Table of Contents

SOT7378 • 9781760567378 • © 2018 Hawker Brownlow Education

Introduction

Education is not the filling of a pail, but the lighting of a fire.

—W. B. Yeats

If you spend much time in a traditional elementary school classroom, you will likely see at least a portion of the mathematics block devoted to small-group instruction. Such time is often characterized by groups of students rotating through *centers* or *stations*, where students work on mathematics independently or in small groups. One group might start at the computer station, where students work on individualized learning programs; another group of students might play an educational game together; and students in a third group might work on their own to complete problems on a worksheet. Activities in these centers often vary; however, during small-group instruction, the existence of the *pulled small group*—the group of students that the teacher pulls to receive direct support—seems to be consistent.

Based on your own experience teaching or conducting classroom observations, you might picture a pulled small group as a teacher and students sitting together at a kidney-shaped table. The teacher sits in the center of the curve, and the students sit around the outside of the curve, each facing the teacher. It is typical for teachers to use this common pulled-small-group setup to offer support based on individualized student needs.

In our roles as mathematics teachers and educators, mathematics researchers, coaches, and teachers, we have observed a wide variety of lessons in which teachers engage students in small-group instruction. Working with school districts throughout North America, it has become obvious to us that this aspect of mathematics instruction—what we call *small-group instruction*, or engaging students in learning in a pulled-small-group setting—is in need of refinement. When observing small-group instruction, we typically see a teacher explaining how to solve a problem to a group of students using a particular procedure. The students are then offered the opportunity with a similar problem to replicate the teacher's steps on their own. When students struggle, the teacher attempts to scaffold student learning by explaining the procedure again using the numbers in the new problem. What is missing from this scenario are opportunities for students to think critically, take ownership of their learning, and make sense of the procedure. Without these opportunities, students are unable to transfer and apply their mathematics understanding to new situations. Small-group instruction can provide a venue for closely examining individual student thinking and facilitating students to make connections among mathematics concepts; however, the way it is typically being used does not allow teachers to truly get to know their students' existing understandings so that teachers can tailor their actions and responses to students' individual needs.

Our motivation for writing this book is to share effective small-group instruction practices and to unpack the purposes of and best practices for small-group instruction. Although small-group instruction

is deeply embedded in many elementary mathematics classrooms, both administrators and teachers often neglect examining the purpose and quality of instruction during small-group time. We encourage administrators to read this book alongside their teachers so they build a shared image of what effective elements lead to high-quality small-group instruction in mathematics. As you read about each element, we urge you to deeply reflect on how these elements occur in your classroom or the classrooms you support. How does your current instruction align with the encouraged practices throughout this book? How does your belief system and philosophy of small-group instruction promote or hinder the type of thinking required of students? As you read, allow the material to challenge your beliefs and current instructional practices.

In this introduction, we first describe the need for high-quality practices specifically tailored for small-group mathematics instruction. We then describe the purposes of small-group instruction. We anticipate that what you learn through this book will motivate you to dig deeper into ways you might support students to learn mathematics. For this reason, we also direct you to additional resources that may guide your instruction of elementary mathematics.

High-Quality Small-Group Mathematics Instruction

Many teachers use small-group interventions for mathematics in ways similar to small-group interventions during reading instruction. As a result, small-group work during mathematics instruction often mirrors that of reading. For example, one aspect of small-group instruction in reading that teachers often transfer to small-group instruction in mathematics is the use of *gradual release of responsibility*. In this instructional method, the teacher begins by modeling ("I do"), then the class practices as a whole group ("We do"), and finally the students practice independently ("You do"; Fisher & Frey, 2014). This strategy, which San Diego State University professors of educational leadership Douglas Fisher and Nancy Frey (2014) describe, has been used extensively during reading instruction; however, it can undermine best practices in small-group mathematics instruction. Mathematics instruction requires a different model to facilitate deep understanding. Lynn S. Fuchs, Douglas Fuchs, and Donald L. Compton (2012) provide a critical analysis of interventions for mathematics at the elementary level. Their research identifies strengths and limitations of using strategies based on correcting errors and procedural computations. While they state that strategies focusing on procedures are effective for some students within distinct topics of mathematics, they emphasize that not all students benefit from that type of intervention. They also note that students do not necessarily transfer knowledge to other mathematical topics. If the goal is to close the achievement gap and to build conceptual understanding of mathematics, different approaches must be explored.

