide and choose the mathematical tasks students are required to complete during lessons, homework they develop and design, unit assessments such as quizzes and tests, and projects and other high-performance tasks. Your teachers have the power to determine the rigor for those mathematical tasks, the nature of student

communication and discourse to learn those tasks, and whether or not learning mathematics should be a formative process for teachers and students. You, as a leader, must ensure the choices of the teachers are good choices, each and every day.

Most important, you have the power to decide if you and the classroom teachers in your school will do all of the challenging mathematics work of your profession alone or with others. As you embrace the belief that together, the work of your professional learning community can overcome the many obstacles you face each day, then the belief that *every student can learn mathematics* just may become a reality in your school.

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