

So what are “those same things?” Our list includes the following:

- Students reference the learning goal throughout a lesson to help clarify for themselves what they’re learning and where to focus their attention or to provide feedback to others about mathematics work.
- Students have an image of what successful work looks like, either from criteria provided by the teacher or from criteria they have for themselves internally. Students pay attention to these criteria to evaluate how well their mathematics thinking and their work meet the learning goal.
- Students share their mathematical reasoning with you—their teacher—or with peers in small groups or in the whole class. This sharing goes beyond merely listing what steps they followed, to talking about *why* they followed certain lines of mathematical reasoning. Students also are willing to take risks to share their thinking-in-process, even if it is not fully formed or may be inaccurate.
- Students proactively use the resources they have available to them.
- Students pay attention to the feedback they receive, and they use it to revise their work to better meet the learning goal.
- Students work with peers, either thinking through a mathematics task together, helping each other better understand an idea, or giving each other feedback to improve work.

This list of student actions helps provide some specific examples of what we refer to as students becoming *self-regulating learners*, and we say more about that shortly. The research on formative assessment points to a collection of instructional techniques whose potential impact reach far beyond the use of diagnostic tools to assess students’ understanding and make instructional in-the-moment adjustments and points to the development of stronger self-regulation in students (Black & Wiliam, 1998; Heritage, 2010; Popham, 2008; Stiggins, 2007). This list may sound idealistic and beyond the scope of many of your students. However, this book results from several years of intensive work in classrooms with real teachers and students who were able to make this a reality.

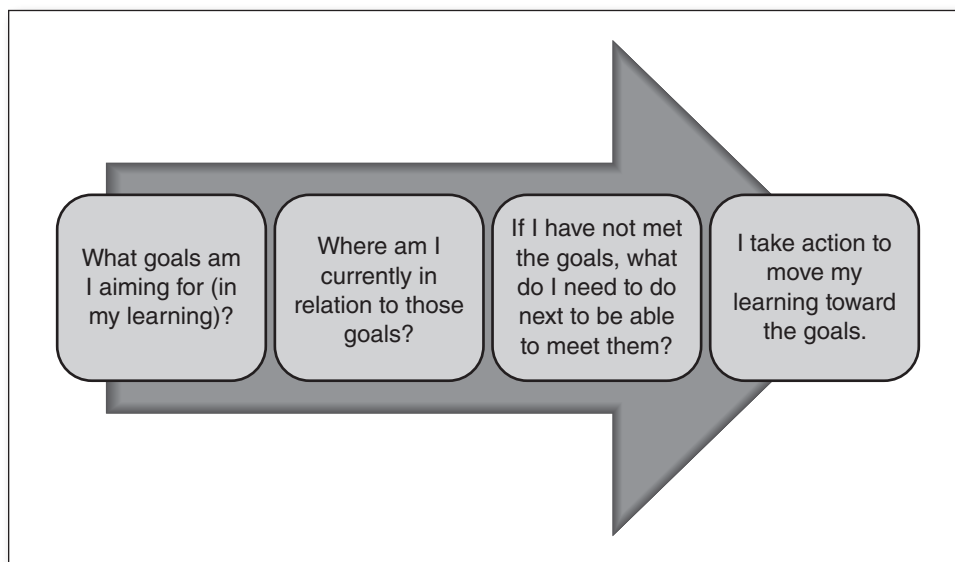
The collective voice of “we” who are talking to you throughout this book is an author team who has first and foremost been mathematics teachers. We are also professional developers, coaches, and curriculum developers, and we have worked closely alongside colleagues who are researchers. We have spent numerous hours in classrooms with our own students and with other people’s students. And we are indebted to a dedicated group of mathematics and special education teachers who worked with us over 5 years as part of the National Science Foundation–funded project whose work is captured in this book. (See the Preface for more information about this project.) The situations portrayed in this book have happened in real middle grades classrooms that are not out of the ordinary, and in many cases, are less than ideal. The voices of teachers that appear throughout this book are the voices of the teachers who worked closely with us and who have agreed to share their words because they wanted others to experience what they learned from this experience. You may encounter some things you will read here that will make you wonder whether this could happen in your classroom, and the teachers’ voices are here to tell you that it can.

The work of our project focused on the use of what we call *formative assessment practices* as a vehicle for helping students learn to become more self-regulating in regard to their mathematics learning. Simply put, these practices are the instructional techniques you can use to implement formative assessment in your classroom. While many of the teachers in our project were familiar with an assortment of formative assessment practices and related tools, many of them had not yet learned to realize the full potential of those practices and tools. This book shares with you what they—and we—have learned. We use the rest of this book to flesh out what the bullets in that list of student actions mean and what you can do to help your students get there. The good news is that you are probably already doing many things in your classroom that support students in learning to do these various actions. Our intent is to help you get more mileage out of those things and to help your students learn to participate in their mathematics class in a powerful way.

BEING A SELF-REGULATING LEARNER ■

The process of students becoming self-regulating learners can be described more broadly as students internalizing a set of questions and resulting actions that guide their learning. Figure 1.1 lays out these questions and actions.

Figure 1.1 Thinking Like a Self-Regulating Learner



These questions grow out of the work of Royce Sadler, an Australian educator and researcher who described the necessary conditions for self-regulation as follows:

[The] learner has to (a) possess a concept of the standard (or goal, or reference level) being aimed for, (b) compare the actual (or current) level of performance with the standard, and (c) engage in appropriate action which leads to some closure of the gap. (1989, p. 121)

Students may not be aware of these questions nor trying deliberately to answer them, but the questions frame the nature of the internal dialogue going on inside a student's head. If we were to look inside the heads of students, the internal dialogue of a student who is self-regulating would sound quite different from a student who is not; see Figure 1.2.

