
Getting Started and Establishing Norms

In the following vignettes, these teachers choose to enhance how they use formative assessment data to differentiate instruction in alternative ways. They all begin in different places and pursue individualized goals.

Ms. Chou decided to enhance how she used formative assessment to differentiate instruction after first identifying practices she already used, such as giving differentiated homework assignments and tests. She decided her next step would be giving diagnostic preassessments before units. Though she usually knew where her students were, a colleague reminded her that preassessments also benefit the students when they self-correct them and get an idea of what they need to work on. As an example, on a trial preassessment, one typically high-achieving student only scored 12/15, which surprised Ms. Chou. She had assumed that he had already mastered these skills and was planning to give him and several others an enrichment investigation task. Instead, she now chose to wait and shore up the skills he had missed. She was thrilled to hear him explain, "I missed the questions on volume of prisms and cylinders. It must have been due to calculation errors because I know the formulas. I found several model problems in a supplementary text. I'm going to practice these two types again and see if I can get the calculations right." In addition to her now knowing where to focus her teaching, the student also now knew exactly where he needed to focus his learning.

In contrast, Mr. Martin decided to begin with smaller formative assessment check-ins. He chose to begin with check-ins so that he could monitor how students were doing throughout the unit. After reviewing the class's homework and finding two minor error patterns, he designed a quick check-in task during a unit on solving linear equations. He had students solve two linear equations and substitute the solution

back into the original equations as a way of teaching his students how to self-check their work. He then reviewed the activity with the class, pointed out all they seemed to understand well, and then helped his students use the check-in to identify which of the two different types of errors they were making. He reviewed each type, then had them select which further practice to do based on which type of error they had made.

Ms. Musambee had been giving preassessments for some time and wanted to enhance how she handled the subsequent forming of groups. In the past, she had often created three groups based on those who knew most of the material, some, or had no prior learning of it. Instead, she wanted to do a deeper error analysis and group students according to their specific inclinations and conceptual misunderstandings. She also wanted to move beyond just grouping by readiness levels so that she could strengthen the class norm that “we all learn differently” and move away from students regularly comparing each other hierarchically. To do this, she redesigned her preassessment to better capture these different conceptual understandings and to include a more substantial self-reflective evaluation for students to complete. They were able to more closely analyze their strengths as well as the kinds of conceptual errors they made and understand why they may have made them. The students proved adept and thoughtful in their analyses of their preassessments. Ms. Musambee then used this more complex, detailed information to form more nuanced groupings. She found four different tasks that allowed them to begin practicing strategies for addressing the specific conceptual understandings, ranging from those who inverted the first fraction when dividing to those who needed to refine how precisely they could explain why the second is inverted.

GETTING STARTED

These three teachers understand that achieving a comprehensive vision of using formative assessment to differentiate instruction is achieved slowly over time, and each teacher’s path to doing so is unique. Identifying where you already are can prove helpful toward deciding how to enhance your use of formative assessment to differentiate math instruction. This process can begin with completing the self-assessment shown in Figure 1.1. You can then see what you already do and choose next steps to take.

Formative assessment has been defined as teachers or students using data as a basis for decisions about next steps to take toward achieving learning goals, and to then make instructional decisions that are better than those that would have been made without this data (William, 2010). When using formative assessment, differentiation is the natural next step. Carol Ann Tomlinson (1999) has defined differentiating instruction as an organized, flexible, and proactive approach to adjusting instruction so that it best meets the needs of all learners and promotes maximum growth for all. Aiming to achieve this goal is a core of *equity*, which is the first of the six principles of high-quality mathematics education recommended by the National Council of Teachers of Mathematics (2000).