Research compiled in *Principles to Actions: Ensuring Mathematical Success for All* (National Council of Teachers of Mathematics [NCTM], 2014) suggests that students are more likely to develop conceptual understanding of mathematical topics when they are provided opportunities to engage in productive discourse. Teachers can help ensure that students engage in productive discourse when they encourage them to share reasoning, build off one another's mathematical understanding, and make meaningful connections through the use of various tools. These connections are more likely to last and help students make associations within and across concepts (NCTM, 2014). Thus, rather than telling students about mathematics and showing them procedures to follow, the focus should be on *listening* to students and *facilitating* their connections to important mathematical concepts, especially during small-group instruction, where there are such excellent opportunities to gain access to students' thinking.

SOT7378 • 9781760567378 • © 2018 Hawker Brownlow Education

Throughout *Making Sense of Mathematics for Teaching the Small Group*, we provide detailed suggestions, aligned with the research shared in *Principles to Actions* (NCTM, 2014), for how teachers can improve the small-group model of mathematics instruction. We highlight how to facilitate understanding by using effective questioning and responding to student talk as students provide evidence of their learning, and we address how to engage students in meaningful tasks through the eight Standards for Mathematical Practice contained within the Common Core State Standards for mathematics (National Governors Association Center for Best Practices [NGA] & Council of Chief State School Officers [CCSSO], 2010). We will refer to the eight Mathematical Practices at various times throughout the book.

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

It is important to consider how we engage students in these Mathematical Practices. They bring to the forefront the skills we look to develop as students build understanding of mathematical concepts. Throughout the book we discuss how the questions and tasks teachers choose support students to engage in the various Mathematical Practices and help them develop as proficient mathematical problem solvers.

As we begin to explore best practices in small groups, it will be helpful to first consider if, and when, the small-group structure is beneficial for a given learning goal.

Purposes of Small-Group Instruction

It is important to consider whether pulled-small-group instruction is appropriate for your particular learning goal. We encourage you to make this instructional decision consciously. The questions of when and how frequently to pull small groups during mathematics instruction is a key aspect of the decision-making process. Furthermore, the students' needs should determine the necessity of pulled-small-group instruction, rather than an expectation that you incorporate small groups into mathematics instruction each and every day. In addition to working with students on grade-appropriate tasks in settings where the teacher has greater access to the thinking of each and every student, there are two main reasons why the pulled small group is typically used: (1) intervention and (2) enrichment.

Intervention

Teachers commonly view small-group instruction as a time to provide intervention for students who are struggling with mathematical concepts. One form of intervention during work in the small group is to support students by providing instruction on prerequisite concepts and skills. For example, if several students are struggling with adding and subtracting fractions with unlike denominators because they have

difficulty generating equivalent fractions, then it would help to pull this group of students and provide instruction on this skill. Most likely, the students are having difficulty generating equivalent fractions because they lack conceptual understanding of fraction equivalence. In this example, the purpose of providing intervention is clear but implementation is equally important. If the intervention consists of providing more of the same instruction to the struggling students, then an opportunity for learning is missed. On the other hand, an effective intervention might afford them the opportunity to use visual representations in a small group setting; through those visual representations, they can gain conceptual understanding of the prerequisite skill. In this particular case, the students could be given a task that requires them to find equivalent fractions using tools. These tools could take the form of drawings, paper cut-outs, or Cuisenaire Rods, to name a few. In a small-group setting, the teacher would also have the opportunity to diagnose each student's specific struggles and address them with tailored supports.

Enrichment

Although not used as frequently for this purpose, small-group instruction can also be an avenue for providing enrichment for students who "get it." Too often, students who excel in mathematics are not provided the same amount of time in a small-group setting. While it is tempting to structure small-group rotations to favor students who struggle, we must address the learning needs of all students. Consider students who excel with adding and subtracting fractions with unlike denominators. How can you enrich these students' learning? Students who are able to successfully add and subtract fractions with unlike denominators might have only one method they rely on when solving these problems. Asking these students to compute in more than one way or to interpret another student's solution strategy will afford them opportunities to understand the concept on a deeper level. A teacher can accommodate these students in a small group because he or she has the opportunity to take a close look at the students' strategies and ask them targeted probing questions to extend their thinking. These opportunities are often missed during whole-class instruction, as it is difficult to examine the thinking of each and every student in that setting.

Throughout this book, you will see examples of small-group instruction serving as both intervention and enrichment for different students. You might even see them occurring simultaneously as one student's learning is remediated while another student's learning is enriched.

