



## CHAPTER ONE

# START UP

## WHY KNOWING AND ADDRESSING STUDENTS' LEARNING DIFFERENCES IS CRITICAL

**U**ndoubtedly you have heard of “differentiated instruction.” Depending on your experience or background, you might associate learning styles or choices with the term. You may associate Tier 1 Response to Intervention (RTI). All of these have aspects of differentiation, but none are the complete picture. In this chapter, you will find the following:

Introduction

What Differentiation Is and Is Not

A Glance at a Differentiated  
Classroom

Frequently Asked Questions

Keepsakes and Plans

## INTRODUCTION

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Welcome to school! There is something so very exciting about a new class of students, a new year of potential, and the fulfillment of touching the future. As teachers, we love getting to know our students. We love thinking about how much they will grow this year through another turbulent tween or teen year. We feel excitement to share our content that we love, and we hope our students will love it too.

And very quickly, as we get to know our students, we recognize who each student is as an individual human being and as an individual learner. We come to understand that Maddi already knows much of what is in our grade level or course content, and what she doesn't already know, she will learn in less than half the time it takes the rest of the class. There is outgoing Elena, who prefers to learn with others, asks for help freely, and offers help equally as freely. Judah is a constant bundle of energy and desires to follow directions, even if he usually forgets what the directions were and asks you to repeat them as soon as you finish giving them. There is Izzi, who prefers to draw and thinks in color and pictures, and Landon, who is shyly constant in his learning. There is Alexia, who reads thick novels voraciously but is less inclined to enjoy math. Sophia is extremely shy, bright, and capable but doesn't want to show it and does not like to do anything in front of the class. And there is Justin, who you didn't even realize was a special education student with an Individualized Education Plan (IEP) until the IEP showed up in your mailbox. Aamino just moved to this country from Somalia and hasn't been in a formal school for over a year and has very limited English. Nick is very bright but is slowly losing interest in school because he is tired from taking care of his little brother and sister after school, even though he could use some attention himself. And that is just a few of the students in class. When we consider all of the students and the overwhelming amount there is to learn this year, we don't lose our love for students and enthusiasm, but we begin to wonder just how to pull all of this off!

Let's face it. We didn't go into teaching for the prestige or money. We care about students. We care about the quiet and shy, the rowdy and rambunctious, the leaders and followers, the musicians, artists, athletes, cheerleaders, scholars, strugglers, and everyone in between. And in most classrooms, I have just described your

student population. We want to forward our content and give a love of it to our students. Our kids come to us from a wide range of backgrounds and families, experiences, and mastery. And we need to reach and teach them all: to have high expectations for each student and help each one fulfill his or her potential and beyond. And that is where differentiation comes in.

## WATCH IT!

As you watch Video 1.1, *Getting Started With Differentiation*, consider the following questions:

1. How is differentiation not individualization, yet about the individual?
2. What descriptions confirm your understanding of what differentiation is and is not?
3. What is new or surprises you in the description or definition of differentiation?



**Video 1.1** Getting Started With Differentiation

## WHAT DIFFERENTIATION IS AND IS NOT

If you ask a group of educators what is differentiation, you will undoubtedly hear it is about helping every student succeed to the best of his or her ability. That is true. However, if you dig deeper for details, explanations can vary drastically and have changed in emphasis over the years. I have heard everything from “it’s just the old individualized instruction back again with a new name.” Or, “this is just about multiple intelligences,” or even “all you have to do is give choices.” Today, largely due to a common description of Tier 1 of Response to Intervention (RTI) as quality core instruction for all students that is differentiated, many educators equate differentiation with interventions for struggling learners. Just like the story of the blind men describing an elephant based only on the part of the elephant they can feel, all of these explanations give a small sliver of the bigger picture of differentiation. Far too often a person’s sliver of differentiation is taken as the whole, applied in ways that are neither appropriate nor purposeful, and the conclusion is that differentiation just does not work.

According to Carol Ann Tomlinson (2014), “Teachers in differentiated classrooms begin with a clear and solid sense of

what constitutes powerful curriculum and engaging instruction. Then they ask what it will take to modify that curriculum and instruction so that each learner comes away with knowledge, understanding, and skills necessary to take on the next important phase of learning” (p. 4). In essence, differentiation is a teacher’s decisions about instructional and assessment design to best equip his or her students for learning.