In a comprehensive approach to using formative assessment to differentiate math instruction, teachers would work toward regularly using the following seven practices. I developed this group of practices to help guide the teachers that I have worked with on using formative

Figure 1.1

Teacher Self-Assessment				
<i>Differentiating Math Practices Rubric</i>				
<i>We all begin in different places and pursue different goals as we grow as teachers. This self-assessment provides an overview of practices that can enhance your skills at using formative assessment to differentiate instruction, rather than a required to-do list.</i>				
On a scale of 1–4, rate how frequently you do each practice:				
1—I do this often,	2—occasionally,	3—have tried it,	4—haven't tried this yet	
Convey Norms and Targets				
I foster self-directed, independent approaches to learning.	1	2	3	4
I emphasize to students that doing different work helps everyone get what he or she needs.	1	2	3	4
I clearly convey objectives (targets) before each unit.	1	2	3	4
Assessment				
I use diagnostic preassessment tasks before each unit.	1	2	3	4
I systematically collect informal and formal assessment data all along.	1	2	3	4
Coplan Next Steps				
I use assessment data to tier homework, class activities, and assessments.	1	2	3	4
I have students self-score assessments and use the results to decide next steps to take.	1	2	3	4
I stress the importance of self-initiated student learning, based on teacher feedback and self-scored assessments.	1	2	3	4
Grouping and Tiering				
I regularly use flexible groupings (often 3) for differentiated tasks.	1	2	3	4
Based on my review of homework and /or class participation during instruction, I enable those students who indicate mastery to move on as I assist others.	1	2	3	4
I draw on supplemental resources (alternate texts/websites) for differentiated activities.	1	2	3	4
Challenge and Support				
I select from my own bank of strategies for filling in calculation gaps, solidifying procedural steps, and clarifying concepts.	1	2	3	4
I select from my own bank of strategies for challenging students such as open-ended tasks, higher order questions, abstract project, projects compacting contracts, and extension resources.	1	2	3	4
Homework and Graded Assessments				
I differentiate homework and assessments and hold students accountable for the different work they do.	1	2	3	4

4 USING FORMATIVE ASSESSMENT TO DIFFERENTIATE MATHEMATICS INSTRUCTION, GRADES 4–10

assessment to differentiate math instruction. Most are drawn from research-based principles, while others that emphasize application of these principles emerged from our conversations.



1. Build supportive and self-directive class climate norms (Andrade, 2010).



2. Clarify learning targets and convey them (Wiliam, 2010).



3. Preassess before each topic and continuously engineer discussions, activities and tasks all along that are purposefully designed to elicit specific student understandings (Wiliam, 2010).



4. Involve students in using assessment data and teacher feedback to inform next steps they will take in their learning (Wiliam, 2010).



5. Use assessment data to group students for differentiated activities via centers, varied tasks, projects, performances, and presentations (Tieso, 2005).



6. Use assessment data to further challenge and support all learners.



7. Differentiate homework and graded assessments.

As a caveat, and this reminder will continue to be stressed throughout the book, this list is not something that teachers should expect to adopt quickly or fully. When teachers I worked with tested out these practices, they used different practices and quickly discovered that student achievement rose in notable and exciting ways when they only used a few of the practices, and even those only partially. They repeatedly recommended that I emphasize this. The practices are not an exhaustive list, but a buffet. Even choosing and using only a few will uplift student achievement.

How do these practices fit into a Response to Intervention (RTI) model?

1. Select research-based Tier I instructional program.

Since the basis of these practices, formative assessment, is research-based, it meets RTI requirements

2. Collect assessment data.

These can include state assessment results, internally developed assessments, universal screening probes, and other sources described in Chapter 2.

3. Use data to differentiate Tier I instruction and to ensure 80% of students are thriving in Tier I.

Chapter 3 describes differentiation methods.

4. Analyze data to determine students to receive Tier II interventions.

5. Provide interventions via small groups in class or outside of class (before or after school, study hall).

Chapter 4 details specific interventions.

6. Collect additional progress-monitoring data weekly on students receiving Tier II interventions.

Chapter 2 overviews progress monitoring.

For a comprehensive overview of RTI and math, see Riccomini & Witzel (2010b).

The seven practices can also be understood in terms of what actions might be considered as exemplifying formative assessment and differentiated instruction and which would not, as the following chart shows. I created this chart to help teachers more readily see the distinctions between these two types of models. It is modeled after similar charts presented by differentiation experts such as Heacox (2002).

