Math Workshop

Five Steps to Implementing Guided Math, Learning Stations, Reflection, and More

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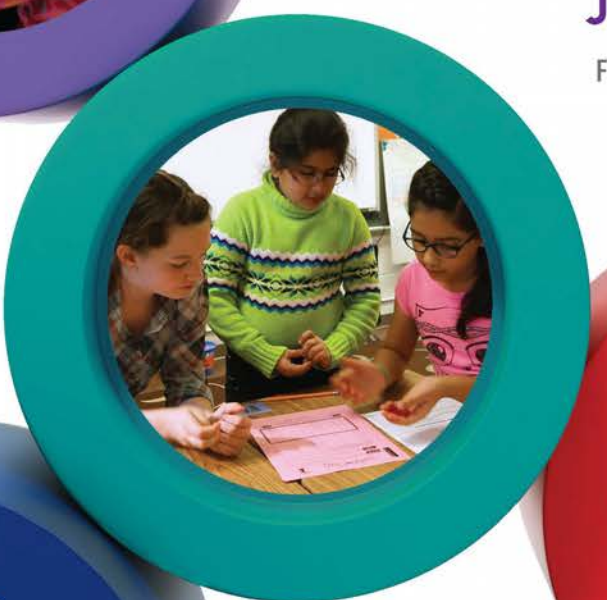
FOREWORD BY SHERRY PARRISH

GRADES K–5
With Video Streaming



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What Is Math Workshop?

In education, things seem to constantly be changing. As teachers, we wonder how long the latest new thing is going to be around. We wonder what will replace it. We wonder why the change has to happen and how much we will be asked to do. We often ask ourselves, *Do I really need to do this or will it be gone by next year? I'll outlast this latest new educational fad, right?*

It is fair to ask these same questions about math workshop. However, even if the term *math workshop* is replaced by a new fancy term one day, the philosophy of math workshop is here to stay. It is here to stay because math workshop, in its simplest definition, is *good mathematics instruction*.

> Though there is a definite philosophy to workshop teaching, it is not a curriculum. It is a structure amenable to any number of curricula and all topics (it is not hard to imagine a physical education workshop in the same model). It can—and should—look different in the hands of different teachers working in different schools. What is crucial is the focus on instruction, practice, and reflection, with the central idea that students learn best when they are doers, too.
>
> —Maggie Siena, *From Reading to Math*

What is good mathematics instruction? If we expect that our instruction is going to be strong, then we need to ensure that our instruction reaches all levels of learners; that students are engaged in daily, rich mathematical discussions; and that we allow ample time for students to grapple with mathematical ideas.

As stated in the How to Use This Resource section, math workshop is a model of instruction that allows for all students to be engaged in mathematics. It is more of a philosophy than a curriculum or lesson plan template. It includes accessible mathematical tasks, open-ended problem solving, small-group instruction, student choice, and time for practice of important concepts throughout the year.

Seven Math Workshop Characteristics

To answer the question "What is math workshop?" I find it easiest to first think about what math workshop *is not* as opposed to what it *is*. To do this, consider the seven characteristics of successful math workshops. (See Figure 1–1.) This list is not all-inclusive, and you may find that you want to add more characteristics as you finesse your own math workshop.

Let's explore each of these characteristics, and include a discussion of the research, in the hope of further clarifying our thinking around the definition of math workshop.

	MATH WORKSHOP *IS NOT* . . .	MATH WORKSHOP *IS* . . .
Characteristic 1	teachers doing most of the math.	students doing most of the math.
Characteristic 2	teachers assigning worksheets.	students making choices.
Characteristic 3	students quietly listening to only the teacher.	students enthusiastically talking about their mathematical thinking and reasoning with each other.
Characteristic 4	teachers showing and telling students how to solve problems.	teachers facilitating, clarifying, connecting, monitoring, and collecting data as students solve problems.
Characteristic 5	students working in isolation (sharing answers or strategies is cheating!).	students working collaboratively
Characteristic 6	teachers rescuing students when they struggle with challenging mathematics.	teachers allowing students to struggle with challenging mathematics.
Characteristic 7	teachers solely presenting to the whole class.	teachers working with small groups and/or individual students.

