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Introduction

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

Teaching 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 solve that task in isolation from your colleagues will not result in erasing inequities that exist in your schools. The pursuit and hope of developing into a collaborative community with your colleagues and moving away from isolated professional practice are necessary, hard, exhausting, and sometimes overwhelming.

Your professional life as a mathematics teacher is not easy. In this book, you and your colleagues will focus your time and energy on collaborative efforts that result in significant improvement in student learning.

Some educators may ask, “Why become engaged in collaborative mathematics teaching actions in your school or department?” The answer is simple: *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 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 as students pass from course to course and grade to grade.

These types of equity issues require you and your colleagues to engage in team discussions around the development and use of assessments that provide evidence of and strategies for improving student learning.

Equity and PLCs

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). Schools and districts 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, 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 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?

The four critical PLC questions provide an equity lens for your professional work. Imagine the opportunity gaps that will exist if you and your colleagues do not agree on the level of rigor for PLC critical question 1 (DuFour et al., 2016): What do we want all students to know and be able to do?

Imagine the devastating effects on K–12 students if you do not reach complete team agreement on the high-quality criteria for the assessments you administer (see PLC critical question 2) and your routines for how you score them. Imagine the lack of student agency (their voice in learning) if you do not 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 structure through the development of *products* for your work together, and a formative culture through the *process* of how you work with your team to *use* those products.

The concept of your *team reflecting together and then taking action* around the right work is an emphasis in the *Every Student Can Learn Mathematics* series.

The Reflect, Refine, and Act Cycle

Figure I.1 illustrates the reflect, refine, and act cycle, our 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?”

The intent of this *Every Child Can Learn Mathematics* series is to provide you with a systemic way to structure and facilitate 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 includes four books that focus on a total of six teacher team actions and two coaching actions within four larger categories.

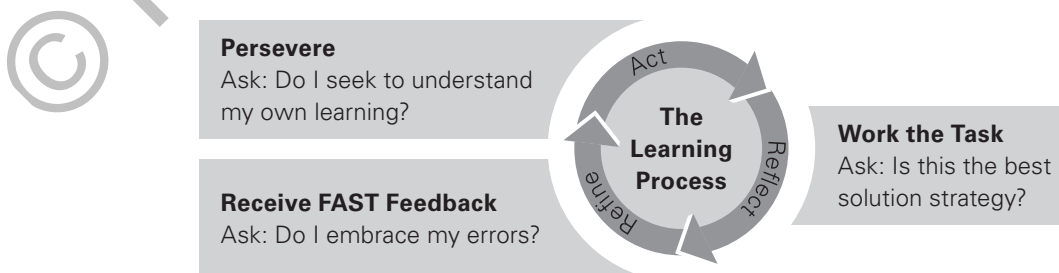


Figure I.1: Reflect, refine, and act cycle for formative student learning.

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 shows each of these four categories and the two actions within it. These eight actions focus on the nature of the ongoing, unit-by-unit professional work of your teacher teams and how you should respond to the four critical questions of a PLC (DuFour et al., 2016).

Most commonly, a collaborative team consists of two or more teachers who teach the same grade level or course. Through your focused work addressing the four

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 I.2: Mathematics in a PLC at Work framework.

critical questions of a PLC (DuFour et al., 2016), you provide every student in your grade level or course with equitable learning experiences and expectations, opportunities for sustained perseverance, and robust formative feedback, regardless of the teacher he or she receives.

If, however, you are a singleton (a lone teacher who does not have a colleague who teaches the same grade level or course), you will have to determine who it makes the most sense for you to work with as you strengthen your 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

Every grade-level or course-based collaborative team in a PLC culture is expected to meet on an ongoing basis to discuss how its mathematics lessons and assessments ask and answer the four critical questions as students are learning (DuFour et al., 2016). For this book in the series, we explore two specific *assessment team actions* for your professional 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.

This book emphasizes intentional differentiation between the mathematics assessment instruments or *products* your team develops and produces (part 1, chapters 1–3) and the *process* (part 2, chapters 4–6) for how your team uses those products to analyze the student learning results of your mathematics work week

after week. Part 1 examines the quality of common mathematics assessment instruments you use during and at the end of each unit of study. You will evaluate your current common assessments (quizzes and tests) based on eight mathematics assessment design criteria, including the calibration of your scoring for those assessments. Part 2 explores how to use the high-quality common assessment instruments you develop to enhance and improve the student learning process.

The tools and protocols in this book are designed to help you become confident and comfortable in mathematics assessment conversations with one another, and move toward greater transparency in your assessment practices with colleagues.

In this book, you will find discussion tools that offer questions for reflection, discussion, and action about your mathematics assessment practices and routines. We invite you to write your personal assessment story in the *teacher reflection* boxes as well. You will also find some personal stories from the 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 *Every Student Can Learn Mathematics* series is steeped in the belief that as classroom teachers of mathematics, your decisions and your daily actions matter. You have the power to decide and choose the mathematical tasks students are required to complete during lessons, homework, unit assessments such as quizzes and tests, and the projects and other high-performance tasks you design. You 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 you and your students.

As you embrace the belief that together, the work of your professional learning community can overcome the complexities of your work and obstacles to learning you face each day, then *every student can learn mathematics* just may become a reality in your school.

Team Action 1: Develop High-Quality Common Assessments for the Agreed-On Essential Learning Standards

To begin with the end in mind means to start with a clear understanding of your destination.
It means to know where you're going so that you better understand
where you are now so that the steps you take are always in the right direction.

—Stephen R. Covey

During your career, you can use common mathematics assessments to create a more equitable learning experience for every student, inspire student learning, and help students persevere in their mathematics learning based on the feedback they receive and their response to that feedback. Part 1 of this book examines the criteria for evaluating and developing high-quality, unit-by-unit assessments (both during and at the end of a unit) and the accuracy of the scoring protocols used for those assessments.

There are several team discussion tools designed to support your team's assessment work in part 1.

- Common Assessment Self-Reflection Protocol (figure 1.1, page 11)
- Assessment Instrument Quality Evaluation Rubric (figure 2.1, page 14)
- High-Quality Assessment Evaluation (figure 2.2, page 15)
- Sample Assessment Questions for Team Scoring (figure 2.5, page 29)
- Scoring Assessment Tasks (figure 2.6, page 30)
- Sample Grade 4 End-of-Unit Assessment (figure 3.3, page 43)
- Sample High School Algebra 1/Integrated Mathematics I End-of-Unit Assessment (figure 3.4, page 47)
- Assessment Instrument Alignment and Scoring Rubric (figure 3.8, page 61)

Mathematics assessment throughout the year becomes an opportunity for students to *reflect*, *refine*, and *act* both during and at the end of a unit. Your students should be expected to use the assessments and feedback you provide to reflect on their understanding for each mathematics standard, and then act to refine their errors in the process. This formative feedback process begins with an examination of the quality of your common unit mathematics assessments with your colleagues.