The Importance of Making Sense of Mathematics for Teaching

We recognize that changing your teaching strategies or even your perspective on how best to teach mathematics in a small group is a challenging endeavor. Much of your work during small-group instruction consists of choosing appropriate tasks, supporting those tasks during instruction, engaging students in productive discourse, and collecting evidence to support decision making during instruction and for the instruction to come. Each of these aspects of planning and implementation requires content knowledge for teaching mathematics. As a result, if you have not already done so, we invite you to make sense of mathematics for teaching in general as you make sense of mathematics for teaching the pulled small group. Two helpful resources are *Making Sense of Mathematics for Teaching Grades K–2* (Dixon, Nolan, Adams, Brooks, & Howse, 2016) and *Making Sense of Mathematics for Teaching Grades 3–5* (Dixon, Nolan, Adams, Tobias, & Barmoha, 2016). We refer to these resources throughout the book. We strongly

SOT7378 • 9781760567378 • © 2018 Hawker Brownlow Education

encourage you to read the grade-band book most relevant to your teaching role so that you gain the deep understanding of mathematics necessary to foster your ability to give students meaningful mathematics experiences in the pulled small group setting.

About This Book

Perhaps you are new to exploring the idea of implementing small-group instruction for mathematics. On the other hand, you may have been using this structure for years. Either way, your experiences will likely influence how you relate to the concepts presented in this book. We encourage you to take your time reading and implementing strategies as you encounter them. Consider reading with a colleague or in a collaborative team so you can share the journey and reflect on how these strategies impact student learning. We provide support through videos of authentic small-group instruction with students in kindergarten through grade 5. These videos, shared using Quick Response (QR) codes throughout the book, provide examples of best practices and help create a shared image of effective small-group instruction. The discussions following the videos will help you focus on key aspects of each lesson as they relate to the topics discussed in each respective chapter.

In chapter 1, you will gain insights into best practices for small-group instruction. You will learn how to effectively implement small-group instruction, and you will learn why each instructional practice presented is important for student learning. Chapter 2 focuses on the use of tasks, questions, and evidence (what we call the *TQE process*) for planning and implementing small-group instruction. You will have the opportunity to make sense of how tasks should connect to the learning goal, how you can use questions to uncover common errors, and how you can collect evidence during small-group instruction within a formative assessment process. Chapter 3 is focused on productive discourse. We share strategies to engage students in meaningful conversations and active participation related to mathematics during small-group instruction. Throughout the chapter, we will draw your attention to who is doing most of the talking, as well as to the mathematical quality of that talk. You will gain new understandings of effective small-group practices by exploring the establishment and maintenance of norms that create a shared ownership of learning. Finally, the epilogue concludes your exploration of small-group instruction with a synthesis of and reflection on key aspects of effective strategies. You'll have an opportunity to revisit the key aspects from each of the chapters as you view two more classroom videos. By this point, as you watch best practices in action, you will be well on your way to building a new framework for thinking about how you can effectively use small groups for mathematics instruction.

We recognize that it is much more common to see pulled-small-group instruction incorporated in elementary school settings. For this reason, our examples are provided within that setting as well. Those with a focus on secondary mathematics instruction can generalize these practices to their corresponding settings. And, while our focus is on effective strategies for teachers working with small groups of students, the strategies we suggest are appropriate for working with students one on one and in whole-group settings as well.

Throughout this book, we will use different icons to call your attention to various tasks to think about or perform. The *play button* icon, depicted in figure I.1 (page 6), indicates that an online video depicting a small-group lesson is available for you to watch. You can find the videos either by scanning the adjacent

Figure I.1: Play button icon.

QR code or by following the provided URL. The *task* icon, in figure I.2, highlights academic tasks or problems featured in the videos. We encourage you to consider the tasks and how you might solve them, or help your students solve them, prior to watching the videos. We strongly recommend that you watch each video as you read this text to allow you to more fully understand the implementation and impact of each strategy suggested in this book.

Figure I.2: Task icon.

Before reading on, use the following QR code to watch a video of author Juli Dixon sharing our perspectives related to best practices in small-group instruction. As you watch the video, think of how your current perspective on small-group instruction is similar to and different from Juli's perspective. You will have continued opportunities to reflect on using the TQE process and supporting productive discourse throughout the book. Our hope is that you are as excited to learn about small-group instruction as we are to share it. We will begin with an exploration of best practices.

Interview With Author Juli Dixon:
SolutionTree.com/DixonInterview

SOT7378 • 9781760567378 • © 2018 Hawker Brownlow Education