Sounds simple, and in some ways, it is. In some ways, it absolutely is not. The decisions teachers make need to be based on the foundation of explicitly clear standards and learning goals, knowledge of their students as learners, effective pedagogical strategies and task choices, and assessment data. When thinking about students as learners, there are three areas as defined by Tomlinson (2001) that provide a structure for decision making: Readiness, Interest, and Learning Profile. These three characteristics of learners will be the basis on which we discuss and develop how we can embrace and address the differences in our learners. What follows is a brief introduction to each characteristic that will be developed in detail with lesson examples in the following chapters.

## READINESS

“This is easy.” “This is too hard. I can’t do this.” Neither of these reactions from students is what we want to hear. If those are honest reactions from the students, then we have not addressed their readiness. In some ways, readiness differentiation is like the Three Little Bears of Education: We want “Just Right.” The problem is that it is usually impossible to find just one “just right” for an entire class (Hattie, 2013).

Readiness differentiation begins with determining the entry point for each student on the learning trajectory for the activity, lesson, or unit. We tend to link readiness with “ability grouping.” Yet there are significant differences in what we commonly think of with readiness grouping and ability grouping or tracking, no matter how flexible the ability grouping may be designed to be. Many areas affect readiness, including but not limited to life experiences, prior knowledge, ability to abstract and generalize, and home support.

We have all experienced the wide range of learners in our classrooms that can be based on a wide variety of factors. Certainly,

a student's prior knowledge plays a major role in whether the student is perceived as advanced, typical, or struggling. In addition, there are factors that equally affect (or perhaps have a greater impact on) a student's alacrity with learning mathematics, such as the speed at which students process and learn new information, the help and attitudes about education that students experience at home, and past experiences in school. Add to this students who are from other countries and learning English as a second language, or are identified as gifted or with a form of learning disability, and the range of learners can seem overwhelming. To teach all students with the same strategies, at the same pace with the same expectations, does not make sense. This is the essence of readiness differentiation.

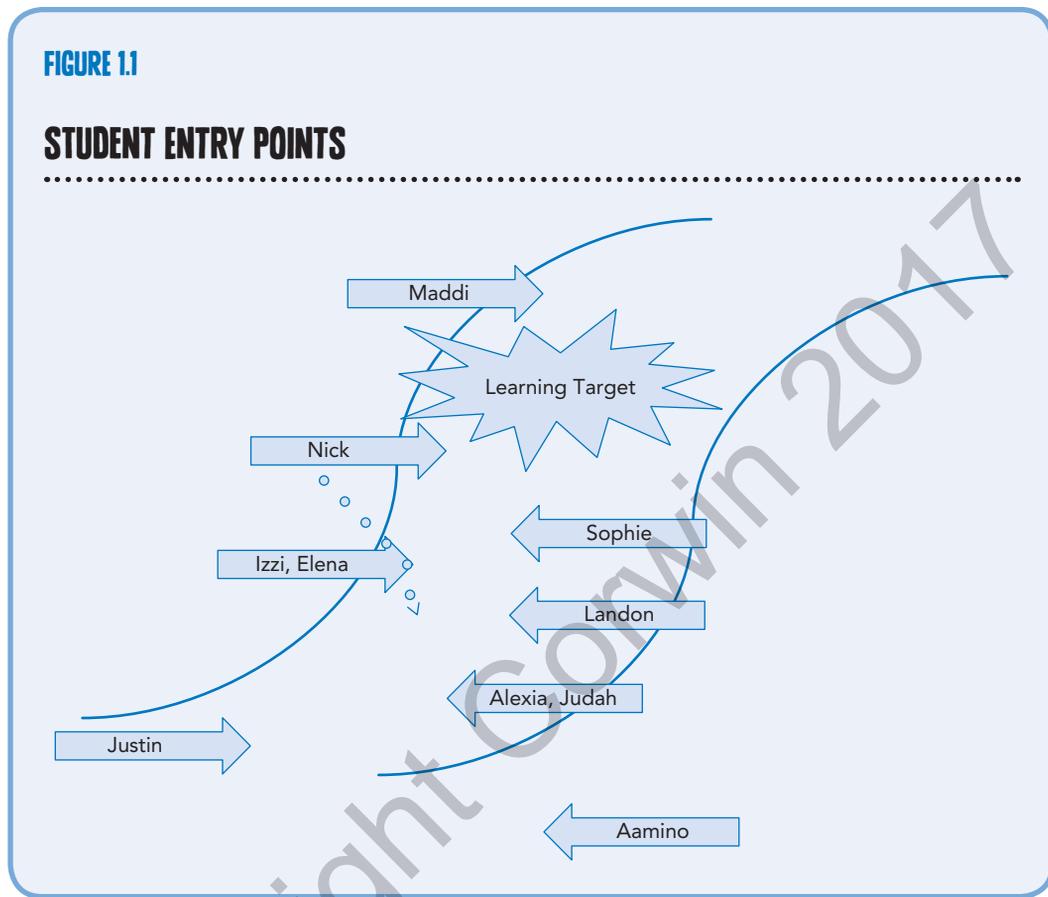
Please notice that readiness does not imply ability! In fact, we now know without a doubt that ability is based on effort and is not a fixed commodity. According to Carol Dweck (2006), "No matter what your current ability is, effort is what ignites that ability and turns it into accomplishment."