Figure 1.2 Internal Dialog for Self-Regulating and Non-Self-Regulating Students

	Student who is self-regulating:	Student who is not self-regulating:
What goals am I aiming for in my learning?	<i>"My job is to learn something new—the learning goal for today's lesson."</i>	<i>"Do the work to my teacher's satisfaction."</i>
Where am I currently in relation to those goals?	<i>"I can try to check myself against the criteria for good work. I can also look at any feedback I've received about my work or my thinking."</i>	<i>"I don't know; my teacher will tell me."</i>
If I have not yet met the goals, what do I need to do next to be able to meet them?	<i>"I may have some ideas of my own. If I don't, or if I'm unclear, I'll talk to my teacher or peers to figure out how to improve my work or adjust my thinking."</i>	<i>"I will wait for the teacher to help me."</i>
I am able to take action to move my learning toward the goals.	<i>"I can get myself started. If I get stuck, I can refer to my resources or the feedback I got. I can also get help from a peer or my teacher."</i>	<i>"Only if the teacher will tell me what to do next, or when to do it, or how to do it."</i>

Throughout this book, you will find templates, lessons, strategies, and other resources that you can use to structure your classroom, your instruction, and your interactions with students to move them toward becoming self-regulating learners.



Reference Resource: Go to Resources.Corwin.com/CreightonMathFormativeAssessment to access this resource.



Chapter 1 Summary Cards. This printable file provides a small version of the Thinking Like a Self-Regulating Learner diagram. Each chapter has a set of Summary Cards; we recommend printing them on sturdy paper (or laminating them) and punching a hole in one corner so you can keep them on a key ring for easy access.

USING FORMATIVE ASSESSMENT PRACTICES TO DEVELOP SELF-REGULATION SKILLS

Using a collection of formative assessment practices, taken as a whole, can create rich and effective opportunities for all students to learn self-regulation skills. In our work with teachers, we've learned that there are many varied understandings of what *formative assessment* means, so before we go further, it's important to establish how we talk about formative assessment in this book and what these practices are.

What Is Formative Assessment?

In the existing literature, there are many descriptions and definitions of formative assessment. Here are some examples:

- Formative assessment is a planned process in which assessment-elicited evidence of students' status is used by teachers to adjust their ongoing instructional procedures or by students to adjust their current learning tactics. (Popham, 2008, p. 6)
- By providing students and teachers with specific, regular feedback on how well students are mastering key concepts and skills, formative assessment helps teachers create opportunities that maximize the chances of learning happening. (Brookhart, Moss, & Long, 2008)
- [All] those activities undertaken by teachers, and/or by their students, which provide information to be used as feedback to modify the teaching and learning activities in which they are engaged. (Black and Wiliam, 1998, pp. 7–8)

Notice that these definitions have some common elements: They are focused on identifying student success, but they go on to mention the *use* of that information to help students achieve more. They also include recognition of the students' use of the information as well as teacher use.

In our work with teachers, we found a need to establish a common definition that we could rely on. We have adopted the following definition, put forth by the Council of Chief State School Officers (CCSSO):

Formative assessment is a process used by teachers and students during instruction that provides feedback to adjust ongoing teaching and learning to improve students' achievement of intended instructional outcomes. (2008, p. 3)

We chose this definition both because of its characterization of formative assessment as a process and its inclusion of students in that process and because of its comprehensive nature. For example, there are several important pieces to this definition:

- A process: Formative assessment is much more than a type of quiz, test, or other tool that can simply be given to students. Rather, it's a *process* that starts when the teacher begins planning and continues as the teacher and the students are engaged in a lesson and

continues even further as the teacher reflects on the lesson and plans the next. We refer to this process throughout the book just as *formative assessment*.

- Used by students and teachers: While the teacher has a major role in implementing formative assessment, the students also have a major role. In fact, Heidi Andrade (2010) characterizes students as the “key producers and consumers of formative assessment information.” A significant portion of this book is focused on the student role and how to engage students in it.
- During instruction: The power of formative assessment lies in its timing. Because the process is used *during instruction*, teachers and students are able to adjust and refocus their efforts so that energy is spent where it does the most good, while it is still helpful—that is, while instruction is still underway and while students are engaged with content, rather than after a unit or chapter is done. During instruction allows both for the use of instructional tools or strategies that can provide information in real time during a lesson as well as those that provide information that a teacher can analyze and use after a lesson to plan for the next day.
- Provides feedback to adjust: Formative assessment cannot be formative if the process does not help teachers shape or *form* their instruction based on the real-time information gathered and if it does not help students *form* their learning in response to what is needed. Feedback is one of the mechanisms in formative assessment that helps students learn to adjust their mathematical thinking and their work, and to refocus their efforts if necessary, to better meet the learning goal. Teachers also get feedback from the process so that they can adjust their approach to meet their students’ needs.
- Ongoing teaching and learning: It’s notable that this definition mentions both teaching and learning, both of which require adjustment as instruction occurs, to respond to the variety of learners in any given classroom. It may be easiest for teachers to pay attention to adjustments in their teaching to try to help students be successful but more challenging or less familiar to pay attention to helping students learn to make adjustments for themselves to their learning. Yet both are important here.
- To improve student achievement of intended instructional outcomes: Of course, improving student achievement is the ultimate goal for all of our efforts to improve our teaching practices. But as we know, students will learn many things from us, and they will not always learn what we intend them to learn! By creating a clear focus on the *intended* instructional outcomes, teachers can avoid energy that is misspent on other unintended outcomes.

This definition provides an excellent description of formative assessment but not the important details—what it looks like and how one implements it in the classroom. Different authors provide a variety of ways to characterize these details; we consolidated many of the views and, through our work with teachers, arrived at a set of common and useful aspects that we consider the *critical* and *supporting* aspects of formative assessment. In the next section, we provide a brief overview of these aspects; the following chapters delve deeper into each.

Before you read that section, though, we'd like to point you to a collection of resources that exist on the website that accompanies this book. These resources include tools you can use in your classroom with students to implement the recommendations you'll encounter throughout this book as well as planning guidelines for your use. In addition, there are a collection of interactive web pages, some of which can be used as planning tools, others of which help illustrate in more depth some of the ideas in this book. At this point, we suggest you take an opportunity to look at one of these interactive pages. Log in to the companion resource website (Resources.Corwin.com/CreightonMathFormativeAssessment) and find the "Formative Assessment Overview" interactive page, which provides several statements about formative assessment by selected notable authors. You can sort these statements and form your own opinion of how they align with each other. You can also see how your choices align with our own characterization of the critical and supporting aspects. This is an activity we've done with numerous teachers in professional development settings, and we have found that it helps provide a clear, big picture of formative assessment in an engaging and informative way.



