

CHAPTER 1

SURVEYING YOUR SITE

Knowing Your Students

My students are incredibly diverse in ethnicity, culture, learning needs, and prior experiences. I find that while they are very diverse, they share an innate curiosity about learning. They may not always want to show this to me, but I have my ways of capitalizing on their inquisitive nature! First, I provide a safe space for them to ask questions and explore their ideas. Second, they really, really like to talk. I prefer that they talk about math, so I must give them many opportunities to talk to each other about the math they are learning. I have found that if I use a “thought-provoking” question, image, or task that connects to them or their interests, I can ignite this curiosity. When I am designing these provocations, I think about them—their developmental needs, interests, and even quirks. Just last week, I was looking at the standard for converting measurements and thought about how I could get them interested—worksheets on conversions were not going to do it for them! I know that they need to see why and how this is important to them and that they need to see, feel, and touch the math as much as possible. I decided to set up stations with different types of volume, length, and area measures. As soon as they walked in the room, they started asking questions:

“What are we doing, Ms. Weyforth?”

“Oooh, there is different stuff at each station. Can we do them all?”

“Is this about measurement?”

“When can we start?”

“Can I start with the measuring cups? I love to help my grandmother cook!”

I looked around the room to see hands busily measuring and comparing while diverse voices created a pleasant buzz of discourse. “This is gold,” I thought.

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How would you describe your students? Every classroom is distinctive. The students you teach are uniquely yours, and they enter your classroom with a vast array of learning needs, interests, hopes, and even dreams about how they will spend their time with you. The focus of this chapter is to encourage you to think about the many needs of your learners and connect it to your preparation for planning. We will explore the following questions:

- Why is it so important to know your students?
- What do access and equity really mean?
- How do identity and agency influence lesson planning?
- What is prior knowledge in mathematics?
- What do culturally and linguistically diverse students need?
- What do students living in poverty need?
- What are learning needs?
- What are the common themes?

WHY IS IT SO IMPORTANT TO KNOW YOUR STUDENTS?

As a teacher, you surely appreciate the value of knowing the learners in your classroom because you recognize how this intricately connects your teaching to your students' learning. Consider a time when you looked at a lesson plan constructed by someone else and thought, "This will never work with my kids." You know your students, and you were able to imagine how they would respond to the particular activities, content, or facilitation in the lesson plan.

As Bransford, Brown, and Cocking (2000) note, your knowledge of students is critical because students "come to formal education with a range of prior knowledge, skills, beliefs, and concepts that significantly influence what they notice about the environment and how they organize and interpret it. This, in turn, affects their abilities to remember, reason, solve problems, and acquire new knowledge" (p. 10). While it is vitally important to understand the mathematics content you teach, it is equally important to know and understand everything you can about the students you teach.

The students in your classroom have unique backgrounds that influence the ways in which they respond to you. At the same time, the ways you respond to your students may be influenced by your own cultural and language preferences and beliefs. All this information can help you plan lessons and design learning activities that both capitalize on students' cognitive, behavioral, and social-emotional strengths and **scaffold** their learning challenges.

As you work your way through this book, you will be constructing a mathematics lesson on the topic of your choice for your grade level and content area. While this book is about lesson planning, it is essential for you to begin the lesson-planning process with a focus on your own learners' needs. As you read the brief discussion about different learning needs, consider how the descriptions apply to your own group of students.



Think about a situation when knowing about a student's needs in your class helped you plan an instructional activity that supported mathematical learning. Briefly describe the details here.

WHAT IS PRIOR KNOWLEDGE IN MATHEMATICS?