Readiness addresses that range of challenges where learning can happen for a student, being neither too easy nor too hard. One of the problems with considering readiness is that when looking at the students' actions, it is easy to associate readiness with what students can and can't do . . . *especially* what they cannot do.

I remember reading an article several years ago about the new superintendent my district had just hired. In it she stated that we would be committed to finding all of the holes and gaps our students had and filling them. At first this might sound noble and an appropriate endeavor. But think about it. The implication is that our education was to work from a deficit model—find what is wrong and fix it. Working from this negative frame of mind leaks out in our attitudes and speech too often, leaving students to feel unsuccessful, unable to learn, and, at worst, dumb.

Readiness, on the other hand, works from a position of strength on the part of the student. What is it the student does know and is able to do? This provides the entry point into the learning. When we consider the "next step" in the learning progression for a student, we are addressing readiness. Readiness differentiation offers all students appropriate challenge, a taste of success with effort, and a developing sense of efficacy and pride in learning.

Figure 1.1 illustrates readiness differentiation as determining entry points on the learning path.



### TRY IT! READINESS IMPRESSIONS

Purpose: To begin thinking about differing readiness levels of your students

As you have gotten to know your mathematics students, you have an instinct as to their readiness levels. At what readiness levels would you put each of your students for mathematics, recognizing that this is a general statement and that readiness certainly changes?

1. Make a list of readiness groupings for your classroom. Next to each student's name, explain why you placed that student in that group. For example, acquires new skills and concepts quickly or still struggles with basic facts.

This initial list is based on your current knowledge of your students. Detailed information on determining readiness is provided in Chapter 2, and further examples of designing for readiness is provided in Chapter 4.

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## INTEREST

We all know the power of interest—when students are really excited and hooked on what they are doing. The adage about time flying when you are having fun is never truer than when students are involved in learning and doing something they enjoy.

When I first considered differentiating by interest, I was largely stuck. For the most part, my students did not have hobbies and extracurricular activities that were mathematics related. No student came up to me and asked, “Is today the day we are going to learn slope? I’ve been waiting so long to learn all about slope. Please tell me it is today!” There are only so many shopping problems you can use with ratio or integers . . . and the boys didn’t really care about shopping. Trying to print math problems on their favorite color of paper wasn’t exactly doing it either! What a misunderstanding I had about differentiating by interest.

It is incredibly powerful when we can link our content learning to students’ hobbies and passions. It is equally important to ignite new interests through our own modeling of interest and passion for our subject. Interest differentiation is about igniting intrinsic motivation for learning. Eric Jensen (1998) gives three criteria for increasing intrinsic motivation that fit perfectly with interest differentiation: providing choices, making content relevant to the learner, and using engaging and energetic learning activities. Figure 1.2 models Jensen’s lesson factors that contrast increasing students’ motivation versus apathy.

How we determine our students’ interests can be easy—talk to them. Ask them. Beginning-of-the-year surveys are usually filled with interest items. We find out their hobbies, extracurricular activities, favorite movies and books, and hopes and dreams. We can also find out what are their favorite ways to learn mathematics, such as

**FIGURE 1.2**

**MOTIVATION VS. APATHY LESSON FACTORS**

Classroom Factors	Classroom Factors
<b>Choices</b> —access to content, process, product, grouping, resources, and environment	<b>Required</b> —no student voice, specific task or assignment for all
<b>Relevance</b> —what is being learned is meaningful in the eyes of the learner and connected to the learner’s experiences. Content is developed at a conceptual and applicable level	<b>Irrelevant</b> —content appears out of context and disconnected from the student and is often learned only to pass a test
<b>Engaging</b> —emotional, energetic hands-on, and provides for the learner’s input	<b>Passive</b> —learning activities have low interaction such as seatwork and note-taking
<b>Results in</b>	
Increased intrinsic motivation	Increased apathy and resentment

hands-on activities, games, and group work, and why. When we can make connections among personal interests, learning interests, and content, we have them hooked! All of these pieces of information begin to build a bank of interest differentiation possibilities.