Learning Resource: Go to Resources.Corwin.com/CreightonMathFormativeAssessment to access this resource.



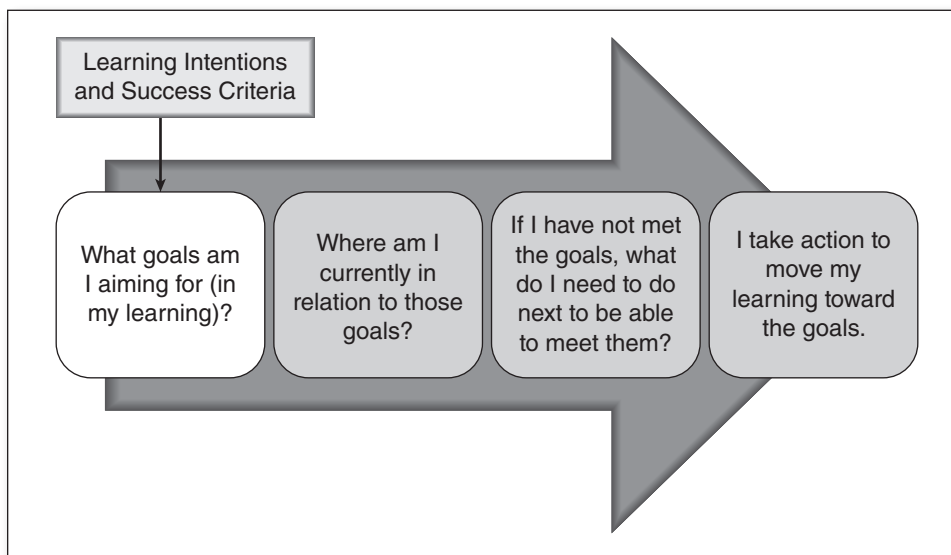
Formative Assessment Overview. This interactive web page provides a big picture view of formative assessment.

Overview of the Aspects of Formative Assessment

While there are several different characterizations of the vital elements of formative assessment in various definitions in the field, there are notable similarities among them. In our work with teachers, we focused on these similarities to identify four elements that we call the *critical aspects* of formative assessment. In addition, we identify two *supporting aspects*, which provide intellectual, mathematical, and practical foundations for implementing formative assessment into your daily teaching practices. (You probably saw these six aspects in the Formative Assessment Overview interactive page.) A short description of each is provided here, and you'll see examples of each in the "Using Formative Assessment in Your Classroom" section of this chapter. Chapters 2 through 7 present details about each aspect, including descriptions of the corresponding teacher and student roles within formative assessment as well as recommendations, tools, and strategies to help you implement them in your own instruction.

Critical Aspects of Formative Assessment

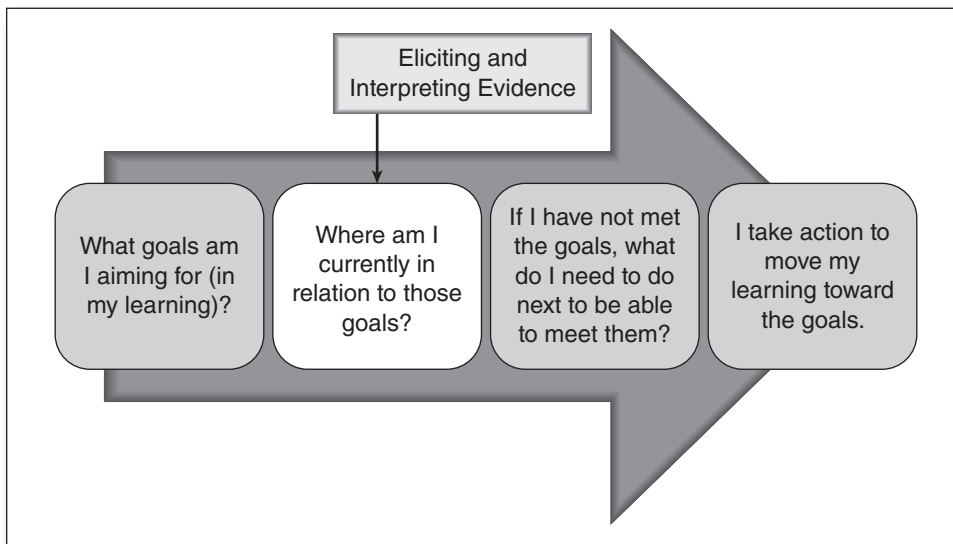
- **Learning Intentions and Success Criteria:** This critical aspect requires articulating, and sharing with students, both the learning that you intend to happen in a lesson (the *learning intention*) and the indicators that help both you and your students assess whether that learning is taking place (the *success criteria*). (See Figure 1.3.)

Figure 1.3 Learning Intentions and Success Criteria in Self-Regulation

You may be accustomed to writing your lesson goals as student objectives, mastery objectives, “I can . . .” statements, or any one of a number of other formats. Many commonly used formats have favored an emphasis on tangible, observable goals, resulting often in a focus on what students will successfully *do* during the lesson but with less clarity on what students will *understand* mathematically *as a result* of what they do. This understanding is captured in the statement of a learning intention, with the tangible evidence of that learning described in the success criteria. Each of the other critical aspects uses the learning intention and success criteria to focus both your instructional decisions and your students’ attention as they try to meet the learning intention.