Figure 1–1. Seven characteristics of math workshop

VIDEO CLIP Introduction, Revisited

Rewatch this clip, keeping in mind the seven math workshop characteristics (see Figure 1–1).

- Which characteristics of math workshop do you identify happening and/or being talked about in the clip?
- Which characteristics do you find most challenging to implement in your classroom?
- Is there a characteristic you would add to the list? If so, how would you describe it using the is not/is framework in Figure 1–1?

To view this video clip, scan the QR code or access via http://hein.pub/MathOLR

Characteristic 1: Math Workshop Is Students Doing Most of the Math In a traditional model of mathematics instruction, the teacher does most of the talking—and subsequently the math. We want students to be doing the thinking and the learning, and to do so we need to engage them in doing the math.

Successful math workshops deeply engage students in the mathematics. This engagement might transpire through a number of structures; for example, some students may be working with the teacher in a small group while other students are exploring mathematics at learning stations. Whatever the arrangement is, it is not the teacher in front of the classroom doing the math; it is the students doing the math.

Characteristic 2: Math Workshop Is Students Making Choices In math workshop you will not see teachers assigning (and students individually completing) worksheets. Rather, you will see students making choices. There is a wide range of choices students might be faced with; they may be choosing which learning station to explore, and/or they may have to decide what task to complete and who to work within each station. Students may choose what strategy to use to solve a problem and/or what manipulatives they use to support their thinking.

Patall, Cooper, and Robinson (2008) did a meta-analysis of forty-one studies in which they found a strong link between giving students choices and their intrinsic motivation for doing a task, their overall performance on the task, and their willingness to accept challenging tasks. Students who are given the choice of the activities, the choice in how long they spend on an activity, and the choice of what strategy to use to problem-solve are more invested and have more buy-in to their learning. However, remember to "go slow to go fast"—the transition from fewer to more choices should be gradual, sometimes spanning several months.

Characteristic 3: Math Workshop Is Students Enthusiastically Talking About Their Mathematical Thinking and Reasoning with Each Other A classroom of students participating in math workshop is rarely a quiet room. Student discourse is encouraged and respectful dialogue is expected. Students talk about their thinking, share with one another, listen to one another, and learn from each other. Students value the knowledge of their peers and look to one another as supportive colleagues in their learning environment.

Zwiers and Crawford (2011) list many advantages of conversations that transcend the mathematics classroom; a few are included here.

Conversation . . .

- builds academic language;
- builds vocabulary;
- builds oral language and communication skills;
- builds critical thinking skills;
- promotes different perspectives and empathy;
- fosters creativity;
- fosters skills for negotiating meaning and focusing on a topic;
- builds content understanding;
- cultivates connections;
- builds relationships;
- makes lessons more culturally relevant;
- fosters engagement and motivation;
- builds confidence and academic identity
- fosters choice, ownership, and control over thinking; and
- builds student voice and empowerment.

Wow! Isn't that list exactly what we dream about for all of our students? After looking at the list, I wonder why I would ever want to walk into a quiet classroom again.

Characteristic 4: Math Workshop Is Teachers Facilitating, Clarifying, Connecting, Monitoring, and Collecting Data as Students Solve Problems

As teachers our roles may differ based on which math workshop structure we are using (see Chapters 3–5). However, regardless of the structure we choose to use, there are four roles teachers take on in math workshop:

1. the teacher as facilitator,
2. the teacher as clarifier and connector,
3. the teacher as monitor, and
4. the teacher as data collector.

Let's take a moment to look at each of these roles a bit more in depth.