**TRY IT! THEY CARE ABOUT ...**

Purpose: To identify students’ interests

1. What do you know already about your students’ interests? Create an Interest List that includes general interests of students in your grade level, strategies and activities that have worked well for your class, and individual interests of your students of which you are aware.

Strategies for assessing your students’ interests are given in Chapter 2 and on the companion website at [resources.corwin.com/everymathlearner6-12](http://resources.corwin.com/everymathlearner6-12).

## LEARNING PROFILE

Perhaps the most debated and questioned aspect of student differences is learning profile. In general, learning profile refers to the way brains best receive information, make sense of information, commit information to memory, and recall information from memory. I imagine that all of us have learning stories that exemplify when a lesson completely connected with us and when one completely did not. Sometimes it is a connection with the teacher. Other times it is dependent on the type of task. This could be a hint as to your preferences in learning. When I was a student, I struggled with teachers who primarily lectured. I still do not like listening to audiobooks and can get bored with long phone calls. I need visuals. When sitting in a lecture, I take extensive notes to make the talk visible. How about you? In what ways do you feel you learn best?

There are many different structures by which we can consider learning profile. Notice that the term is learning *profile*, which is an all-encompassing term for many different styles of learning. In fact, learning style has so many different meanings that it is wise to ask someone to clarify what he or she means when using the term.

Different authors and researchers have different opinions about learning profiles—whether we are born wired in certain ways, if these paths change over time, and if they vary subject to subject. For our purposes, we will have a more general conversation about learning profile and how we can use it to structure differentiated tasks.

Learning profile includes four broad categories: Group Orientation, Cognitive Style, Learning Environment, and Intelligence Preference (Tomlinson, 2001). Figure 1.3 elaborates on each of these areas.

Certainly other factors can play into learning profile—there is plenty of research indicating learning differences between the genders as well as among cultural influences. While the learning profile structures are generalizable, none is true for every student. It is part of our job to be a student of our students—to determine what each student's combination of preferences will be as we teach mathematics. When considering learning profiles for your students, please be aware of two very important warnings.

- It is possible that some students learn in exactly the same ways that you do. You can also count on the fact that other students will not learn in the same way. Yet, it is completely natural for us to teach in the ways we best learn. That will

**FIGURE 1.3**

## **CATEGORIES OF LEARNING PROFILE**

Group Orientation	How do students prefer to work? Alone or with a partner? Who likes to figure things out first and then share? Who likes to work through an activity with someone else? Which of your students work to please themselves, others, or the adults in their lives?
Cognitive Style	Which of your students need to see the big picture before they can make sense of the details, or do they need details in order to build to a big picture (whole-to-part or part-to-whole)? Who thinks very linearly and who is more global and nonlinear? Which students work better with collaboration and which work better with competition? Who are more reflective and who are more action oriented?
Learning Environment	Who needs a quiet and calm atmosphere to concentrate and who can concentrate in noise and activity? How does temperature and light (bright or dim, natural or fluorescent) affect the learning of different students? How are desks arranged? What about music playing?
Intelligence Preference	Students will come with different learning intelligence preferences such as the theory of multiple intelligences (Gardner) and triarchic theory (Sternberg), which includes analytical, practical, and/or creative orientation to learning.

always be our most natural fallback option. Thus, it is important to be aware of and plan for the wide variety of learning profiles in your classroom.

### **Consider It!**

Think about your own learning profile. What are your natural tendencies for preferred learning activities and instruction? How does this influence your lesson design? Who in your class learns in the same way? Who does not? Do you know how they might learn? Chapter 2 will explain how to recognize your students' learning profiles.

- We need to be careful not to try to determine “what kind of learner” students are, lock them into that description, and then always assign them to tasks by what we assume is the student’s “type.” It is possible to use discussions about learning profile to help students understand differences in how people learn and their likely strengths and weaknesses, as discussed in Chapter 2. However, in differentiating by learning profile, it may be best to offer varied learning profile approaches to exploring and expressing learning, with the student making the choice of the specific task.

