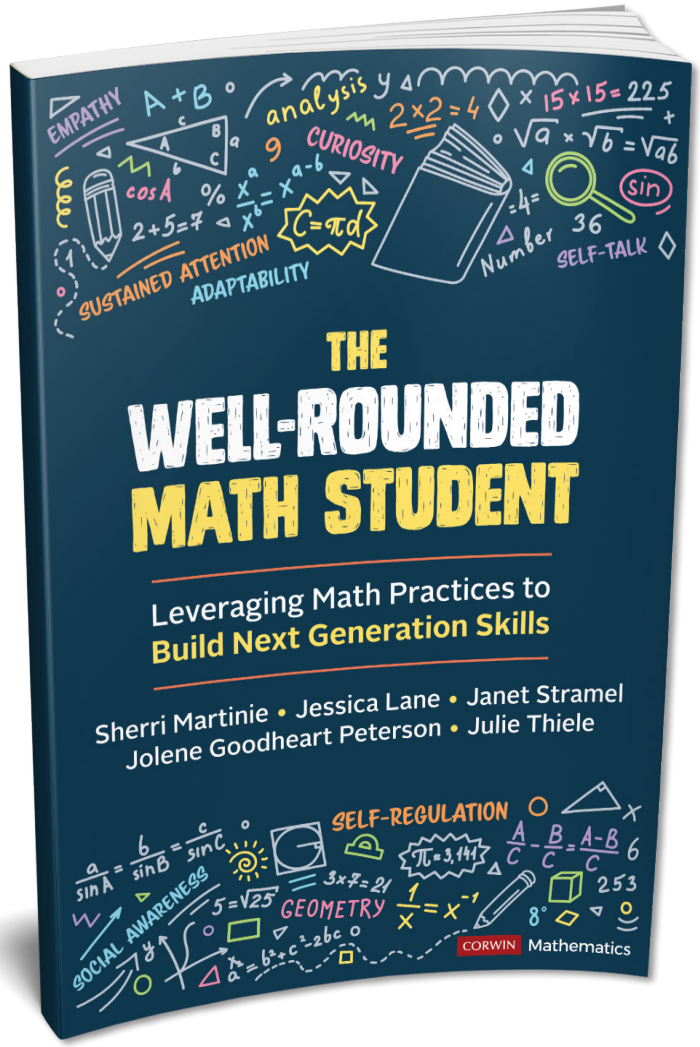

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CHAPTER 1

BUILDING SELF-EFFICACY IN PROBLEM-SOLVING FOR MATHEMATICS AND DAILY LIFE

IN OUR DAILY LIVES, navigating decisions and solving problems is a fundamental part of being human. Children also encounter problems at every stage of their development, from learning to tie their shoes to understanding the intricacies of social interactions. As they grow, they naturally acquire tools and experiences to help them tackle these challenges. However, what if you could intentionally cultivate and hone these problem-solving skills in a way that empowers them for life?

In mathematics, you have the unique opportunity to do just that. By guiding students through the process of *making sense of problems and persevering in solving them*, you can equip them not just with mathematical strategies, but with a mindset that is invaluable beyond the classroom walls. It's about more than "just solving for x" or finding the area of a rectangle; it's about building a repertoire of strategies that students can draw on in any situation. This dual focus on gaining and retaining problem-solving techniques is what prepares students to confidently approach challenges, persist through difficulties, and succeed in making sense of problems—both in mathematics and in life. While Mathematical Practice 1 (MP1) outlines some key strategies for problem-solving in mathematics, these strategies are transferable to many nonmathematical situations.

MAKE SENSE OF PROBLEMS AND PERSEVERE IN SOLVING THEM

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches. (CCSSM, 2010)

Consider the actions associated with MP1 in Table 1.1. Review the actions listed in the first column and think about how they connect to mathematical problem-solving. Then, examine the second column, where these actions are interpreted in the context of everyday problem-solving scenarios, like accidentally locking your keys in the car, or realizing you're missing ingredients for a recipe you've started.

Table 1.1 • *Actions Associated With MP1 That Can Be Applied to Everyday Life*

In Mathematics	In Everyday Life
• Interpreting and understanding the problem before attempting to solve it	• Identify and understand the problem. What is happening?