The Differentiated Classroom	The Traditional Classroom
<i>Practice 1:</i>	
<ul style="list-style-type: none"> • Teacher consciously cultivates a supportive climate 	<ul style="list-style-type: none"> • Competitive climate flourishes
<i>Practice 2:</i>	
<ul style="list-style-type: none"> • Unit targets conveyed up front 	<ul style="list-style-type: none"> • Targets not conveyed, or only just before tests
<i>Practice 3:</i>	
<ul style="list-style-type: none"> • Preassessment precedes each unit • Engineered discussions, tasks, and activities are used to elicit specified insights into student understandings (William, 2010) 	<ul style="list-style-type: none"> • Only summative tests used • Insights into student understandings are unplanned and incidental

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The Differentiated Classroom	The Traditional Classroom
<i>Practice 4:</i>	
<ul style="list-style-type: none"> Teachers assess, and students self-assess, what’s understood constantly, and this drives teaching and learning Each student helped to get what he or she needs 	<ul style="list-style-type: none"> Curriculum or text drives what is taught Same work for all
<i>Practice 5:</i>	
<ul style="list-style-type: none"> Lessons break off into tiers Frequent and flexible groupings 	<ul style="list-style-type: none"> Whole class usually instructed together
<i>Practice 6:</i>	
<ul style="list-style-type: none"> Student-centered supports and challenges 	<ul style="list-style-type: none"> Teacher/text centered
<i>Practice 7:</i>	
<ul style="list-style-type: none"> Differentiated homework and tests, and grading systems 	<ul style="list-style-type: none"> Same homework and unit tests for all

Again, these practices can seem daunting. As mentioned at the start, teachers need to pursue how they will implement these kinds of practices in individualized ways and at different paces, beginning by noting those they already do, then weighing the need for each, prioritizing and selecting which to focus on each year. The preassessment (Figure 1.1) can serve as a guide in this process.

The rest of this book takes up Practices 2–7 in detail. However, the second section of this chapter focuses on Practice 1, setting norms. The teachers I have worked with have consistently given establishing class norms top priority.

ESTABLISHING CLASS NORMS

On the fourth day of school, Mr. Miles has his students break into cooperative learning groups to work on a data-analysis project. He created this project based on interests they expressed when they completed a survey on ways they spend their recreation time. In class, Mr. Miles explains each of the four data-analysis tasks. Each student then moves to one of four tables with others who have selected the same task.

Once seated, the students are given the task of plotting the data for how their group members spend their recreation time on a box-and-whiskers diagram, yet done in one of four ways. Mr. Miles allows them to choose whether they want to:

1. Use lists to explain why they set up the box-and-whiskers diagram as they did.
2. Create a flow chart to explain why they did it as they did.
3. Act out the chart physically by standing where each quartile would be drawn on a life-sized graph.
4. Create an alternate diagram to convey the same information.

Because he had earlier asked the class for a show of hands if anyone had familiarity with this model and no hands went up, this “instant formative assessment” enabled him to know that differentiating by readiness levels was not possible. However, he did expect that some students would master the topic at a quicker pace, and so he had built a challenge into the end of the activity to differentiate according to their needs. After they completed the tasks, he had them reflect on the lesson, beginning some conversations that would continue all year. He has found that every year some students announce that they are “bad at math.” He chose to open up this conversation today because this task had a broad array of math in it and students could use it to break down this notion. They could see that while some elements of math might be difficult, such as arranging the data accurately or doing certain calculations with the data, there might be other aspects such as designing a visual model that are a breeze for certain students. Mr. Miles also had them reflect on how they each learned the task and raised another point that he will reinforce all year that “we all learn differently.” An implicit message he begins to send less directly is that different approaches and paces will be valued and respected. He does this primarily through modeling it. He purposely calls on Tim, a student known by his peers to be struggling in math, to explain to the class why outliers are not included in the plotted quantities. He was pleased when he had circulated among the groups during the project to see that Tim, who is so strong visually, had instantly seen why this is the case. Since Tim has a language-based, diagnosed disability, Mr. Miles spent a few moments supporting Tim’s efforts to explain the idea behind this concept to his peers in the group. Instead of telling him “great job,” he had given Tim some advice on how to explain his reasoning more clearly to the group, then to the class. Tim was clearly intrinsically satisfied and proud of his achievement. Mr. Miles was careful to focus on pointing out Tim’s use of his visual abilities so that he might remember to utilize this skill regularly. Mr. Miles also focused on complimenting Tim’s efforts, rather than his achievement, as research has found this focus uplifts motivation and achievement (Hattie & Timperley, 2007).