Role 1: The teacher as facilitator At a certain point in my teaching career, after attending several conferences and participating in professional learning opportunities, I committed to telling less and asking more. To do this, I started asking questions and probing for students' understanding. The effect it had on my students was remarkable. At first, students responded with frustration, exclaiming, "Just tell me what you want me to do!" However, it wasn't long before students felt motivated by the opportunity to be problem solvers and excited by the chance to explore problems. I started to see students picking up on my questions and using them with each other!

A teacher once told me that in the beginning of her use of math workshop, when she would ask the question, "How do you know?" her students would immediately change their answer because they assumed that they must be wrong. But by asking this question frequently and consistently with every student, her students started to ask *her*, "Don't you want to know how I know?"

Some questions to consider asking students to probe their thinking or help them get unstuck might include:

- What information do you know?
- What have you done so far?
- Would your strategy work with a different set of numbers?
- How might you prove this to your peers?
- Can you make a model to prove this?
- What other methods might have worked?
- Have you considered all the possibilities? How do you know?

"As teachers, when we act as facilitators, we encourage independence, responsibility, and risk taking in students."

As teachers, when we act as facilitators, we encourage independence, responsibility, and risk taking in students. Students come to realize that the teacher believes in them and their ability to solve problems. The onus is on the students to participate in the learning experience, and with that, students have a more solid understanding of the content and are not simply regurgitating the teacher's steps.

Role 2: The teacher as clarifier and connector A second role of the teacher during math workshop is to clarify students' ideas and find connections. Our students are still kids; they might not always be able to explain what they are thinking or find the words to express their strategy. During these times, our role as clarifier and connector is critical. We can ask thoughtful questions, encourage students to talk to one another, ask if students agree or disagree (the use of talk moves is helpful), and pro-

vide the appropriate vocabulary when paraphrasing a student's thinking. To encourage connections, we can use meaningful, real-world examples, another mathematics concept, or another content area. Finding those connections and helping students to see them creates important learning moments—and instills curiosity. Just think, how can students be curious if they are focused only on memorizing facts and procedures?

Finding connections and helping students to see them creates important learning moments—and instills curiosity. Just think, how can students be curious if they are focused only on memorizing facts and procedures?

Do not make the mistake, however, of confusing your role as clarifier and connector with taking over a student's thinking. Even the most well-intentioned teachers can fall into doing this, especially due to time pressures. We see the time ticking away and we jump in, take the pencil out of the student's hand, move the manipulatives around for the student, and essentially show the student how to do it. We must be aware of and refrain from this behavior.

Role 3: The teacher as monitor During math workshop, as teachers we should monitor students' participation, being on the lookout for students who might not be engaged, who might be "hiding" from doing the task at their learning station, or who might be displaying passive behavior. We should note which students' voices we hear the most and encourage all students' voices to be heard. To encourage more student participation, have students turn to partners more frequently; getting students to interact with a partner first will help them feel more comfortable when it comes to talking with more classmates.

Role 4: The teacher as data collector As teachers we know our students' strengths, weaknesses, and learning styles; to get this information we use multiple forms of assessment, and collect some form of data each and every day. During math workshop, we might consider taking anecdotal notes. Anecdotal notes

- are recorded during math class, especially during guided group time;
- help us make instructional decisions for the entire class and for individual students;
- support us when we need to assign grades and conference with parents;
- help us create small groups for future math workshops; and
- remind us of the great things that are going on in the minds of our students long after the day's workshop takes place.

If you are comfortable taking notes about student performance during reading workshop, then this role will likely seem more natural to you as part of math workshop. However, you may wonder what to write down. See Chapter 8 for examples of anecdotal records.

Characteristic 5: Math Workshop Is Students Working Collaboratively The important work of mathematics is not done in isolation. In a math workshop you will see students collaborating to solve problems and make sense of the mathematics. In the primary grades, students often feel more comfortable collaborating in pairs, whereas in upper elementary grades, larger groups of four or five students may be preferred.