In Mathematics	In Everyday Life
• Planning a solution pathway	• Generate viable solutions. What can I do about this?
• Monitoring progress and being willing to change one's approach if needed	• Evaluate the alternatives and decide. If this is not working, what else can I try?
• Connecting current situations to previously learned concepts	• Think about what you know about the alternatives. Has this happened to me before? Has this happened to anyone else that I know?
• Continually assessing the logic and coherence of one's approach alongside the approaches of others	• Weigh the cost and benefit of the alternatives. What makes the most sense? Implement a strategy and evaluate whether it is working. What other strategies might also work?

MP1 describes a comprehensive approach to mathematical problem-solving that emphasizes understanding the problem, considering multiple strategies, analyzing representations, engaging persistently with a positive mindset, verifying solutions, and reflecting on solutions with peers. Effective problem-solving requires determining what the problem asks, what's important, the best strategy, and whether the solution is reasonable. It also involves having the mindset to handle confusion and persist until a solution is found (O'Connell & SanGiovanni, 2013). MP1 consists of two key components, each with its own distinct attributes (Table 1.2).

Table 1.2 • *Attributes Associated With MP1*

When students make sense of problems, they	When students persevere in solving problems, they
• Understand what they are being asked and consider multiple strategies and tools to analyze the problem • Analyze the meaning of the problem • Actively engage in the problem • Ask if their answers make sense • Check answers using a different method	• Show patience and a positive attitude • Continue thinking about what they can learn from the problem

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By incorporating MP1 into mathematics instruction, teachers can support students' social-emotional growth, including their **self-efficacy**, **perseverance**, and **social awareness**. As students engage with problems and work through challenges, they recognize their abilities and learn to persist. Self-efficacy, defined by Bandura (1995) as the belief in one's capacity to execute necessary behaviors, plays a key role in how students approach tasks and respond to obstacles. Teachers can enhance this process by intentionally integrating and modeling social-emotional skills throughout lessons, using strategies like discussing and reflecting on problem-solving actions. Students' **social awareness** grows as they learn to understand and appreciate diverse perspectives. By naming these skills and providing regular opportunities for reflection, teachers can create a supportive learning environment that fosters both academic and emotional development.

As with all mathematical practices, students engage differently based on age and experience. Regardless of the grade level, it is essential to plan deliberately for this practice. All lessons should actively (1) assist students in linking mathematics content with mathematics practices, (2) help students connect mathematics to their social-emotional development, and (3) reflect what is suitable for the age group they are designed for.

MERGING CONTENT STANDARDS, MATHEMATICAL PRACTICES, AND SOCIAL-EMOTIONAL COMPETENCIES

There are many decision points in planning mathematics lessons that explicitly incorporate MP1 and the relevant social-emotional competencies. In the introductory chapter, a framework was shared for building mathematics lessons with a social-emotional learning mindset. This framework does not require additional work but rather a thoughtful and intentional approach in the planning process. The framework consists of questions to prompt you to be purposeful in your lesson development, and shift thinking about the social-emotional competencies, so you are not adding "one more thing" but *the* thing that is foundational to deep and meaningful learning of mathematics.

Mathematical Content Standard and Corresponding Mathematics Goal

Start by asking, **"What is the mathematics goal of this lesson?"** For example, in kindergarten, students learn to "represent addition and subtraction with objects, fingers, mental images, drawings, sounds

(e.g., claps), acting out situations, verbal explanations, expressions, or equations" (K.OA.A.1, CCSSM, 2010). In this standard, students experience addition and subtraction in a concrete context to develop an understanding of what it means to add and subtract, as well as solve addition and subtraction scenarios using different representations. One mathematics goal for a lesson focused on this standard would be for students to engage with addition and subtraction situations using various representations (visual, verbal, symbolic, contextual, and physical) to help them make sense of the operations and how they relate. This will enable us to deepen students' understanding of the concepts of addition and subtraction and to move beyond a focus on rote calculation to grasp the underlying meaning.

At the middle school level, students learn to "solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale" (7.G.A.1, CCSSM, 2010). One goal for a lesson addressing this standard would be for students to explore the concept of scale factor as the number of times one object's measure is multiplied to obtain a similar object's measure. They then use this understanding to find the dimensions of an actual object given a drawing of the object that has been reduced or enlarged by a certain amount (also called a scale). A floor plan of a house is an example of a scale drawing. Another goal would be for students to determine the scale factor between two figures. This standard strongly emphasizes the role of visualization. The ability to visualize and then represent geometric figures on paper is crucial for making sense of and solving geometric problems.