Mr. Miles conveys an expectation that all students will value learning differences, making everyone feel safe no matter how they learn. “Since we are all individuals who learn differently, different learning experiences are to be expected, and so you will often do different tasks to achieve the same learning,” he explains. Knowing that the science department is currently teaching a unit on constants and variables, he reminds them that becoming more proficient with essential unit learnings should be a constant for every student, whereas how this is achieved will vary for each student.

Before assigning homework, he wraps up the lesson by asking students to share, after they have corrected a final practice task, whether their corrections show that they have “got it,” “need more practice,” or “have questions.” He has learned through experience

that students need to make this self-evaluation with data from a task that backs up their choice. For example, if they got 19/20 correct and easily answered questions in class, they can use this as an argument. However, if they only got half the answers correct and these were not simple errors, this would indicate that they “have questions.” In the past when he had asked this, he would find many students would state they have “got it,” then he would find at quiz time that they had not, particularly with struggling students who notoriously have difficulty with accurate self-assessment (Andrade, 2010). As self-assessment is a basis for becoming self-directed, a core norm he cultivates, he carefully designs repeated opportunities to coach students in developing these skills, through offering frequent practice, followed by feedback and guidance on their efforts.

As they each state where they are in their understanding of the topic, Mr. Miles is careful to remain nonjudgmental, avoiding complimenting students who did well. He has realized that privileging kids who perform well sends a message that can undermine establishing a climate in which all levels of performance are respected. Also he now believes the band of capability is narrower than he had thought earlier in his career. Over the years, he has seen many students excel with the right support and extended effort. Hence, he compliments perseverance and effort, which he has come to realize may be bigger factors in determining which students will excel.

As students ask clarifying questions about the homework he has assigned for that evening, he notes in their homework study books that a few should skip the main practice section and do only the final challenge problems. He again is careful not to convey a congratulatory tone, but rather just an observation when he makes this determination for certain students, based on how well they had shown mastery of the material in class and on the final wrap-up practice assessment task. In this way, he avoids making others who do require the extra practice to feel any less than those who skip ahead. “We all should seek ways to get what we need,” he reminds them, “whether you do the practice or the challenge is not the central issue. What matters is whether, in the end, you master the targets for the unit.”

When he recommends that one student do the practice problems and a few extra, he is careful to focus on the task and not on her as a person, as research has shown this is important to increasing achievement (Hattie & Timperley, 2007). “I see you got the first parts of the problem correct, which was ordering the data then averaging the middle data points. You yourself have made a note here that you need to practice plotting data some more. So I agree that it looks like you will master it if you practice a few more.” To foster trust and encourage her, he points out what she did well and conveys that he believes she is close to mastering the task, emphasizing how hard she has worked and the effective processes she is using. Then, he gave her pointed feedback on what to focus on, specifically, and helped her gauge how much practice she will need to master the topic. After this quick homework clarification time, he dismisses his students.

In this snapshot, Mr. Miles is hard at work establishing important class norms that foster the kind of climate in which students feel supported, safe, and comfortable with differences. In addition, he carefully cultivates independent work habits and a self-directed approach to learning, which are necessary if students will be working on differentiated tasks in his class during the year and so will not have whole group instruction and direct teacher guidance at all times.

Model Respect for All

1 Mr. Miles models respect for all students when he purposefully distributes his praise among all students, those who tackle problems creatively and those who draw on personal strengths, even when aspects of the math do not come easily for them. Again, he does not compliment student achievement as much as he compliments effort and specific approaches they have used so that they will be more aware of the effectiveness of these. For example, when Tim, a student with special needs, immediately grasped why outliers are not included in box-and-whisker graphs, Mr. Miles used this chance to hold up the student as an example before his peers. Mr. Miles is also careful not to overvalue “logico-mathematical” intelligence (Gardner, 1983) when he praises students. Instead, he carefully compliments students on factors that are more easily within their control, such as effort level. He does not use the phrase, “good job,” but instead focuses on giving feedback on the task such as, “I saw you do 24 extra problems and then you remembered all the steps on the quiz we took the next day.” In his many years of teaching, he has seen students who struggle in math make tremendous leaps with the right coaching and practice. So he has come to believe that all students can move forward in becoming more proficient with essential unit learnings when given the right conditions. If all students have more potential for capability than one might realize, he reasons, then praise should be used to build strategic approaches and effort in all.