> When students work together, their learning increases. And they don't just learn mathematics—they learn how to work in groups, monitor their own behavior, and interact with peers who have different experiences or ideas.

Collaboration is a twenty-first-century skill that is not fostered enough in mathematics classrooms. Students are often put in pairs or small groups to work together in other content areas; however, mathematics, for most, is still a very isolated subject that is presented as black or white, right or wrong. When students talk to one another, they improve their own reasoning and are exposed to other strategies. When students work together, their learning increases. And they don't just learn mathematics—they learn how to work in groups, monitor their own behavior, and interact with peers who have different experiences or ideas.

Characteristic 6: Math Workshop Is Teachers Allowing Students to Struggle with Challenging Mathematics We have all seen it—students who shoot their hand up for help just seconds after you've given an assignment. All I can think in that moment is that they could not possibly have a question so soon. After all, they did not even have a chance to get started. When I approach such students, they usually say the words that I dread the most in a classroom: "I don't get it!" At this moment, it can be easy for a teacher to tell (or show) the first step, just to get students started. However, in doing this, we are stealing from students the opportunity to struggle. And we are sending a harsh message: *You can't do this without me*. There are also the students who do the opposite: those who quietly sit back and wait for someone else to solve the problem. These students know that someone else will do the "heavy lifting" for them if they just wait long enough.

In math workshop students develop the mindset that they are capable of doing great things in mathematics. As teachers, we support them in persevering through challenging problems; we recognize that a student's struggle

is a part of the learning process. We want students to realize that a part of the process is getting wrong answers and learning from those experiences. After all, if it were all easy, would there really be any learning going on?

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Seeley (2009) advocates for *constructive struggling*, a term that refers to the positive place students reach when presented with engaging and challenging problems. "As students engage in the constructive struggling needed for some of these problems, they learn that perseverance, in-depth analysis, and critical thinking are valued in mathematics (90).

In order for students to truly understand math, they need to explore it for themselves and have ownership of the strategies that they use. As teachers, we often tell students to "show your work." Yet, what we are really asking them to do is to "show *my* work"—meaning show me the way that I showed you how to solve it. In that situation, math simply becomes a procedure in the student's mind. And, if math is equal to a procedure, then students think that memorizing procedures will equate to their success in mathematics. Just think about it . . . those for whom math is simply something to memorize start off by memorizing 100 addition facts and then the correlated subtraction facts. Such students then memorize a traditional algorithm for addition and subtraction with regrouping. Moving on to third grade, these same students memorize 144 multiplication facts and the correlated division facts, how to multiply by two-digit factors, and the process for long division. Whew! That is a lot, and we have not even made it to fifth grade. No wonder so many students feel that math is too difficult!

However, there is an alternative. Instead, allow the opportunity for student exploration of strategies (and this may very well include struggle!). The methods that they use could be shared with the class, discussed, put under scrutiny, and revised. Students defend their strategy, choose to abandon their strategy if it lacks consistent results, or find another, more useful strategy. True number sense will allow a student to have a variety of strategies to use at their disposal. The thing that makes students successful is that they have the knowledge of when to use the one that best fits their purpose.

Characteristic 7: Math Workshop Is Teachers Working with Small Groups and/or Individual Students

In math workshop, while students are working collaboratively in learning stations or delving into rich problem solving with one another, the teacher is working with small groups of students or individuals. These small groups, referred to in this book as guided math

groups, are determined by what the teacher has observed as well as other data points. The teacher may also meet with one student during this time (considered a math conference) as a way to help clarify thinking or interject about a misconception.

> Math workshop teachers recognize that there are a lot of students in the classroom, and no two students are exactly alike.

Math workshop teachers recognize that there are a lot of students in the classroom, and no two students are exactly alike. Presenting to the whole class at once is like shooting for the middle. However, in shooting for the middle, you are missing many other students—those who may be struggling or have gaps and those who may be in need of enrichment. Of course, as teachers we try to do in-the-moment adaptations of our lessons based on the questions students ask or the facial expressions they make. Still, we are left trying to adapt for many students. By getting these students into smaller groups, we are able to find out more about what each student knows and does not yet know. As teachers we are able to make those adjustments more quickly, and we are better able to address the individual needs of students. In this way, differentiation can take place.