Mathematical Practice

After examining the mathematical goals within the standards, consider how they align with the mathematical practices. Ask, **"Which mathematical practice enhances understanding of this content standard?"**

The standards emphasize using multiple representations (visual, verbal, symbolic, contextual, and physical) to help students understand concepts and solve problems. These standards encourage students not only to compute but also to analyze, identify relationships between representations, and make sense of problems. This approach fosters focus, patience, and adaptability as students plan, monitor, and, if needed, revise their strategies. These expectations align well with MP1. For instance,

- Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together,

taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. (1.OA.A.2, CCSSM, 2010)

- Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram. (3.MD.A.1, CCSSM, 2010)
- Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. (HS.A.REI.1, CCSSM, 2010)

These examples highlight not only the importance of problem-solving and multi-step problems but also the ability to represent problems in various ways, a crucial element of mathematical proficiency. By requiring students to use objects, drawings, and equations to solve addition and subtraction problems (1.OA.A.2), solve problems involving time (3.MD.A.1), or solve equations (HS.A.REI.1), students develop a deeper understanding of the underlying concepts. This approach supports the idea that there are often multiple pathways to a solution, encouraging students to explore different strategies and choose the most efficient one.

By encouraging students to understand a problem, devise a plan, and persist in finding a solution, these standards foster deeper mathematical understanding. Guide students in verifying their solutions by asking, "Does this make sense?" Across all grade levels, students are motivated to explore various strategies and persist through challenges.

Social-Emotional Competencies

Next ask, **"What intrapersonal and interpersonal skills are inherent, are needed, and can be further developed, while students engage in making sense of problems and persevering in solving them?"** As mentioned in the Introduction, integrating intrapersonal and interpersonal skills into lessons requires being mindful and intentional, so these skills are seen as a natural part of learning, not separate from the content. Students come with different levels of these skills, therefore it's important to explicitly teach and support them, even informally, to help students develop them fully. To accomplish this, pinpoint the intrapersonal and interpersonal skills that naturally align

with the mathematical tasks students are completing. Although many of these skills can be applied during MP1, it's important to focus on one or two at a time, teaching or emphasizing them explicitly. This approach helps students recognize when they are using these skills and encourages their ongoing development. To illustrate this, let's focus on the intertwined intrapersonal skills of **self-efficacy** and **perseverance** and the interpersonal skill of **social awareness**.

Intrapersonal Skills

As mentioned at the beginning of this chapter, **self-efficacy** is the belief in one's ability to succeed in specific situations or accomplish a task. MP1 encourages students to reflect on their problem-solving approaches and consider alternative strategies. This process of reflection and adjustment demands perseverance, as students must be willing to continue working on a problem even if their initial approach doesn't yield immediate results. This idea pairs with Carol Dweck's work, which recognizes that students with a growth mindset, who believe in their capacity to improve through effort, are more likely to **persevere** when faced with challenges. **Self-efficacy** and **perseverance** are therefore mutually reinforcing, and MP1 cultivates this mindset of nimbleness and determination in mathematical problem-solving.

Interpersonal Skills

As noted in the introductory chapter developing and strengthening **communication skills** is recommended across all MPs. In the case of MP1, making sense of problems often involves discussing mathematical ideas and strategies with others. This includes listening to others' arguments, showing an understanding and respect for their ideas, and considering the various contexts and backgrounds that shape their perspectives. To promote this, create lessons that emphasize collaboration and discourse. Doing so also supports the development of **social awareness**, which allows students to appreciate diverse ways of thinking and helps create a supportive learning environment where all ideas are valued. When students collaborate with partners or in groups, MP1 helps them develop skills like listening to others, understanding different approaches, and respecting diverse perspectives. Engaging with others' ideas might present disagreements or conflicting perspectives, and **perseverance** in this context means staying engaged in discussions, listening carefully, and being open to new ideas, even if they seem difficult at first.

Instructional Structures and Engagement Strategies

Now shift toward planning and ask, **"With an eye on our mathematics goal, how will I support social-emotional development as I engage learners in MP1: Make sense of problems and persevere in solving them? What structures, strategies, methods, and/or tools can I use?"**

There are two important aspects of this MP to consider as you plan to implement it in the classroom. First, what approach to problem-solving are you using and how can you center the reasoning processes around student thinking? Second, how do you build self-efficacy in a way that supports perseverance in problem-solving? The teacher and student activities that follow speak to these considerations and demonstrate how to address these competencies explicitly.