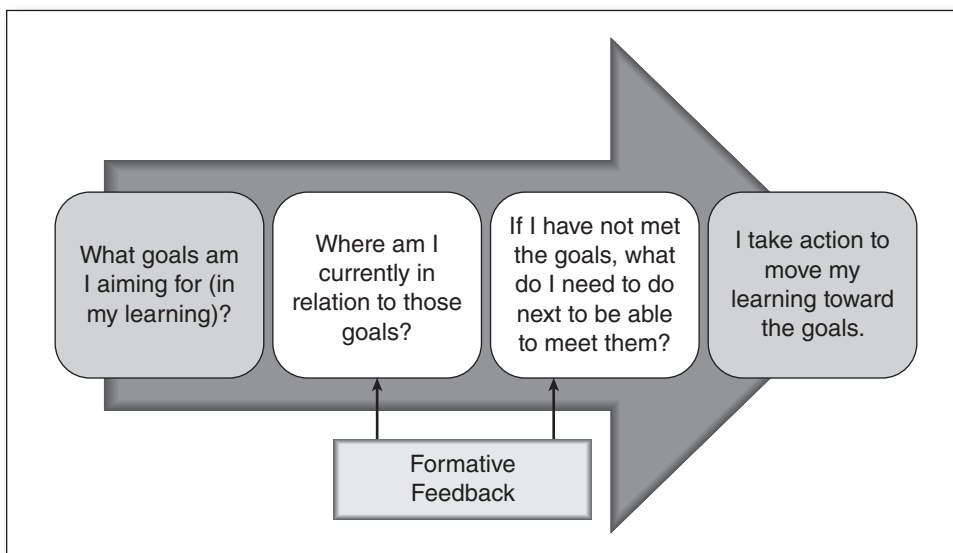
Whether you name a lesson goal as a *learning intention* or *learning target* or *objective* may just be a matter of semantics. We are choosing to use the language of *learning intention* and *success criteria* here because these are the phrases used in much of the literature on which we based our work with teachers. The importance is not in what you call them but how you articulate them and then use them. There are important characteristics of learning intentions that are effective for implementing formative assessment that may distinguish them from other uses of lesson goals. These characteristics are addressed in Chapter 2, “Using Mathematics Learning Intentions and Success Criteria.”

- **Eliciting and Interpreting Evidence:** This aspect entails gathering evidence of student thinking and student skill and interpreting it against the success criteria to determine appropriate next steps. (See Figure 1.4.) All teachers observe what their students do; however, in formative assessment, that gathering of evidence is specifically focused on evidence related to success criteria, and the next instructional steps are similarly focused on using the results to move students’ understanding and skills toward meeting the learning intention.

Figure 1.4 Evidence in Self-Regulation

Interpreting evidence of mathematics learning should go beyond answering the question of *can* the students *do* the mathematics, to answering the question of *how* students are *making sense of* the mathematics. Answering these questions requires gathering evidence both about students' fluency with skills and about students' understanding of the underlying mathematical concepts. This aspect is covered in more detail in Chapter 3, "Gathering, Interpreting, and Acting on Evidence."

- **Formative Feedback:** This critical aspect can be a powerful response to student needs, when it's the appropriate next instructional step. There are many kinds of feedback such as motivational feedback,

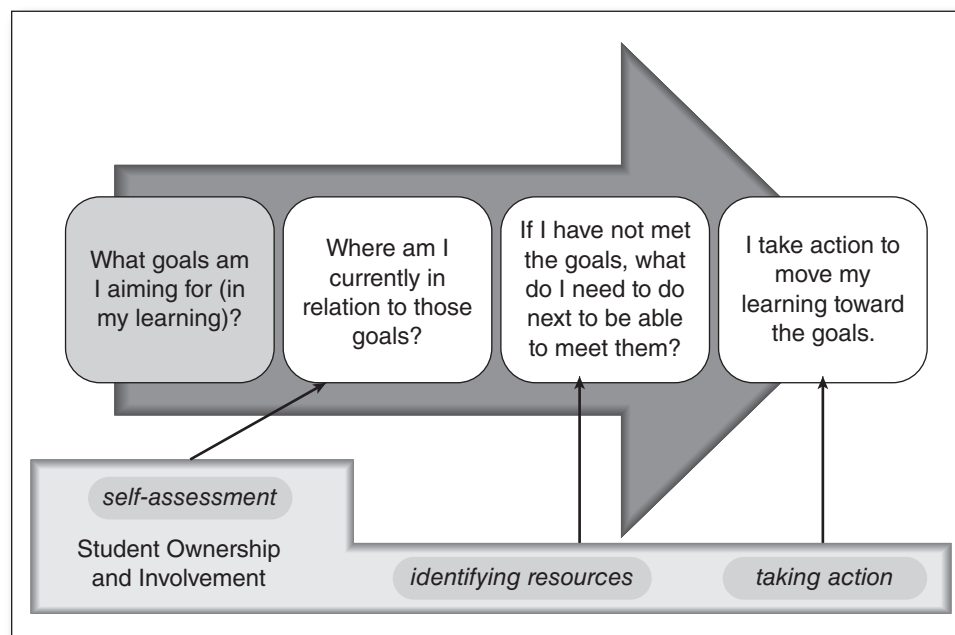
Figure 1.5 Formative Feedback in Self-Regulation

including praise (“You did a terrific job helping your group figure out a solution method!”) or suggestions for revision of work (“See if you can find the places where you misplaced the decimal point”). However, feedback that is *formative* refers to the success criteria to provide information that helps the students move farther toward meeting the learning intention. (See Figure 1.5.)

Formative feedback in a mathematics classroom focuses on identifying where students’ current mathematics understanding meets or exceeds the goals, where it needs improvement, and what to do next to move their learning forward. Because formative feedback relies so directly on the success criteria, it is difficult to provide a brief example without the surrounding context of the learning intention, success criteria, and the context of the lesson activities. However, Chapter 4, “Providing and Using Formative Feedback,” provides more information and numerous examples.

- **Student Ownership and Involvement:** This aspect is listed last, but certainly not least! The goal of helping students learn the skills they need to become self-regulating learners is best viewed as an overarching goal of formative assessment, and as such, makes sense to discuss after the other critical aspects have been introduced. This aspect includes helping students learn to self-assess in relation to the learning intention and success criteria, identify resources (including using each other as peer resources), and take action on their own to move their learning forward. This critical aspect relates to all parts of self-regulation, though self-assessment, identifying resources, and taking action can each be identified with specific different parts of self-regulation. (See Figure 1.6.)

Figure 1.6 Student Ownership and Involvement in Self-Regulation



Ideally, an involved student will be looking for the meaning and sense in the key mathematics concepts of the lesson, evaluating his or her work against the success criteria, sharing his or her reasoning with others, giving feedback and responding to feedback from others, and proactively seeking help (from peers, from the teacher, or from other resources such as the textbook or Internet) when needed. While we address student involvement in formative assessment in Chapters 2 through 4, this aspect is considered in depth in Chapter 5, “Developing Student Ownership and Involvement in Your Students.”