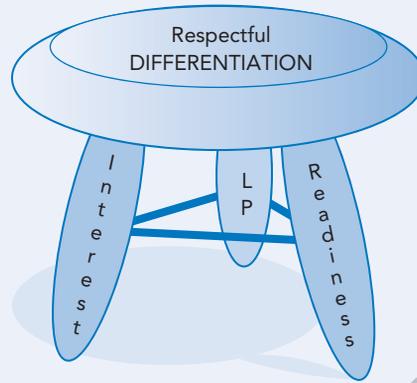
### **THREE CHARACTERISTICS OF DIFFERENCE**

A friend and colleague, Cindy Strickland, uses an image of a three-legged stool to illustrate differentiation, with each leg labeled with one of the learning aspects of students. Figure 1.4 provides an illustration of the balance of the “differentiation legs.”

**FIGURE 14**

## **DIFFERENTIATION LEGS**

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Have you ever sat on a three-legged stool with uneven legs? I have. I can do it for a little while but soon am looking for a different place to sit. It wobbles and is uncomfortable. Worse would be sitting on a three-legged stool with only two legs . . . or what about one leg? That is a pogo stick, not a stool. This should be the picture of respectful differentiation: Decisions about differentiation need to be in balance according to students' learning needs. Just like a stool out of balance, differentiation out of balance may cause unanticipated consequences.

- When we differentiate only by **readiness**, we tend to track our classrooms without meaning to. Students begin to feel that they are always working with the same other students and can self-classify as smart or dumb, math person or not.
- When we differentiate only by **interest**, we can give the impression that learning for learning's sake is never necessary and that if a student isn't really interested, the learning can be skipped.
- When we differentiate only by **learning profile**, we can create learning cripples that are not flexible in their approaches to learning and not able to learn from a wide variety of tasks, opportunities, or teachers.

### **Consider It!**

As you think about ways you currently differentiate in class, to which of the differentiation "legs" do you most naturally lean? Is there a "leg" that you do not address often or with which you feel uncomfortable?

The three-legged stool is the perfect balance when we consider the whole of differentiation.

## DIFFERENTIATION IS AND ISN'T . . .

You may already be questioning some of your previous understanding of differentiation. Several misconceptions about differentiation can hinder teachers from investing in or effectually implementing differentiated instruction in their classrooms. The remaining chapters of this book will equip you step-by-step to be able to design differentiated instruction for your mathematics students. Before beginning the process, however, it is important to more fully understand the philosophy and structure of differentiation. Consider Figure 1.5, which contrasts some of the most common misconceptions and the actualities of differentiation.

## A GLANCE AT A DIFFERENTIATED CLASSROOM

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Most secondary mathematics classes run in a similar fashion. Students come in and usually have a warm-up of some kind on the board. Next, the previous night's homework is reviewed, followed by any new notes. Students then practice the type of problems the notes just covered, often with a worksheet or a practice set of problems in the text. If there is time, tonight's homework is begun at the end of class so the teacher can be sure students can finish at home. While there is nothing inherently wrong with any of these pieces, a steady diet of this type of learning is surely uninspiring at best and demotivating and disconnected at worst. Consider two examples of a slightly different way to design a differentiated mathematics class.

### MIDDLE SCHOOL CLASSROOM

The teacher begins the lesson:

“Good morning! We have been working with adding and subtracting integers. We have talked about real-life examples of positives and negatives—can anyone give some ideas about that? (Students suggest spending money, going deep-sea diving, population growth or decrease, etc.) I am wondering if you and a partner could come up with one real-world situation that would be an addition or subtraction with integers—and one of the integers has to be a negative number. Write your situation on one of your white boards, and model and solve the situation with an equation on your other white board. We will have a class challenge in a few minutes.”

**FIGURE 1.5**

## **DIFFERENTIATION IS AND ISN'T**

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<b>Differentiation Isn't</b>	<b>Differentiation Is</b>
A way to make struggling students pass the test	A way to address all students and all ranges of readiness. Readiness differentiation is one third of the total picture of differentiation and is not limited to struggling students.
Fluffy	A way for individual sense-making and connections by providing multiple methods for learning and demonstration of learning. It focuses on providing access to deep and rich content founded on standards.
The individualized instruction from the 1970s or personalized instruction	A way to address how individual students and how they learn, but it does not endorse individual lessons for each student. Rather, it considers which groups of students will most benefit from which methods and tasks.
All about multiple intelligences	Inclusive of multiple intelligences, but a learning profile is one third of the total picture of differentiation, and multiple intelligences is one of many ways to address learning profiles. This is a small slice of the total picture of differentiation.
Just about giving choices to cover your bases	Inclusive of giving choices to increase motivation, but the design of the choices offered is significant. Again, interest differentiation is one third of the total picture of differentiation.
Instinctive	Not instinctive. Our instinct is to teach the way we learn or the way we were taught. Differentiation is based on assessment data and understanding our content as well as our students.
Untenable and not worth a teacher's time	Possible. No one differentiates every lesson every day. Choosing when and what to differentiate is part of a teacher's decision-making process. Designing effective differentiation does take time and planning, especially at first. It gets easier over time and is worth it when you see students engaged and excited to learn.