Identifying a High-Quality Task

High-quality mathematics tasks have two critical components: the what and the how. Traditional word problems are simple and have one correct answer. Students are often taught to solve them by finding keywords and numbers and then calculating the answer; the perceived goal for the students becomes simply to arrive at the correct answer. This approach—sometimes called teaching *for* problem-solving—deprioritizes the thinking process. Conversely, a high-quality mathematics task is open-ended and/or can be solved in more than one way. High-quality tasks generate discussion, questioning, and critical thinking. They allow students to understand the context, explore various methods for solving tasks, and eventually decide on an efficient strategy to solve the problem. This approach is thought of as teaching *through* problem-solving and is especially important to building conceptual understanding. To support the selection of high-quality tasks, SanGiovanni (2017) created an Identifying High-Quality Tasks rating tool (Figure 1.1) that can be used to evaluate the quality and effectiveness of mathematical tasks.

Figure 1.1 • *Identifying a High-Quality Task Rating Tool*

Identifying a High-Quality Task

The purpose of the task is to teach or assess:

☐ Conceptual understanding ☐ Procedural skill or fluency ☐ Application

Rating:

2 – Meets the Characteristic

1 – Partially Meets the Characteristic

0 – Does Not Meet the Characteristic

The mathematics task:	**Rating**
Aligns to the content standards	
Promotes deep understanding of mathematics concepts rather than procedural knowledge	
Is relevant and engaging for students	
Has multiple entry points (self-efficacy)	
Encourages students to make sense of problems and persevere in solving them (perseverance)	
Encourages students to be actively engaged in discussions (social awareness)	
Allows for different strategies for finding solutions (adaptability)	

Source: From SanGiovanni (2017, p. 2). Reprinted with permission.

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John SanGiovanni also developed a corresponding rubric that describes the way a task may or may not meet the intended characteristic as summarized in Figure 1.2. The rubric helps you evaluate the following criteria on a scale of fully meets, partially meets, and does not meet.

Figure 1.2 • *Task Characteristic Rating Rubric*

The task aligns to the mathematics standards I am teaching. Tasks must be worthwhile and aligned to the skills and concepts in our curriculcum.
The task encourages my students to use representations. Representations help students make sense of and communicate mathematical ideas.
The task provides my students with an opportunity for communicating their reasoning. Students can communicate their reasoning with models or pictures, numbers, and words.
The task has multiple entry points. Students can approach a problem from various perspectives, using diverse strategies and/or representations.
The task allows for different strategies for finding solutions. Students can solve a problem in various ways.
The task makes connections between mathematical concepts. Mathematics ideas are related. We can also connect them to representations, procedures, and applications.
The task prompts cognitive effort. High quality tasks should generate some amount of struggle. Students should have to make sense of the prompt, the problem, or the representation.
Tasks are problem based, authentic, or interesting. High-quality tasks are problem based. They can reflect real-world, authentic applications of mathematics. They should have interesting or noval prompts that grab students' attention.

You can download the full rubric at https://companion.corwin.com/courses/wellroundedmathstudent.

Notice within the descriptions of the characteristics are connections to social-emotional learning saying things, such as "High quality tasks should generate some amount of struggle, " Students make sense of and communicate mathematical ideas," and "Students can approach a problem from various perspectives."

Competency Builder 1.1

Teacher Task Analysis

Use the Identifying a High-Quality Task Rating Tool (Figure 1.1) and the corresponding Task Characteristic Rating Rubric (Figure 1.2) to analyze the tasks you have selected for your next lesson. Next, consider modifications that

could improve the quality, accessibility, and rigor of each task. Then, review sources with examples of high-quality tasks. Look for opportunities to replace or enhance tasks in your existing materials with those that foster greater student engagement and deeper thinking.

When you use the Identifying a High-Quality Task Rating Tool and the Task Characteristic Rating Rubric, the social-emotional competencies are more explicit. **Self-efficacy** grows through tasks that offer appropriate challenges, and social awareness is enhanced through collaboration.

Some Sources for High-Quality Tasks

Illustrative Mathematics (https://tasks.illustrativemathematics.org/content-standards)

Youcubed (https://www.youcubed.org/tasks/)

Illuminations (https://illuminations.nctm.org)

3 Act Math Tasks (https://tapintoteenminds.com/3act-math/)

Rich Math Tasks (https://us.corwin.com/landing-pages/rich-math-tasks)

Using Self-Efficacy Starters

As students tackle difficult problems, you can attend to the development of their self-efficacy through several concrete skill building activities so that they can build perseverance. The following two activities illustrate each approach, and by doing both activities with students, you are doing this work explicitly, in small doses, applied consistently over time. You are giving students opportunities to understand perseverance and act themselves into the belief that they are capable of doing mathematics.