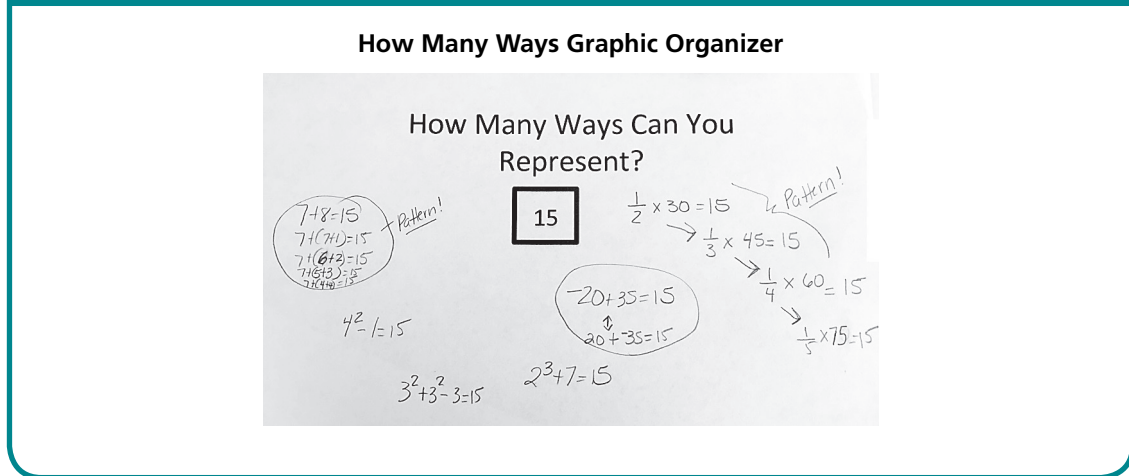
As a teacher of middle school students, you know firsthand that students walk into your classroom with a wide array of backgrounds and experiences. **Prior knowledge** refers to the mathematics knowledge or content that students know as they enter your classroom. If you do not help students engage their prior knowledge, they may not be able to integrate new knowledge meaningfully. Accessing and connecting prior knowledge to new learning can affect students' motivation to learn and how much they will learn (Dolezal, Welsh, Pressley, & Vincent, 2003).

How students experience mathematics at home is one influence on their mathematics learning in the classroom. For example, if your students talk with their parents about mathematics and shop with their parents at the grocery store, you can connect these experiences to your instructional activities. If students do not regularly have access to these kinds of opportunities, you will need to create instructional activities that help your students construct foundational knowledge for standards you will be teaching in the future. One way you can do this is by integrating number routines into your overall instructional plan.

Example: Amelia

Amelia, a sixth-grade teacher, conducts a **number routine** at least twice a week. These number routines help students think about numbers and computation in flexible ways, provide an entry point for every student, and offer Amelia opportunities to use students' ideas to facilitate mathematical discussions. At the beginning of the year, she asks students to represent numbers in multiple ways using multiple representations and operations (Figure 1.1).

Figure 1.1



Amelia organizes the students to work with a partner to encourage inquiry and flexibility in thinking about number and operations. This simple number routine prompts students to demonstrate their understanding of numbers and operations and provides Amelia with information about how students make connections and apply the mathematics they have already learned. While all students may not need more opportunities to develop foundational knowledge before moving to grade-level lessons, Amelia knows that all students will benefit from the exploration and conversation that this number routine elicits.

Amelia also uses a rotating bulletin board display to ensure that every student has work represented in the classroom and highlight student strategies for particular lessons that she is going to teach. For example, when she introduced the ratio and proportion unit, she took pictures of the students' models for ratio stories and asked the students to discuss what all the representations had in common.



What do you know about your students' prior knowledge? Make a list and share it with another teacher who knows your students.

WHAT DO ACCESS AND EQUITY REALLY MEAN?

Knowing your students is the first step in providing equitable learning opportunities and **access to high-quality mathematics instruction**. The National Council of Teachers of Mathematics' (2014a) Access and Equity Position Statement states the following:

Creating, supporting, and sustaining a culture of access and equity require being responsive to students' backgrounds, experiences, cultural perspectives, traditions, and knowledge when designing and implementing a mathematics program and assessing its effectiveness. Acknowledging and addressing factors that contribute to differential outcomes among groups of students are critical to ensuring that all students routinely have opportunities to experience high-quality mathematics instruction, learn challenging mathematics content, and receive the support necessary to be successful. Addressing equity and access includes both ensuring that all students attain mathematics proficiency and increasing the numbers of students from all racial, ethnic, linguistic, gender, and socioeconomic groups who attain the highest levels of mathematics achievement. (www.nctm.org/Standards-and-Positions/Position-Statements/Access-and-Equity-in-Mathematics-Education)