Supporting Aspects of Formative Assessment

- **Learning Progressions:** A learning progression is an articulation of a pathway through which understanding of content evolves, from basic to more sophisticated understanding. As support for a teacher’s use of formative assessment practices, a learning progression provides a context in which a sequence of learning intentions should lie; it also provides insight into gaps in necessary prior knowledge that can contribute to a student’s misconceptions or other barriers to learning. Chapter 6, “Using Mathematics Learning Progressions,” provides a description and examples of learning progressions and how you might use them to support your own formative assessment practices.
- **Classroom Environment:** Every teacher has a particular classroom environment and knows how fundamental a positive classroom environment is to student learning. However, some environments are more conducive to implementing formative assessment practices than others. Your implementation of formative assessment can be aided or hindered by the physical environment, the cultural and social norms, and the instructional framework of your classroom, so in Chapter 7, “Establishing a Classroom Environment,” we discuss these different types of environmental influences.

You might find it helpful to have a summary of these aspects readily available. Throughout the book, we point you to “Summary Card” resources on the companion resource website that summarize information you’ll find in this book. We recommend printing these on sturdy paper (or laminating them) and punching a hole in one corner so you can keep them on a key ring for easy access.



Reference Resource: Go to Resources.Corwin.com/CreightonMathFormativeAssessment to access this resource.



Chapter 1 Summary Cards. This printable file provides a summary of the critical and supporting aspects of formative assessment.

■ USING FORMATIVE ASSESSMENT IN YOUR CLASSROOM

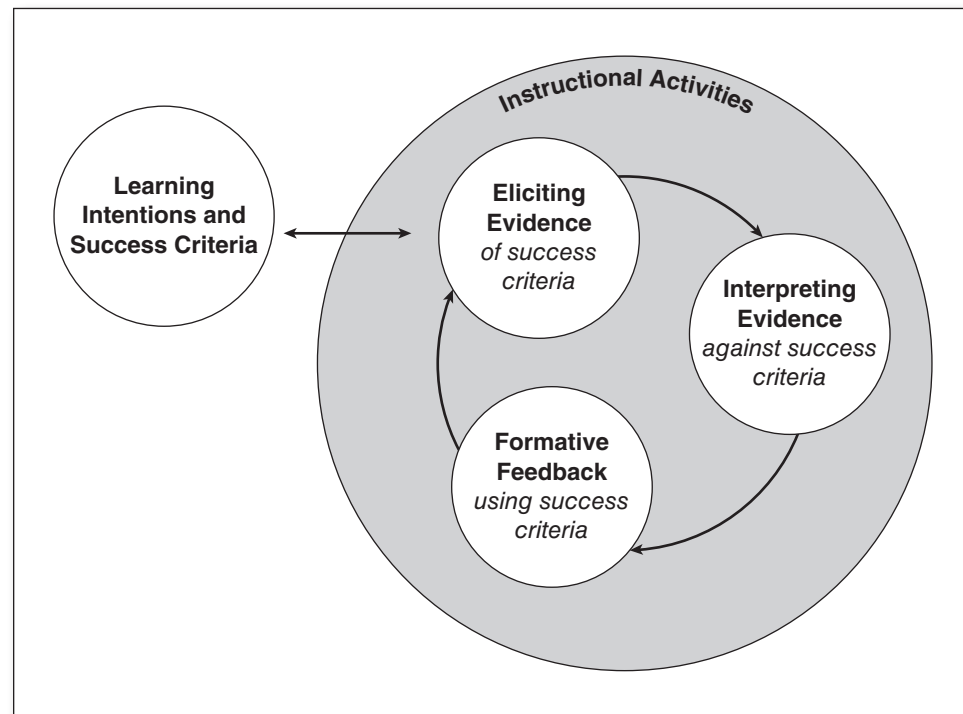
As we delve deeper into each of the critical and supporting aspects in Chapters 2 through 7, we provide specific details about how each appears in the classroom, along with recommendations for planning, implementation, and student use of the formative assessment process. Here, we want to address your role, and your students' role, in more general terms.

The Formative Assessment Cycle

To illustrate how the critical aspects form a coherent process, a lesson-level view is helpful. (In this case, by *lesson* we mean some period of instruction within a unit of study, which may be a single class period or may extend to multiple periods.) We use a diagram we call the Formative Assessment Cycle to illustrate how all the aspects interact within the process. This diagram was informed by the work of Margaret Heritage, Heidi Andrade, Dylan William, and Susan Brookhart, among others, and refined through our work with teachers. Here in Chapter 1, we provide the most basic picture of this cycle (Figure 1.7). As you progress through the chapters, we will gradually provide more detail to flesh out the full version of the cycle.

Our basic view of the Formative Assessment Cycle shows three of our critical aspects, with Eliciting and Interpreting Evidence split into two steps. First, you determine and share the *learning intentions and success*

Figure 1.7 The Evolving Formative Assessment Cycle (Basic View)



criteria. Then, within the context of the instructional activities of your lesson, are three steps: *elicit evidence* of your students' thinking and learning, focusing on the success criteria; *interpret* that evidence against the success criteria; and then provide *formative feedback* (when appropriate) using the success criteria. At that point, the cycle returns to *eliciting evidence*—did their learning progress?

Example: For one lesson, Mrs. Jenkins wants students to work toward recognizing how constant change can look in different representations. She decides on this learning intention: "Today, we will learn to relate growth in numeric patterns to growth in corresponding visual patterns." For success criteria, she decides on the following:

1. I can describe how a pattern of numbers continues.
2. I can describe how a corresponding visual pattern continues.
3. I can explain how the way a number pattern grows relates to the way the visual pattern grows.

For the instructional activities, Ms. Jenkins decides on one Warm-Up and two Exploration Tasks.

- Warm-Up: Find the missing numbers in this table:

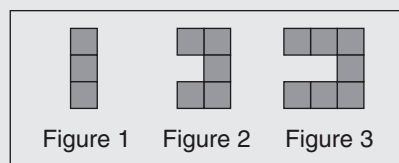
X	0	1	2	3	4	10	?
Y	0	2	4	?	?	?	28

- Exploration Tasks: Find the patterns in the sequence of squares and in the sequence of numbers. Be prepared to discuss how the patterns are connected.

1. Numbers:

X	1	2	3	4
Y	3	5	7	?

