

# Preface

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*“But for tiny adjustments, if we knew how to make them, we could release the genius in every child.”*

—Albert Einstein (cited in Murray & Jorgensen, 2007)

**A**s a teacher committed to implementing the principles of the National Council of Teachers of Mathematics (NCTM) and therefore using formative assessment to differentiate instruction in my classroom, I sought guidance on the practical issues that arise and a coherent description of what exactly these principles would look like in actual exemplary classrooms. But I did not find enough. After developing my own resources and formulating a theoretical and practical framework for how to use formative assessment to differentiate instruction in mathematics, I found an overwhelming demand among other math teachers at conferences, in math education courses I teach, and in schools where I consult to learn more about how they can do this effectively in their own classrooms.

The NCTM (2000) strongly recommends, in its first and arguably most important principle—the Equity Principle—that all students receive challenging math instruction, support, and enrichment. This book provides a road map for using formative assessment to differentiate instruction, most specifically in Chapter 2, making achieving the equity principle more within the reach of teachers. Furthermore, the assessment strategies I describe are aligned with the NCTM’s recommendations that assessment be an integral part of instruction used regularly to inform decision-making.

A growing research base shows that instruction is most effective when differentiated so that students are taught at their individual instructional levels (Heubner, 2010). When instruction is either too difficult or too easy, students become frustrated or bored, and learning declines. When teachers use formative assessment to understand where students are in their learning, then differentiated instruction is more effective. Although there is growing substantial research on the effectiveness of differentiating instruction, not many large-scale studies have been conducted. In contrast, researchers have collected more than 250 articles and book chapters, all showing the tremendous effectiveness of formative assessment on raising student achievement (Black & Wiliam, 1998). Given the strength of the

research base on formative assessment, which meets the requirements of legislation such as No Child Left Behind and Response to Intervention that require schools to use research-based methods, there has been a turn to formative assessment and differentiating instruction to improve how math is taught.

This book cites seminal and recent research and describes the instructional procedures found effective for teaching middle school mathematics through a unique comprehensive framework of seven practices that I have assembled, based on research and my classroom experiences. This book's content was tested, reviewed, and enhanced in more than 70 hours of meeting time by experienced math teachers. The author met with these teachers weekly in 2-hour blocks after school to share ideas, listen to their ideas, and coplan strategies to test in the classroom. Then, in an action research format, the teachers tested them out with real classes of students and reflected on the results. Woven throughout the book are practical teacher-tested suggestions, real-world examples, and student activities, followed by a list of recommended resources at the end.

Teachers are busy. That is why I include reproducible handouts of exercises and activities that can be used immediately with students. The suggestions can be used step by step, all designed with time management in mind. As most mathematics teachers are bound by school requirements that they teach a prescribed curriculum (one of several challenges mathematics educators face), this book offers a format for how teachers can adapt existing lessons from the texts they must use to deliver them in a more differentiated way. Not only teachers working in heterogeneously grouped classrooms can benefit from differentiating in these ways, but even in homogeneously grouped classrooms, teachers acknowledge that there is still a wide array of abilities and diverse approaches to learning.

Chapter 1 opens with vignettes of three teachers using formative assessment to differentiate instruction in individualized ways. Then readers are offered a self-assessment on differentiation and an introduction to the seven-practices framework. This provides teachers with an instant big picture snapshot of what a differentiated math class looks like as well as concise directions for how to work toward achieving this. Research on the benefits of differentiated instruction and formative assessment are presented in this chapter as well as suggestions for creating a class climate or norms in which students work independently and appreciate that they may need to do different work, given that we all have unique learning styles and needs.

Assessment as the core of differentiated instruction is addressed in Chapter 2. Diagnostic preassessments and strategies for collecting formative assessment data on a regular basis are discussed in depth. An array of preassessment options is presented as well as suggestions for continuous formative assessment. A comprehensive picture of how to use these data is given, followed by a discussion of the importance of students' self-scoring assessments and using the data to inform next steps they will take in their learning. As most teachers may be responsible for more than

a hundred or more students by middle school, the most practical and time-efficient ways to create, adapt, collect, and analyze these assessments are suggested. The chapter concludes with cautions on how assessment can impact confidence and motivation, followed by recommendations for how to make this more positive.

In Chapter 3, an overview of tiered unit and lesson planning is provided along with five model-tiered lessons, with formats for lesson planning and reproducible handouts for students. Tiering is broadly discussed in terms of how teachers can naturally and easily tier lessons regularly. Also emphasized are making assignments equally interesting for all students and not assigning more or less work to different groups.

Chapter 4 addresses specific strategies for supporting low-achieving math students. If after using the strategies suggested in Chapters 1–3, some students still struggle, then Chapter 4 offers a broad framework for fine tuning differentiation supports. Research-validated strategies are presented to address basic fact gaps, conceptual understanding challenges, and procedural calculation difficulties.

Chapter 5 addresses techniques for challenging students who are math talented. It offers suggestions for how to design open-ended, abstract, and complex tasks and enrichments within lessons or during class discussions. Fundamental modifications, such as curriculum compacting and creating learning contracts, are presented, along with practical examples and reproducibles. Models of effective higher order questioning strategies as well as instant challenge templates for pushing students to clarify and extend thinking are also presented.

Chapter 6 provides time-management strategies for running a differentiated classroom, including unit planning, grouping and managing students working on different tasks, assigning and correcting homework, and grading.

The following chapters represent a journey that I took in my own classroom, with colleagues in the schools in which I have worked, the teachers who have taken my courses, and the teachers in the small groups that I have led. It has been a privilege to learn from these talented people. It is my hope that your journey through these pages, and the experiences you will gain from testing out these strategies in your own classrooms, will be as rewarding for you and your students' learning as it has been for us.