Without equal access, students' opportunities to learn are reduced. Students' knowledge gaps are often the result of instructional gaps, which happen when students are not appropriately challenged because beliefs about what they learn and how they can learn are reflected in the types of instruction they receive. Equitable instruction is a key factor in supporting students' opportunities for access to high-quality mathematics instruction. Knowledge of your students should inform and support high expectations and beliefs about what your students can learn and do in your mathematics classroom. Later in this book, you will have an opportunity to apply what you know about your students to your own lesson-planning process.



How do you ensure that *all* your students have access to high-quality mathematics instruction? Record your response here.

HOW DO IDENTITY AND AGENCY INFLUENCE LESSON PLANNING?

Identity and **agency** are two concepts that help teachers understand the dynamics that take place in a classroom, which, in turn, helps teachers better understand their students and how best to meet their needs. Identity is how individuals know and see themselves (i.e., student, teacher, good at sports, like math, etc.) and how others know and see us (i.e., short, smart, African American, etc.). When defined broadly, identity is a concept that brings together all the interrelated elements that teachers and students bring to the classroom, including beliefs, attitudes, emotions, and cognitive capacity (Grootenboer, 2000).

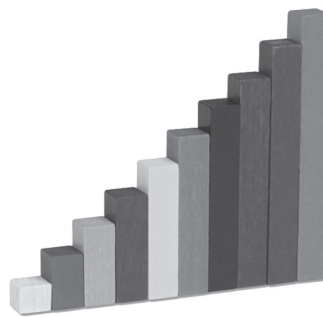
Agency is the power to act. Students develop their agency when they actively engage in the learning process (Wenmoth, 2014). Since student learning is greatest in classrooms where students are engaged in high-level thinking and reasoning (Boaler & Staples, 2008), teachers need to ensure that tasks they choose promote this engagement on a regular basis.

The types of lessons teachers design, the approach they take to teaching, the tasks they select, the types of questions they ask, the classroom climate, and social norms of the classroom all affect student engagement and are influenced by the teachers' identity. For example, in a classroom where the teacher sees his or her identity as the giver of knowledge, students are passive recipients of knowledge, working individually at their desks on assignments designed by the teacher. In this approach, there is no opportunity for students to exercise agency. In addition, student identities are lost as they are treated as a group with all the same learning needs rather than as individuals with unique learning needs.

If teachers think about teaching and learning as social activities (Vygotsky, 1964, 1978), then they must take the initiative to put structures into place in the classroom that support the social nature of learning. These include creating a classroom climate in which students feel safe to test hypotheses and ask questions. In this environment, teachers present tasks that afford students the opportunity to act, to explore, to move, and to exercise some choice. They set social norms in the classroom that encourage students to work together on challenging tasks and engage in productive struggle. They not only encourage student-to-student discourse but also intentionally plan for it. Students hypothesize, listen to one another, critique ideas, and formulate questions. They exercise their agency. In this student-centered approach, students become “authors” of mathematical ideas and texts and not “overhearers” (Larson, 2002).

Let’s look at an example in which students from racial groups often challenged to find voice and agency in classrooms were engaged in a task that allowed them to exercise their agency. Arthur Powell (2004), a researcher from Rutgers University, captured African American and Latinx students exercising their agency during a study under a grant from the National Science Foundation (REC-0309062). In this study, Powell describes how students who had never before used Cuisenaire Rods were given a set to help them investigate fractions. Cuisenaire Rods are proportional rods of ten different colors, with each color corresponding to a different length, as pictured in Figure 1.2.