Figures:



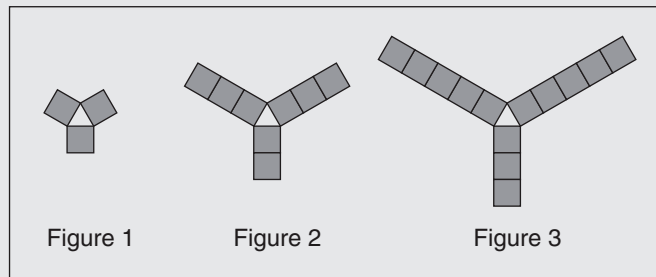
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2. Numbers:

X	1	2	3	4
Y	3	8	13	?

Figures:



To plan for Exploratory Task 1, she writes out some sample responses that she considers ideal so she can clarify for herself (and later for her students) precisely what meeting her success criteria will look like or sound like. She also plans to bring students together for a discussion that would allow several students to provide their thoughts about relating the numerical and visual patterns. She prepares a few questions:

- What patterns did you notice in the numbers? In the squares?
- How is the way that the number pattern grows like the way that the visual pattern grows?
- Do you have a way to describe either pattern in words or in numbers or symbols?

After the warm-up activity, Ms. Jenkins reminds them of the problems they worked on the previous day, creating tables of values from a growing visual pattern. She introduces the **learning intention** and explains how this is similar to, and different from, the previous work. She gets volunteers to read **the success criteria**, and then she directs the students to turn to a partner and discuss how success with each criterion shows progress toward the learning intention. After a few minutes, during which Ms. Jenkins listens to several of the discussions, she calls on a few students to share what they talked about, and then she gives them a chance to ask any questions they may have about the learning intention or the criteria.

Ms. Jenkins's warm-up required students to complete a table following a simple constant growth pattern. She **gathered evidence** by looking at their responses and **interpreted the evidence** to conclude that most students were able to find the pattern, so she felt confident they could move on to the planned Exploration Tasks. (No need for **formative feedback**.) A few students were unable to articulate how they found their patterns, so she made a mental note to be sure they paired with a student with stronger articulation skills and to check on them during the first task. (This concludes one repetition of the cycle within the instructional activities circle.)

*As her students complete Exploration Task 1, Ms. Jenkins gathers **evidence elicited** by the task, simply by observing their work and hearing their conversations. She occasionally interrupts a pair to ask for some clarification of their thinking. At the conclusion of the whole-class discussion after Exploration Task 1, which **elicits more evidence**, Ms. Jenkins **interprets the evidence** by comparing their work and conversation to the success criteria. She provides **formative feedback** to the whole class, saying, "I heard some clear explanations of how the number patterns continue and how visual patterns continue—that shows me that we're meeting the first two criteria. However, I'm not sure everyone is clear about our third success criterion, explaining how number pattern growth relates to visual pattern growth. First, can I have a volunteer to tell the class what you think that means?" After a volunteer explains, she gives students a chance to ask questions of the volunteer. (This concludes another repetition of the cycle within the instructional activities circle.)*

Again, this basic view is a simplification of how formative assessment will appear in a classroom. For example, formative feedback might not be an appropriate response to students' needs, as Ms. Jenkins decided after interpreting the evidence from the warm-up. As you dig deeper into each of the aspects and become more familiar with what they mean, we add detail to this cycle and also return to Ms. Jenkins's lesson to see how the added detail is incorporated in her lesson.

Putting Your Students Front and Center

Although we list "student ownership and involvement" as one of our critical aspects of formative assessment, it does not appear in the Formative Assessment Cycle labeled as such, since it really serves as an overarching critical aspect that permeates all the other critical aspects. Students have an important role to play in nearly all aspects of formative assessment. As we add detail to the evolving Formative Assessment Cycle, you will see that we break most of the steps into a teacher role and a student role. (See Figure 1.8.)



Reference Resources: Go to Resources.Corwin.com/CreightonMathFormativeAssessment to access these resources.

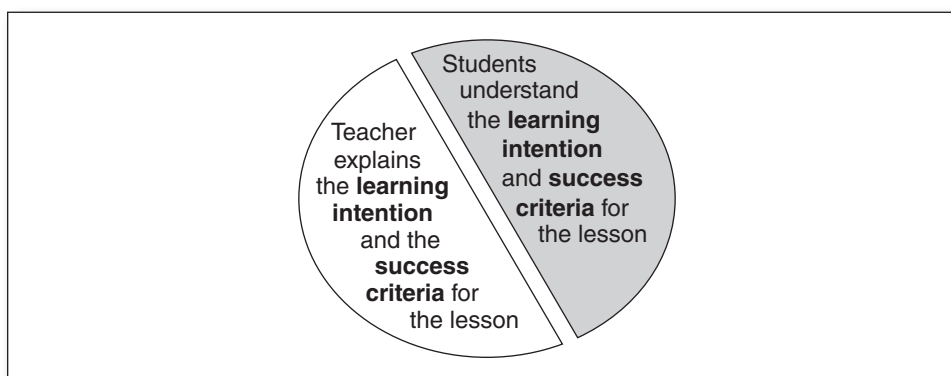


Formative Assessment Cycle. A color version of the completed Formative Assessment Cycle is included in Chapter 8; however, you may want to go to Resources.Corwin.com/CreightonMathFormativeAssessment and take a look now. Look for Chapter 8 Resources.



Formative Assessment Cycle Video. An audiovisual tour of the Formative Assessment Cycle that we are building throughout this book is also included in the Chapter 8 Resources.

Figure 1.8 Example of Teacher and Student Roles in the Formative Assessment Cycle



The student is the ultimate consumer of the information gleaned from this process. The purpose of the process is to help students learn more efficiently; if the process doesn't facilitate focused, intentional learning, then it isn't doing its job. Also, an overarching goal of formative assessment is to help students learn how to regulate their learning themselves, by self-monitoring their understanding and procedural fluency and seeking ways to improve in those places where improvement is needed.

We found that many teachers began their work with us with an image of formative assessment as a useful diagnostic tool *they* could use to evaluate students' understanding. They saw themselves as the keepers of and consumers of the information gathered from formative assessment practices. Their experience with formative assessment centered primarily on trying to figure out "Is students' understanding accurate?" (determining *whether* students understand what was intended) and, if not, then wondering "What is the nature of the problem with their understanding?" (determining both *what* it is that students do or don't understand and *why*, so that they could determine appropriate next steps for the students).