Three Math Workshop Structures

You may already be feeling that the seven math workshop characteristics match your own philosophy about what math class should include. You might be recognizing how different this feels from your own experiences as a student in mathematics. You might also be wondering how these characteristics look when you are considering a unit or lesson. A successful math workshop continually integrates these seven characteristics into an effective structure. You might already have a structure or structures in use; this resource focuses on three math workshop structures that I've found most successful in my instruction and coaching. Figure 1–2 provides an overview of these three structures. These three structures are discussed in greater detail in the section "Step 3: Decide Your Math Workshop Structure." It's intended that you become well-versed in all three structures and comfortable moving from one to the other, selecting which structure best matches your students' needs at any given time.

MATH WORKSHOP: TASK AND SHARE	
5–10 minutes	NUMBER SENSE ROUTINE
30 minutes	MATH TASK
20–25 minutes	TASK SHARE WITH STUDENT REFLECTION

MATH WORKSHOP: FOCUS LESSON, GUIDED MATH, AND LEARNING STATIONS		
5–10 minutes	NUMBER SENSE ROUTINE	
15 minutes	FOCUS LESSON	
30 minutes	GUIDED MATH	LEARNING STATIONS
5–10 minutes	STUDENT REFLECTION	

MATH WORKSHOP: GUIDED MATH AND LEARNING STATIONS		
5–10 minutes	NUMBER SENSE ROUTINE	
45 minutes	GUIDED MATH	LEARNING STATIONS
5–10 minutes	STUDENT REFLECTION	

Figure 1–2. Three math workshop structures: an overview

Reflect on It!

Do you already use reading or writing workshop in your classroom? How about guided reading groups? Writing conferences? If so, what connections are you making to math? What are students doing in your classroom while you work with small groups or individuals?

Why Math Workshop?

Why implement math workshop in your classroom? In a nutshell, math workshop

- provides students with differentiated instruction: instruction that is targeted and based on individual student understanding;
- encourages independence, responsibility, and risk taking in students and creates mathematicians who have a solid foundation of number sense, which leads to a conceptual understanding of mathematics; and
- provides students with engaging learning experiences that promote mathematical thinking, discourse, and a positive disposition toward mathematics.

Let's address these reasons for "Why math workshop?" further by exploring the benefits, specifically the benefits of:

1. differentiation,
2. small-group instruction,
3. student choice,
4. discourse, and
5. continued practice of the big ideas.

The Benefits of Differentiation

> Differentiation should not be merely regarded as a buzzword in education; in math workshop, differentiation is purposeful and plentiful.

Differentiation is defined as classroom practice that has a balanced emphasis on individual students and course content. It should not be merely regarded as a buzzword in education; in math workshop, differentiation is purposeful and plentiful. Differentiation is at the center of the entire philosophy of math workshop. In math workshop, differentiation doesn't just happen for students who are considered mathematically gifted or for students with special needs; differentiation happens for everyone.

Tomlinson and Imbeau (2010) state that the modifications of four curriculum-related elements are at the core of differentiation—content, process, product, and affect. When considering differentiation of the *content*, as teachers we must consider district, state, and national standards; student understandings based on assessment data; and whether a student has an Individualized Education Plan (IEP). When differentiating *process*, we need to allow for multiple ways for students to make sense of the content. To differentiate the *product*, we need to give students a variety of ways to demonstrate their knowledge. When considering *affect*, we observe student behavior and work to drive students in a positive direction. The math workshop model of instruction takes all these modifications into account.