Students work with their partners and create scenarios and equations. Before the whole-class challenge, partners pair up to challenge each other and check their contexts and equations. Having three or four partners challenge the class with their contexts and show their solutions concludes the warm-up.

“Let’s review what we have done so far with adding and subtracting integers. We began by using two-color counters and making zero pairs with addition. The counters got a little more complicated with subtraction, especially when we needed to add in zero pairs in order to subtract what we wanted. We also used what we already knew from modeling addition and subtraction of whole numbers in elementary school on number lines. We already knew that addition moves to the right on a number line, and subtraction moves to the left. This remains the same regardless of what is being added or subtracted because it is about addition and subtraction and not what is being added or subtracted. However, we needed to combine that with the idea that in mathematics, a negative sign means opposite. So, when we add or subtract a negative number, we move in the opposite direction on the number line.”

“Yesterday you practiced using a number line to model addition and subtraction of integers. Some of you actually walked on our floor number line to make sense of moving in the opposite direction. Some of you drew hops on your table number lines, and some of you didn’t need a physical number line but could imagine it in your mind to get to the correct answer. Everyone explained how to add or subtract integers in their own best method on their exit cards.”

“Today we want to work some more with adding and subtracting integers and see if we can come up with ways to do this without needing a physical model. I am going to ask you to move to one of the corners of the room, based on your preference in adding and subtracting integers. The four corners are as follows:

1. I like to add and subtract with a number line.
2. I like to add and subtract with counters.
3. I don’t like manipulatives and can use symbolic notation.
4. I would like some extra help in a small group, teacher-led discussion.”

Students move to the four corners of room and form groups of two or three with others in their preferred work situation. The students are given a bank of problems to complete with their choice of solution method. The problems are all set up in related groups of four as follows:

$$\begin{aligned} &3 + 5 \\ &3 + (-5) \\ &-3 + 5 \\ &-3 + (-5) \end{aligned}$$

The problem groups were chosen to lead into the closing whole-class discussion, which will formalize the patterns for adding integers.

Examples are available that model the first two problems on the sheet using the various methods for students who might need the extra support. Any student who realizes that he or she is not sure about how to do the practice problems will move to the teacher-led group.

In the teacher-led group, the same problems are modeled with number lines and counters to find solutions. The teacher has different students choose one of the methods and explain how they would solve the problems for the group, and the teacher only gets involved if needed. The number line method and counter method are used to check each other's answers. Once the teacher-led group is working well, the teacher is free to check in with the other three groups.

After work time, the teacher brings all the students back together to discuss the answers. For each problem, students are asked if anyone got any other answer, and models are put up showing how answers were found to determine the correct answer. Students run this part of the class as they are very familiar with sharing possible answers and defending their reasoning, which allows the teacher to check work and make any anecdotal records. She also monitors to be sure that all students are recording the correct answers to the problems in their groups of four.

$$\begin{aligned}3 + 5 &= 8 \\3 + (-5) &= -2 \\-3 + 5 &= 2 \\-3 + (-5) &= -8\end{aligned}$$

Now that the problems have been correctly solved, students are asked to talk in their groups to see if they can see any patterns in the solutions. Students can immediately see that when the addends are the same sign, you “add the numbers without the sign on it and use whatever the sign was.” When asked to explain why this makes sense, students are able to explain using both the number line and counters that adding two positives is just what they have always done. Adding two negatives is the same except with negative numbers: If you begin negative and add more negative, you are summing up negatives.

Students also can see that the pattern with adding a positive and negative number is like subtracting, but the signs are confusing. Discussion and modeling lead to the realization that if more

negative is being added, the sum is negative after removing zero pairs or moving on the number line. If more positive is being added, the sum is positive. After recognizing the patterns and discussing why the pattern would always be true, integer addition “rules” are summarized and formalized.

- If the signs of the addends are the same, add the absolute values and keep the sign of the addends.
- If the signs of the addends are different, subtract the absolute values and use the sign of the integer with greater absolute value.