However, the heart and soul of effective implementation of formative assessment lies in the answer to the next question, "What do we do to advance the student's learning?" What is most critical in this question is the *we*, because it refers to the teacher *and to the student*. If the teacher is the only keeper and consumer of this information, then that question becomes merely "What do I, the teacher, need to do about this?" The most important person in the interaction, the student, is already in danger of being left behind in spite of the best intentions of any teacher, because while the teacher can adjust instruction, it is the student who has to adjust his or her learning. Thus, an important goal of the use of formative assessment is to provide students an opportunity and a means to learn and internalize self-regulation skills and thereby take ownership of their learning.

Comparing Formative Assessment Practices to Your Teaching Practices

When you look at our description of formative assessment, you undoubtedly recognized much of it as something you already do in your classroom:

You get information from your students, interpret that information, make decisions based on it, and provide feedback. You might even have a standard practice of launching your lessons by telling your students what you expect them to learn. How, then, is this different from your good teaching practices?

Although the differences may seem subtle, formative assessment provides additional focus and purpose to these typical teaching practices that can make a big difference for you and for your students. Consider Table 1.1, which illuminates these differences. Chapters 2 through 7 will help you understand what these differences mean and how to incorporate them into your own classroom practices.

Table 1.1 Differences Between Typical Practices and Formative Assessment Practices

What teachers do as part of instruction:	What teachers using formative assessment practices add to instruction:
Post lesson learning targets for students.	<p>Help ensure that students understand what the learning intention itself means.</p> <p>Provide success criteria that specify what it means to meet the learning intention.</p> <p>Develop a very clear picture of what it will look like or sound like when a student meets any one of the success criteria.</p> <p>Over the course of the lesson, share that information with students so that they too know what it looks like and sounds like to meet each success criteria.</p>
Assess students (get information about how they're doing).	<p>Focus the assessment information gathered toward the learning intention through the use of the success criteria.</p> <p>Gather information about students' development of conceptual understanding as well as of mastery of procedures.</p>
Interpret assessment data and make decisions based on that data.	<p>Use the success criteria as a framework or guide for interpretation of data.</p> <p>Use a learning progression for the math topic to inform instructional decisions about where students need to go next in their learning.</p> <p>Use a learning progression to inform teacher's thinking about the nature of students' difficulties.</p>
Provide feedback to students on their progress.	<p>Provide a type of feedback that helps the student understand (a) how his or her work or understanding of a concept does or does not meet the learning intention by referencing the success criteria and (b) what to do next if he or she has not yet met the learning intention.</p> <p>Provide opportunities for students to act on the feedback.</p>
Encourage students to take responsibility for their learning.	<p>Use specific instructional techniques to help students learn how to take responsibility for their learning.</p> <p>Give students repeated opportunities to practice and develop new habits and skills that help students become more self-regulating.</p>

■ TEACHING STUDENTS HOW TO PARTICIPATE IN FORMATIVE ASSESSMENT

Students can gain ownership of their learning and become self-regulating learners as part of your implementation of formative assessment, and throughout the rest of this book, we talk about this idea in depth. However, there are some important points to raise here that you will hear echoed in later chapters:

- *Students need guidance about what it is they are expected to do for each part of formative assessment.*

As we worked with teachers, it became clear that helping them hone their use of various formative assessment practices was not enough; students were not yet engaging as fully as we wanted. We learned that students needed to be taught certain skills and mindsets to help them participate effectively in the cycle. Throughout this book, we've shared a collection of the tools we developed and used to help students do so.

- *Students benefit from teachers being explicit with them about the purpose of various parts of formative assessment.*

The more that the teachers we worked with were able to talk with students about what they were doing together, and why, the more students began to buy in and participate. Explicitly sharing the purposes of formative assessment practices turned out to be one important way to help students also become consumers of the information of formative assessment.

TEACHERS' VOICES

I realized that when I became more transparent to my students about my actions—helping them see what I was doing during a lesson and why—they were able to get involved. When I did a short lesson on the concept of formative feedback—what it is and how we will use it in class—and then explicitly modeled it, students totally caught on. The level of discourse and engagement grew. It makes so much sense that for students to do this, they need to be taught. I don't know why I didn't think of this before. After all, we have been working on learning to use formative assessment for a year now. Students need instruction about the process, too.

- *Students need time to learn to do these things.*

Needing time includes providing some class time to introduce students to the critical aspects. But perhaps more important, it refers to allowing students an adequate amount of time to build the understanding of their role over time. Teachers in our professional development program spread this learning out over several months, introducing

one piece at a time and giving students opportunities to practice each piece with guidance, so eventually they could internalize it.

Resources for Teaching Students About Formative Assessment

In cooperation with some of the teachers we worked with, we have developed some lessons to introduce students to learning intentions and success criteria and to formative feedback. In the corresponding subsequent chapters, you'll have the opportunity to look at these lessons and consider using them.

Introducing students to the elicitation and interpretation of evidence is a little subtler. Rather than a lesson on evidence, each individual strategy for eliciting evidence (such as the "X-Marks-the-Spot" strategy in which students self-assess using a particular template or the "Reflect Aloud" strategy in which the teacher models a way for students to share their mathematical thinking) needs to be explicitly introduced; sharing the purpose of those activities with your students will help them understand what you're asking for and why honest responses are important, and it will help them see how they may also be able to start to assess themselves. For example, students are familiar with teachers gathering evidence through questioning and quizzes, although they may assume that follow-up questions from a teacher during class mean they have provided incorrect answers. In time, they can overcome this assumption, if you talk with your students early and often about your desire to understand their thinking, whether they provide correct or incorrect answers, *and* follow up by asking about that thinking! Over time, as they gain trust that you truly are interested in their thinking, they will become more confident in and more practiced at explaining their thinking.

Once students have been introduced to these aspects of formative assessment, another important thing you can do throughout your instruction is to model for students the parts of the process that they need to learn to do. For example, you can refer to the success criteria when you elicit evidence so students understand what you're trying to assess; then, you can refer to it again when you tell them what you have discovered about the extent to which they meet the criteria (i.e., your interpretation of the evidence). As students see how you use these things to help them learn, they can begin to internalize their use.