Competency Builder 1.2

I Used to . . . But Now . . .

Begin by defining self-efficacy and persistence with your students (or reviewing the definition if it has already been introduced). Share that self-efficacy is believing you can do hard things, and persistence is continuing to do something even when it is hard. Ultimately, there are two parts, believing and doing, but not necessarily in that order. Explain that it is normal to think that something

(Continued)

(Continued)

might be hard, and to question your abilities, but you are constantly growing, and you will know more and be able to do more tomorrow than you can today if you make the effort to learn. Over time, that effort adds up to a lot of learning and something that seems "too hard" now will not be hard in the future.

Ask students to name something that seemed hard to learn that they can do now with ease. Look outside the mathematics classroom for examples, such as tying shoelaces, riding a bike, running a mile, or beating a certain level of a video game. Throughout the year, students reflect on their learning and growth and respond to the prompt, "I used to think . . ., but now I . . . ." For example, "I used to think subtraction was hard, but now I know how to think about addition to help me solve subtraction problems" or "I used to think solving two-step equations was hard, but now I know how to break them down into manageable steps and solve them with confidence."

Competency Builder 1.3

Reflecting on Quotes

Share a quote and ask students to think about what the quote means and then share with a partner. Ask them to think about how it relates to self-efficacy and persistence (believing you can do hard things and continuing to try) and discuss as a class. Finally, ask them to think about how this applies to learning math. Here are some quotes to get you started.

- You are off to great places, today is your day. Your mountain is waiting so get on your way. —Dr. Seuss
- It doesn't matter how slowly you go if you don't stop. —Confucius
- You must expect great things of yourself before you can do them. —Michael Jordan
- Hard days are the best because that's when champions are made. —Gabby Douglas
- There will be obstacles. There will be doubters. There will be mistakes. But with hard work . . . there are no limits. —Michael Phelps
- If plan A isn't working, I have plan B, plan C, and even plan D. —Serena Williams
- You have to be able to accept failure to get better. —LeBron James
- Do not go where the path may lead, go instead where there is no path and leave a trail. —Ralph Waldo Emerson

Seeing Mistakes as Opportunities to Learn

Encourage students to recognize and reflect on their mistakes, as this helps them see how much they've learned and builds perseverance through the "power of yet" (Dweck, 2006). This mindset transforms challenges into growth opportunities, encouraging students to keep trying and believe in their ability to succeed with effort.

Ask students,

- Are you really learning if you are doing something you already know how to do?
- How do you know when you are learning something new?
- Yes! It is hard! You will do it wrong many times before you get it right. That is why mistakes are so important to learning!
- You may not have the answer *yet*, but I know you will keep trying!

Mistakes also help us target specific areas to focus on and practice and identify challenges in the first step toward setting goals and learning new things.

Competency Builder 1.4

Learning From Mistakes

Have students engage in a reflection activity where they identify a mistake they made (personal or academic) and either explain or draw the mistake. Then, have them explain or draw what they learned from that mistake. Students can keep this in a journal or a log (Table 1.3).

Table 1.3 • *Mistakes That Become Learning Log*

Mistake	Lesson Learned

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Embed these strategies into problem-solving tasks that students encounter. Brief interventions that target students' mindset toward mistakes and their ability to learn new things have been shown to impact perseverance (Marshall, 2017).

Providing Constructive Feedback

Providing constructive feedback encourages students to persevere by acknowledging their efforts in tackling difficult problems and guiding them toward strategies that help them overcome obstacles. This improves their mathematics skills and social-emotional competencies. There has been a movement to provide better feedback, but what we are working on is getting students to respond appropriately to the feedback.

Competency Builder 1.5

Analyzing Constructive Feedback

To build self-efficacy and social awareness, create structured opportunities for students to be mindful of the feedback they receive and to respond constructively. Provide time, space, and a log (Table 1.4) for recording feedback and their emotional and behavioral responses. Encourage students to note physical sensations and emotions triggered by feedback and to observe if they react defensively or with curiosity. Reflecting on feedback helps students understand their reactions, especially if they have challenging experiences in subjects like math, and fosters clarity and openness to learning, showing growth over time.

Table 1.4 • *Student Log to Record Response to Feedback*

Feedback	How I Felt	How I Acted	Benefits

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Connecting to Children's Literature

Children's literature offers students an opportunity to exercise their problem-solving skills as they relate to characters in stories and engage with the challenges they face. Many children's books offer a mathematics context.