Finally, the subtraction problems are discussed in relation to their related addition problems.

$3 + 5$	$5 - 3$
$3 + (-5)$	$5 - (-3)$
$-3 + 5$	$3 - 5$
$-3 + (-5)$	$-3 - (-5)$

## Consider It!

- What learning beliefs and attitudes need to be in place for differentiation to be viable and for middle school students to work together?
- In what ways did this lesson incorporate readiness, interest, and/or learning profile differentiation?
- How did using manipulatives to model the mathematics lead to students “discovering” the rules? How do you think this approach would affect students’ understanding of integer operations?
- What new ideas do you see in this example that you could replicate in your classroom?

Students are asked to draw lines from a subtraction problem to the related addition problem and why they chose the relationship. For homework, students are asked to find a general pattern relating subtraction of integers to addition of integers. They are also to create their own sets of eight related problems as shown above, with solutions.

## HIGH SCHOOL CLASSROOM

The teacher begins:

“On the board you will find a choice of warm-up problems. Please choose the one that you feel is just right for you—not too hard or too easy. Once you have completed your problem, please find a partner with whom to compare your homework answers based on the homework assignment you did last night—red, purple, or green. Compare not only your answers but also the method you used to solve it. If you have different answers, try to convince each other of your work. You can also check with someone else who did the same assignment. Only ask for help if you cannot figure it out. You have 15 minutes.”

Students compare their homework problems that were based on readiness. All problems were on the current topic of rates of change, but problems were tiered based on applications problems, representations, and whether examples and/or reminders were provided. All assignments had three common problems, which

would be the basis for whole-class discussion following the independent review.

During the homework conversations, the teacher circulates among the students and notes which students chose and completed which of the warm-up problems and answers any pressing homework questions. As students finish their homework review, the class comes back together to discuss the problems that were in common on all assignments to reinforce the concepts of rate of change, unit rate of change, and slope.

“We have been working a lot with this idea of a rate of change. We began by connecting it to work you have done in middle school with unit rates and proportions. It is the same thing and can be determined in the same ways you have used in middle school, including bar models, tables, and solving a proportion. However, we have extended your understanding to include the role of a rate of change within a linear function. In a linear function, the rate of change remains constant, whereas the rate of change can vary in other functions, as we will see later this year. Before we begin, work with your small groups to discuss these questions:

1. In what numeric form does a slope come? (rational number)
2. What does a slope represent in a graph? (rise or change in  $y$  over run or change in  $x$ )
3. How can you estimate the value of the rate of change given a linear graph? (increasing is a positive slope, decreasing a negative slope; the more “steep” or the faster the rise or fall, the greater the absolute value of the slope)”

After discussing these questions, students are prepared to begin the new topic.

“Today we want to explore how the rate of change can be used to graph a linear function without needing to first create a table. You will have an option of three different explorations, but everyone will complete the same problems within their tasks:

- Color-code a graph: Given an initial point and a slope value, plot the initial point in green. Show the rise from the point in blue and the run in red. Plot the next point in black. Repeat the process four times until you can graph the line. Repeat the process with other points and slopes.
- Create a human graph: On the grid in the back of the room, one student draws a point out of the cards and stands on the point.

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## Consider It!

In this example, most of the mathematics lesson was differentiated. That is not always the case. Often one aspect of a lesson will be differentiated in some way, such as a choice of closure activities or a tiered practice.

- How do you respond to this lesson?
- What do you feel can be done with your students?
- Of what parts are you unsure?
- Make a list of pros and cons from this lesson as a baseline for your learning as you work through this book.

The next student draws a slope card and walks the slope from the first student to create a second point. Two more students will create additional points on the graph until all students can extend their arms to form a line. Repeat the process.

- Hands and brains: Students will work in pairs. Student A will be the “brain” and can only describe what to do. Student B will be the “hands” and can only complete exactly what the brain says to do. In this manner, they will graph a line given an initial point and a slope. Students complete several lines, switching roles each time. After they are confident on how to graph a line given a point and the slope, groups of four will create a short infomercial or skit on graphing a line given a point and a slope.”

As students are working, the teacher circulates to monitor progress and answer any questions. As students are finishing, students number off within their task groups to form new groups of three made up of students from each task choice. They move into the mixed groups for the final discussion and closure activity.

To conclude the lesson, students are asked to share how they graphed a line in their respective activities and to conclude what was in common. They are challenged to come up with a simple list of steps on how to graph a line when given a point and a slope.