Finally, with those understandings, students can begin to learn how to self-assess and make decisions for themselves about what they need to do to progress in their learning. You will need to help them learn to self-assess their own progress *based on evidence*, using the learning intentions and success criteria, and we discuss this in greater depth in Chapter 5, "Developing Student Ownership and Involvement in Your Students." Determining their best option for moving forward then requires identifying, and having access to, a variety of resources—their textbook, their notes and past work, the library or the Internet, their peers, and their teacher. You can help them build a repertoire of resources by varying your own suggestions for choosing which resources to move

them forward and gradually turning over to them the responsibility for choosing appropriate resources.

■ HOW TO USE THIS BOOK TO LEARN WHAT YOU WANT TO LEARN

You may find that one or more aspects of formative assessment resonate with you or interest you as a place to begin to learn more. You may be someone who prefers to work from start to finish in order, reading the chapters in chronological order. Or you may be someone who prefers to skip around, looking for parts of the book that address questions you have or that grab your attention. So we'd like to offer a few words of advice on how to make the most of this book:

- Read Chapters 1 and 2 first. Chapter 1 (which you may have now read already!) provides an important introduction to the comprehensive view of formative assessment on which we base this book and the importance of engaging students fully in the formative assessment process. Chapter 2 discusses the nature of the importance of establishing learning intentions and success criteria as well as the importance of establishing them for use *with students*. Because the learning intention and success criteria are foundational to implementing the other aspects of formative assessment, you will be better prepared to skip around to various chapters after you have read Chapter 2.
- There is a method to the order in which the chapters are presented that may inform your choices about how to read this book:
 - Chapters 2, 3, and 4 describe an important triad of critical aspects: writing and sharing a learning intention and success criteria, eliciting and interpreting evidence and choosing an appropriate responsive action, and articulating and using formative feedback. These three elements together form the backbone of any effective implementation of formative assessment. There is more weight given throughout these chapters to the teacher's role, because in our work with teachers, we found that they needed to understand their part in these three aspects of formative assessment before they could fully delve into the ways to bring their students into the cycle. Therefore, you'll see some brief mention of the students' role in these chapters, but an in-depth discussion of the student role is saved for Chapter 5.
 - Chapter 5 talks further about developing student ownership and involvement in the formative assessment cycle. In this chapter, we flesh out what the students' role entails and how to help students learn to step into that role.
 - Chapters 6 and 7 go into more depth about the supporting aspects: using learning progressions and establishing a classroom environment conducive to formative assessment. We could have chosen to talk about those earlier, since clearly classroom environment and a deep understanding of one's subject matter are

fundamental to any successful instruction. However, we know that teachers already are experienced with establishing classroom environments and thinking about their subject matter content, so we want to provide a clear picture of how these two aspects are important to implementing formative assessment. To do that, we need to establish a full vision of formative assessment and your students' role in it. We believe postponing discussion of these aspects until after establishing the context of formative assessment makes the discussion more relevant for you, our reader.

- Chapter 8 then steps back to discuss ways to implement this work. We suspect—and hope!—that you will want to try things during your read of various chapters, so trying some things out need not wait until Chapter 8! However, we also know that the teachers we worked with needed different kinds of opportunities to try things. They first needed opportunities to try individual ideas or strategies from each aspect of formative assessment, and we encourage you to do this as you move through the chapters. As they became more comfortable with individual aspects of formative assessment, they then needed opportunities to weave the pieces together into a more seamless whole. For some, this weaving happened as they added on each new piece; for others, it was a process of focusing on one aspect, then dropping it as they focused on a new one, then picking it up again later. This learning about weaving the pieces together is a very important part of making your implementation successful, so Chapter 8 focuses on some broader recommendations about how to build and sustain your journey toward full implementation.

However you choose to make the most use of this book, we hope that you find many useful strategies, tips, resources, and guidance for bringing your students into the formative assessment equation.

CONCLUSION ■

The following quote from Dylan Wiliam describes both the impact and the challenge of implementing formative assessment practices:

To be effective, [formative assessment practices] must be embedded into the day-to-day life of the classroom, and must be integrated into whatever curriculum scheme is being used. That is why there can be no recipe that will work for everyone. Each teacher will have to find a way of incorporating these ideas into their own practice, and effective formative assessment will look very different in different classrooms. It will, however, have some distinguishing features. Students will be thinking more often than they are trying to remember something; they will believe that by working hard, they get cleverer; they will understand what they are working towards; and will know how they are progressing. (2000)

Formative assessment provides a structure for focusing your instruction, and your students' attention, on the concepts and skills you decide are

most important for the lesson. Your role is to bring all the pieces into play both in planning and implementation, and then to teach students about their role—initially to engage in it, and eventually to internalize it and move toward being more self-regulating in their mathematics learning.

Our intent in this book is to illustrate the strengths of formative assessment by illuminating what it means to embed these practices into the day-to-day life of the classroom and to help you address the challenge of implementing the formative assessment cycle by providing you with some resources and tools to do so. We hope that you find it as rewarding as the teachers in our professional development program did.

■ RESOURCES

The following sections present some resources that can help you learn about formative assessment. Each of these resources is referenced in earlier sections of the chapter, but here we provide a consolidated list. All resources can be found at Resources.Corwin.com/CreightonMathFormativeAssessment.

Learning Resources

This resource supports your learning about the critical and supporting aspects of formative assessment:

- **Formative Assessment Overview** provides an approach to considering different characteristics of formative assessment. The interactive web page provides several statements about formative assessment, by selected notable authors, which you can sort to look for connections among the ideas.

Reference Resources

These resources summarize key ideas about formative assessment practices:

- **Chapter 1 Summary Card** is an index-size Summary Card that provides a summary of the critical and supporting aspects of formative assessment.
- **Formative Assessment Cycle** is a color version of the *full* Formative Assessment Cycle that we are building throughout this book. While the cycle evolves over the course of the book, some of you may want to see the completed version early. We recommend using this color version, possibly with the video available on the companion site.
- **Formative Assessment Cycle Video** is an audiovisual tour of the Formative Assessment Cycle that we are building throughout this book. You may want to look at it now or wait until Chapter 8.