As math workshop teachers, we understand the mathematics, and we are thoughtful about how to support the learning of the *content*. We carefully examine assessment data, get to know students well, and make intentional adjustments in order to meet the needs of all students in the classroom. We are thoughtful about *process* and *product*; we create a classroom community that respects a variety of choices, perspectives, and strategies, and we encourage and celebrate diverse thinking. And we are attuned to *affect*; we hold a strong belief that we have the capability to make an impact on student learning and students have the capability to be successful in mathematics.

Compare this to a more traditional model of instruction: the teacher is standing in front of the classroom, showing students how to do the math. Every child is expected to work on the same practice problem, every child is assigned the same worksheet, and every child is given the same test. In this

model of instruction, a small amount of differentiation may take place. The teacher may gauge the understanding of the class based on student responses and facial expressions. She may adjust the numbers that students are using, try to say it in another way, or modify students' questions. However, trying to do this in the moment with dozens of students can be a daunting—if not impossible—job.

What about the child who is good at hiding during math class? You know that child; you might have been him or her as a student yourself. That child does nothing outwardly disobedient to show that he is not listening or paying attention. That child may even make eye contact and smile. However, that child does not intend to answer any questions, and often feels lost during the whole-class lesson. That child chooses instead to wait it out. He waits the teacher out, and he waits out his friends. He knows that someone else will answer the question, and then he will be off the hook—he will be safe. Such a student might exhibit other avoidance behaviors like sharpening a pencil that is already sharp, throwing away a tissue that wasn't really even used, or using the restroom even though he doesn't have to go. As teachers we likely can all identify these "hiding child" behaviors during our math lessons.

In a traditional classroom, we are not necessarily seeing bad teachers. However, we are most likely seeing average teachers. In *Tools for Engagement: Managing Emotional States for Learner Success*, Eric Jensen (2003) describes the difference between an average teacher and a great one:

> An average teacher may be reaching, at any given time, fifty to seventy percent of the audience. A great teacher may be reaching, at any given time, fifty to seventy percent of the audience, *but a different fifty to seventy percent each time!* In other words, the great teacher uses a variety of activities and instructional methods to ensure that they reach different learners at different times. Over the course of a week or a month, the great teacher will eventually reach all learners. The average teacher, however, will still be reaching the same learners over and over again. The average teacher, too, will lump learners by their ability into a bell curve at grading time, convinced that the differences among learners are because of differences in effort or ability, not because of teaching! (22)

Students come into class with a range of background knowledge, interests, strengths, socioeconomic circumstances, and languages—it's no wonder addressing the needs of all learners can often feel overwhelming. For many of us as teachers, differentiating in literacy is clear. We choose a different level text or a different genre in order to support student learning. In mathematics,

however, we often struggle with the idea of differentiation. Math workshop is here to help. It provides the mathematics instruction that students need when they need it by creating small groups for learning, offering student choice, and allowing enough time for students to grapple with a concept by spiraling or looping back.

When differentiation is taking place, students are more actively engaged in the lesson. Students who are engaged in their learning will undoubtedly be more successful. When engagement goes up and anxiety goes down, learning happens!

Reflect on It!

How are you meeting individual student needs in math class? What are your successes and challenges with differentiation?

The Benefits of Small-Group Instruction

Small-group instruction is important for many reasons. Fountas and Pinnell (2001) explain in their book on guided reading that small-group instruction allows for appropriate instruction for a diverse class of learners, improves the confidence of students and increases expectations for academic success. The same can be said for math. By placing students into small groups, as teachers we can more easily gather an abundance of information on each student. This is overwhelmingly difficult when faced with trying to gather information at once with dozens of students. It is during small-group instruction that we get to know so much more about student thinking. We get to know students' readiness levels, approaches to tasks, learning preferences/styles, the vocabulary that they possess, and what they connect to in real life and previous mathematics. It is during this time that we can also evaluate student understanding, take anecdotal notes, and make mental notes about future grouping possibilities. It is easy for most of us as teachers to see that in small groups in reading, we are able to provide "just-right" text. How can we carry that same philosophy over to mathematics?