Supportive Classroom Climate

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Establish a Climate of Respecting Differences

1 Mr. Miles cultivates a respectful classroom climate in which it is expected that all students will respect their peers’ unique learning profiles in ways that make everyone feel safe and supported. Rather than working to make differences invisible, he celebrates them from the start. He constantly points out how some learners may instantly “see” a concept but struggle with articulating it. Conversely, some can make lists easily that enable them to articulate an explanation of a concept. When students claim they are “bad” at math, he strives to undo that notion by having them break down and identify what aspects they struggle with, and how they can use their strengths to compensate. He is careful with the language students use when correcting work or use when they are unsure about a concept. He doesn’t allow them to say “I don’t know this.” Instead, they say, “I haven’t learned this yet” or “I have questions.”

Mr. Miles emphasizes that since all students are different, giving the same work to all would unfairly privilege one learning profile over another. Differentiation is actually fairer because it acknowledges individual learning differences. He admits that even now, he still struggles with giving clearly more challenging work to some students without making others feel inadequate. He acknowledges that this is fair, yet it is something that is a struggle for many teachers I have known, and something that they have actively worked to address within themselves. When certain preassessments

show vastly different readiness levels, putting students into leveled groups makes the most sense. Yet at this time, middle school and older students are highly adept at quickly determining “high” and “low” groups, and this cannot be easily minimized. However, Mr. Miles has seen so many cases where the “low” group, when given a chance to work up through properly leveled work, attains the same mastery of the standards as those who began at higher readiness levels (though they may not excel at all the challenges in the same way as those who spent time during the unit working on challenge activities). This evidence has made his own discomfort with giving leveled material decrease. He is more casual now when he discreetly forms groups, confident that he is taking the right measures to give each student what he or she needs to be able to come up to the standard level and to challenge those who began at the standard. He has also become more capable of designing preassessments that reveal more nuanced conceptual differences that he can use to form groups rather than forming them based only on readiness levels.



Cultivate Self-Directed Learning

1 The National Council of Teachers of Mathematics (2000) states that “students learn more and learn better when they take control of their learning by defining their goals and monitoring their progress” (p. 21). Self-directed learners, researchers have found, learn more and are more successful academically in school (Andrade, 2010). Introducing formative assessments, described in detail in Chapter 2, that students self-score, then use to design plans for how they will master concepts they have yet to learn, is a step toward becoming more self-directed. Cultivating such self-direction requires teacher modeling, feedback, and ongoing coaching. When teachers I have worked with have strived to cultivate this kind of self-direction, they have been surprised by the extent of modeling, feedback, and ongoing coaching that students require, and for some students their movement along the continuum of self-directedness is much slower than for others. Fostering a climate of self-directed learning informed by ongoing formative assessment is something that takes place from the moment students enter a room until they leave, as Mr. Miles demonstrates.

He begins to nurture self-directed learning with practices such as giving preassessments and having students self-score them, then use what they find from these to self-direct the next steps they will take. Essentially, he works to put his students in charge of understanding and managing how they will learn.

He constantly has them not only self-evaluate their learning of each topic with carefully selected phrases such as, “got it,” “need more practice,” or “have questions,” but he also then expects his students to make a plan for what they should do next to move ahead in their learning. He understands that while correcting one’s work with an answer key is a simple self-assessment, reflecting on one’s deeper understanding of a concept is more challenging, and so students require more coaching, practice,

and modeling to hone this skill. Teacher time is limited, and so teachers must make a judgment call about how much time to invest in supporting students in this process. At times, it may be more time efficient to point out conceptual misunderstandings for students rather than scaffolding them in discovering these themselves. As well, some students may be more talented at learning how to do this for themselves, and it may need to be acknowledged that other students will continuously require more direction with doing this.

When students ask questions, he turns them around, and using questions, allows them to realize that they already do understand much of the concept and sometimes they can answer their own question with the right support. In this way, he encourages perseverance and avoids being seen as the sole math authority in a way that could diminish his students' belief in their own skills and abilities.

In these ways, particularly those described in Chapter 2, Mr. Miles builds a climate in his classroom in which students feel supported, safe, and comfortable and become self-directed in how they approach learning.