As a final closure activity, students are asked to graph a line from a given point and slope on an exit card. All students will do the same homework assignment tonight—linear graphs given a point and a slope.

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## WATCH IT!

As you watch Video 1.2, *Balanced Differentiation in the Classroom*, consider the following questions:

1. In what ways are different aspects of student differences addressed through differentiation?
2. Why a three-legged stool? Why balance the three legs of differentiation?
3. To what extent does a strategy (such as offering choice or designing stations) define or determine differentiation? In what ways could a strategy serve as a basis for differentiation?



**Video 1.2** Balanced Differentiation in the Classroom

## WHAT IS THE DIFFERENCE?

There are some foundational belief differences between a differentiated class and a more traditionally taught class. Figure 1.6 gives a summary list of some of these differences. All of the differentiated facets will be developed throughout the rest of the book and through the video clips.

**FIGURE 1.6**

### **TRADITIONAL VS. DIFFERENTIATED CLASSROOM**

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<b>More Traditional Mathematics Classroom</b>	<b>Differentiated Mathematics Classroom</b>
Student differences are ignored or avoided	Student differences form the basis of lesson design
Texts and resources are the basis for instruction	Standards and knowledge of students as learners are the basis for instruction
Predominantly teacher presentation	Teacher provides means for students to make connections through investigation, collaboration, and communication
Predominantly whole class	Students are arranged to work in a variety of ways, including whole class, pairs, small groups, and individual work. Pairs and groups are purposefully designed
A single pace is expected for all students	As much as possible, flexible time and due dates are used for students who require additional time or to provide meaningful challenge and extension for students who work more quickly
A single lesson or activity is used for all students	Different lessons or activities are designed to reach all learners, varying in design among readiness, interest, and learning profile addressing the same learning outcomes
A single assessment is used	A variety of assessments are used to allow students to demonstrate what they know, understand, and are able to do, with options available when appropriate
A single definition of success is expected, and it is most often speed and accuracy	Success is rooted in student growth and effort, risk taking, and perseverance

## CONCLUSION

### Consider It!

Think about your current classroom practice. No one is purely in one or another category.

Where are your current classroom practices as you consider the two columns of “traditional” and “differentiated” classrooms? Are there any shifts you want to make at this point?

“Educators should be champions of every student who enters the schoolhouse doors” (Tomlinson, 2014). I don’t know any educator who doesn’t agree with this statement. And yet too often, there are students who feel incapable, unaccepted, and unappreciated—especially in mathematics. As teachers, we have incredible power to set the climate of our classrooms, as well as inspire and transform our students. We know from brain research now that there are no such things as “math people” or “non-math people.” We know effort changes everything. And we know that designing engaging lessons and activities that fit our individual students can change their and our world.

## FREQUENTLY ASKED QUESTIONS

- Q: How can you differentiate when we have the same standards and give a high-stakes standardized test?
- A: Differentiation is about maximizing learning for every student. The standards provide the content, or *what* we teach. Differentiation is how we craft the learning experiences for students so that they are able to reach the standards. If students can learn at deeper levels, make sense of what they are learning in ways that make the most sense to their brains, and store and retrieve from memory more effectively, they will have greater success on all assessments, including the high-stakes standardized tests.
- Q: What about students who refuse to try?
- A: I wish I had a foolproof answer. There isn’t one. However, students who are in a class where they feel accepted, have some voice in their learning, and know that the teacher believes in them will almost always start to change their behavior. Usually the behavior comes from negative past experiences. Replacing those beliefs about school and how they associate school with positive experiences and a taste of success goes a long way. There is nothing like relationships to begin to heal students who are shut down.
- Q: How do you find time to do all of this?
- A: First remember that no one differentiates every lesson every day. The start of differentiation can be frustrating because you don’t have activities and plans ready to go. Think about what you already have and gather ideas from colleagues and the Internet as you are able. Instead of choosing which activity you want to use, determine which students would best relate to which of the tasks. Then use them all and you have a differentiated lesson. The best advice comes from Carol Ann Tomlinson: Start slow, but start.

# Keepsakes and Plans

What are the keepsake ideas from this chapter, those thoughts or ideas that resonated with you that you do not want to forget?

What Is Differentiation:

- 1.
- 2.
- 3.

The Learning Environment:

- 1.
- 2.
- 3.

A Glance at a Differentiated Classroom:

- 1.
- 2.
- 3.

Based on my keepsake ideas, I plan to:

- 1.
- 2.
- 3.