Competency Builder 1.6

Counting on Frank

Consider the book *Counting on Frank* by Rod Clements. It follows a dog named Frank and his imaginative owner as they present intriguing mathematical claims that involve counting, measuring, estimating, and calculating.

After reading aloud the book, ask students to share all the ways the boy in the story "uses his brain." He uses it to ask questions, create problems, collect information, make calculations, and draw conclusions. Next, have students discuss with a partner how using the mathematical practices of making sense of problems and persevering in solving them enabled the boy to build self-efficacy. Go back to the page where he calculates that 24 Franks could fit into his bedroom. Tell the students they will now use their brains to determine how many Franks could fit into the classroom. To make sense of and solve this problem, students will need to ask for more information. For example, "How big is Frank?" Frank weighs about 100 pounds and fits into a large dog crate. They will need to gather more information (e.g., the dimensions of a large dog crate and the dimensions of the classroom). Solutions will vary depending on how students interpret and approach the problem. As they share, encourage them to reflect on the process they used and what they might do differently next time.

Assessing Interpersonal and Intrapersonal Skills

Last, ask, **"How will I assess students' progress toward the mathematics goal of this lesson, their engagement in the mathematical practice standard, and their ability to use and continue to develop social-emotional competencies? How will I provide feedback? How will I build in an opportunity for students to reflect on the development of the social-emotional competencies?"**

Recall the attributes in Table 1.2 at the beginning of the chapter. When observing student discussions, look for evidence of students making sense of problems and persevering in solving them. Use a whole class or individual observation tool (Tables 1.5 and 1.6) to document their development in mathematics content knowledge, engagement in MP1, and intrapersonal skills. These same prompts can be given to students to help them reflect on their own learning.

- How did you demonstrate **perseverance** today? Provide an example.
- How did you practice **self-efficacy** in today's mathematics activities? Provide an example.
- Share two examples of your **social awareness**. Were these interactions positive or negative? How could you improve?

Encouraging self-reflection helps students connect mathematical practices with social-emotional skills, fostering better self-awareness, collaboration, and emotional regulation. Use Table 1.7 to support self-assessment of these skills.

Table 1.5 • *Whole Class Observation Tool*

Name	Mathematics Goal	Engagement in Practice Standard *Make sense of problems*	Engagement in Practice Standard *Persevere*	Intrapersonal Competency *Self-efficacy*	Interpersonal Competency *Communication skills*

Note: *Progress will be marked using 0–No evidence, 1–Little evidence, 2–Adequate evidence*

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Table 1.6 • *Individual Student Observation Tool*

Name of student:			
Mathematics Goal	**No Evidence**	**Some Evidence**	**Adequate Evidence**
Engagement in the Mathematical Practice	**No Evidence**	**Some Evidence**	**Adequate Evidence**
Sense-making			
Perseverance			
Social-Emotional Competencies	**No Evidence**	**Some Evidence**	**Adequate Evidence**
Self-efficacy			
Communication			

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Table 1.7 • *Self-Assessment Checklist*

Social-Emotional Competency	Not Sure	Not Yet	Getting There	Got It
Sense-making				
Perseverance				
Self-efficacy				
Communication				
Other skills used:				

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LOOKING AT EXEMPLARS IN ACTION

Now that the merging of content standards, mathematical practice standards, and social-emotional competencies has been explored, let's look more closely at an elementary and a secondary example, using the standards and competencies focused on in this chapter.

Ms. Patel and Their Kindergarten Class

Ms. Patel's kindergarten classroom is focused on the mathematics standard "represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations" (K.OA.A.1, CCSSM, 2010). As you read the vignette from this kindergarten classroom, identify how the teacher engages the students in MP1: Make sense of problems and persevere in solving them while helping them develop self-efficacy, perseverance, and social awareness. Think about ways you do this in your own classroom.

Ms. Patel gathered the kindergarten children on the carpet, the center of which contained a basket of colorful counters. Ms. Patel begins, "Today, we are going to learn different ways to add and subtract using these counters." As they hold up a red counter and a yellow counter, they ask, "Who can tell me what happens when we put these two counters together?"

Several children are excited to answer Ms. Patel's question. Miguel responds, "They make 2!"

"Yes Miguel!" Ms. Patel says with a smile. "Now let's see if we can find different ways to make 4 using our counters."

Ms. Patel asks two other students, Addison and Brennan, to demonstrate making 4.

Addison chooses 2 red counters and 2 yellow counters and places them in a row. "2 and 2 make 4!" Addison says excitedly.

Brennan places 1 red counter and 3 yellow counters on the carpet. "1 and 3 make 4 too!" she adds.

Ms. Patel then asks the students to work in pairs and explore making 4 with their own counters. Samantha and Miguel sit together, taking turns creating different combinations. Miguel says, "Look, we can make 4 this way too!" as he arranges the counters in a new pattern.

Ms. Patel walks about the room, kneeling to talk with each of the children as they work. They listen to their conversations, asking questions to guide their thinking. "Good job of finding 4. Now, can you show me *another* way to make 4?" they ask one group.

When students encounter challenges, Ms. Patel encourages them to persevere. "It's okay if you are stuck for a moment. I like how you keep trying different things, that's showing perseverance. Remember when we read the book, *The Little Engine That Could*?"

Ferdie enthusiastically says, "That was my favorite story!" Ms. Patel asks Ferdie why that one was his favorite. "The little engine kept trying and kept saying 'I think I can, I think I can, I think I can.' He kept trying to get over the mountain," replies Ferdie.

"That's right," says Ms. Patel. "Keep trying and believing you can solve it. Let me know if you'd like to think through it together," they say.

As a closing to the lesson, Ms. Patel gathers the children back on the carpet. "Today, we learned that there are many ways to add and subtract," they say. "You can use counters, your fingers, or even your imagination! Remember, it is important to make sense of problems and keep trying and believing in yourself, just like you did today." ●

Ms. Patel used hands-on activities with colored counters to support students' understanding of addition and subtraction. By asking questions like "what happens when . . ." they encouraged students to explore different methods and explain their thinking to each other, fostering both self-efficacy and interpersonal skills. As students encountered challenges, they reinforced perseverance by acknowledging their efforts and motivating them to keep

trying. Through structured activities and social interactions, students learned to collaborate, share ideas, and adjust to peers' perspectives, enhancing their social awareness. Ms. Patel's approach nurtured self-efficacy, perseverance, and social awareness in their students.

Mr. Nguyen and His Seventh-Grade Class

Mr. Nguyen is emphasizing the mathematics standard "solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale" (7.G.A.1, CCSSM, 2010). As you read the classroom vignette, identify how the teacher engages the students MP1: Make sense of problems and persevere in solving them while helping them develop self-efficacy, perseverance, social awareness, and adaptability. Think about ways you do this in your own classroom.

Mr. Nguyen is ready to introduce the seventh-grade lesson on scale drawings. He begins the lesson by discussing what scale drawings are and why they are used in real life. He asks the class where they have seen scale drawings. Renee says enthusiastically, "Maps!" Latisha responds, "And floor plans."

Mr. Nguyen projects onto the whiteboard a scale drawing of a local park in which 1 inch represents 50 feet and explains, "Today, we are going to solve problems involving scale drawings of geometric figures."

Mr. Nguyen calls on two students, Matthew and Amayah. He points to the distance on the scale drawing and asks, "According to the scale, how long is this pathway in the actual park?" Matthew and Amayah look at the scale carefully, then calculate the actual length using the scale factor. "It's 250 feet long," Amayah says.

Next, Mr. Nguyen provides students with a floor plan and asks that pairs of students choose a specific feature (e.g., length of a room, width of the hallway, etc.) and calculate its actual length using the scale.

Mr. Nguyen circulates around the room, listening to the students' conversations. He hears that some students are struggling to understand the concept of

scale and how to apply it. He sits down with the students and asks, "Can you explain to me how you are using scale factor to find this length?"

The students look confused, so Mr. Nguyen encourages them to persevere. "It is okay to find it challenging, and yet, I like how you keep working to solve the problem. That's showing perseverance. Let's break it down step-by-step," he assures them.

When Mr. Nguyen is confident that students are comfortable with using the scale factor to find the actual length, he moves on. He explains to the students that they will now practice reproducing a scale drawing at a different scale. He provides the class with a new scale factor and rulers and asks students to recreate the drawing using the new scale factor. He encourages the students to use rulers and to be precise in their measurements.

Some students immediately start measuring and drawing, while others hesitate. Sitting with one group, he asks, "Could you explain how you're using the scale factor to redraw the floor plan?"

With some guidance, the students begin to understand. They erased their initial attempts and started again, this time applying the scale factor correctly. "Look, now it's beginning to look like the original drawing!" exclaims Sarah.

As the class ends, Mr. Nguyen calls the students back together. He asks some students to share their solutions and strategies with the class.

Valerie says, "I looked at the scale, which is 1 inch equals 4 feet. Then, I measured the length of the bedroom on the floor plan. It was 3 inches, so I know that the length of the bedroom is 12 feet."

Heather replies, "I changed the scale factor to 1 inch equals 6 feet, so that meant I needed to draw the bedroom length 2 inches long."

Mr. Nguyen then asks his students to talk about any challenges they faced and how they overcame them. Amayah says, "My group had trouble with the

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scale factor and understanding how to draw the floor plan. So, we looked at the original park drawing first. We saw that 1 inch was equal to 50 feet and multiplied to find that 5 inches would be 250 feet."

Mr. Nguyen concludes the lesson saying, "Today, we learned how to solve problems involving scale drawings. Remember, it is important to make sense of the problem and persevere in finding a solution, just like we did today." ●

Mr. Nguyen introduced scale drawings through real-life examples like maps and floor plans, allowing students to calculate actual lengths and recreate drawings at different scales. This hands-on approach engaged students in problem-solving as they computed and reproduced scale drawings. Mr. Nguyen fostered self-efficacy by encouraging students to believe in their ability to apply the concept and persevere as they tackled challenges with the scale factor. By working in pairs, students practiced social awareness, adjusting their approaches and sharing strategies. This vignette highlights the importance of integrating self-efficacy, perseverance, and social awareness into mathematics lessons.

Reflection

To further enrich and reinforce the lesson, incorporate reflection to deepen learning. Reflective practice is crucial for the effectiveness of any lesson, as it aids in the growth and enhancement of both the teacher and the learner. It involves the teacher and students evaluating the lesson's effectiveness and identifying areas for future improvement. This practice naturally fosters self-awareness and the synthesis of learning, engaging in higher-order thinking skills.

When reviewing the lesson, it's important to assess students' grasp of their mathematics competencies and understanding of intrapersonal and interpersonal skills. Engaging in a class discussion can be highly beneficial. There's always room for improvement, and we hope to identify and discuss positive aspects while also considering ways to enhance the learning experience.

SUMMARY

In this chapter, we examined how we can leverage MP1 and draw on the social-emotional competencies of **self-efficacy**, **perseverance**, and

social awareness to enhance classroom lessons. MP1 emphasizes making sense of problems and persevering in them. In both classroom narratives, the teachers deliberately plan and prepare to integrate content standards, practice standards, and intrapersonal and interpersonal learning competencies. They make thoughtful and purposeful pedagogical choices, employing a variety of instructional tools and methods. They highlight the integration and value of intrapersonal and interpersonal skills in their preparation. They also identify and create suitable opportunities to support student interaction, making these approaches explicit for students.

The practice of "naming and framing" intrapersonal and interpersonal skills significantly emphasizes their interplay and importance. When consistently integrated into mathematics lessons, this approach becomes a natural part of the learning process, reinforcing concepts and encouraging personal and social reflection without adding burden to the teacher or the student. Some students may have fears or beliefs about their mathematics abilities. By highlighting other skills, such as communication, adaptability, and perseverance, within the lesson, you can support students who may not feel as confident in mathematics by showing them they can use these skills to become resilient and successful.

Questions to Think About

1. How can you, as a teacher of mathematics, integrate social-emotional competencies into your lesson planning and classroom routines to support students in making sense of problems and persevering in solving them?
2. Consider a specific mathematics lesson that incorporates MP1. Which intrapersonal or interpersonal skill would most enhance the lesson?
3. How do you ensure active integration of MP1 and social-emotional competencies into your mathematics lessons?
4. Reflect on a recent mathematics lesson you taught. How could you have integrated self-efficacy, perseverance, and social awareness during the preparation and planning to positively impact your teaching and student learning?
5. What are other intrapersonal and interpersonal skills you could incorporate in this mathematics practice? What are other ways we can naturally amplify social-emotional competencies within the lesson?

Actions to Take

1. Be intentional about reflecting with your students about the skills they developed throughout the lesson. Pose the following questions to guide the discussion:
   - What mathematics skills did we develop today?
   - What other skills did you/we use to practice or learn this concept?
   - What is the value of learning this concept individually/together?
   - What social-emotional competencies did you apply in this lesson to strengthen students' understanding?
2. Reflect on how you implemented MP1 in the classroom.
   - What strategies did students use?
   - What challenges did students face?
   - How did students persevere through those challenges?
3. Discuss with your colleagues how you merge content, practices, and social-emotional competencies in your mathematics classroom, specifically related to MP1.