Figure 1.2



Powell (2004) describes,

Students were invited to work on the question, “If the blue rod is 1, what is yellow?” Many students manipulated the rods to observe how many white rods they needed to place end-to-end to construct a length equivalent to the blue rod. Malika lists how many white rods make up each of the other rods. She calls the yellow rod 5, and later she and Lorrin say that yellow is five-ninths. Building a model of a blue rod alongside a train of one yellow and four white rods, with a purple rod beneath the white rods, Lorrin and Malika show that the purple rod is four ninths. The students at their table determine number names for all the rods, except that they are uncertain about what to call the orange rod. Eventually, this group of students resolves what number name to give to the orange rod. One student remarks that ten-ninths is an improper fraction. A male colleague [student] ... says assertively, “It’s still ten-ninths. That ain’t gonna change it because it’s an improper fraction. That makes it even more right.” (p. 46)

In this example, the teacher did not overtly give students a set procedure to follow to work out the name for the yellow rod. The teacher did, however, establish the social norms of the classroom so that students knew what was expected of them. Malika manipulated the materials to name all of the rods. Student-to-student discussion provided the opportunity to use reasoning to name the orange rod, a question that was not asked by the investigator. Students were posing their own questions at this point in the investigation. Powell reports that the students held a misconception about fractions when the investigation began—the numerator cannot be larger than the denominator—but, through their own exploration, had convinced themselves by the end of the session that the belief was incorrect. The students had agency in this example because of the task they engaged in and the social norms in place to help them. The teacher expected students to move around, manipulate objects, engage in the task by talking with one another, and challenge each other’s ideas.

In this book, you will read more about tasks, misconceptions, and discourse to support students in exercising their agency.

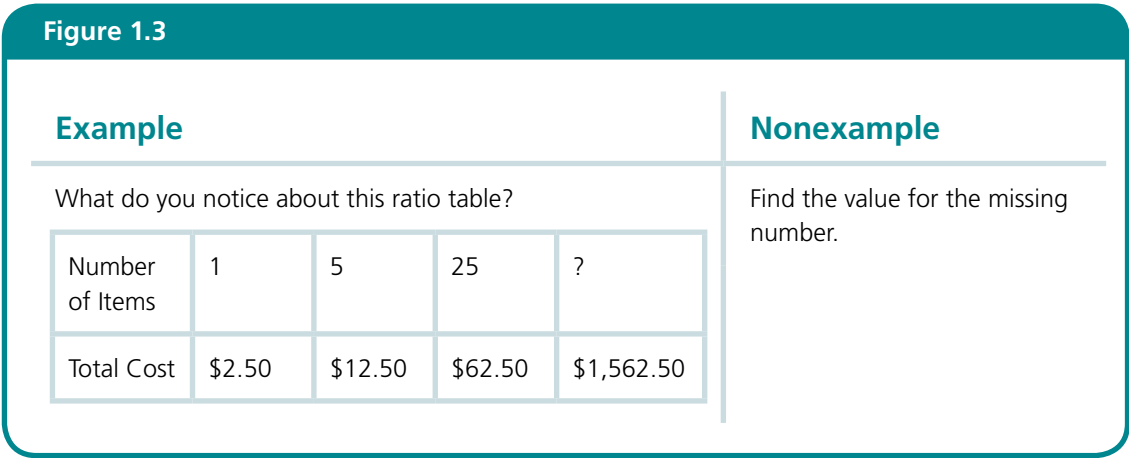
WHAT DO CULTURALLY AND LINGUISTICALLY DIVERSE STUDENTS NEED?

If you are lucky enough to teach culturally and linguistically diverse students, then you know of the rich experiences these students bring to your classroom. An **English Language Learner (ELL)** is defined as “an active learner of the English language who may benefit from various types of language support programs” (National Council of Teachers of English, 2008, p. 2). While these students may share some common needs because they are learning English and mathematics as well as other subjects, they also can, and often do, have very different learning needs. You can gather information about these students by asking them to show you what they know, observing them as they interact with other students, speaking to them often, using visual cues to communicate, and encouraging them to draw representations. The National Council of Supervisors of Mathematics’ (2009) position paper, titled “Improving Student Achievement in Mathematics by Addressing the Needs of English Language Learners,” recommends that mathematics educators do the following:

- Realize that mathematics is neither value free nor culture free but instead is a product of human activity. Thus, race, class, culture, and language play key roles in its teaching and learning.
- Understand that language is not only a tool for communicating but also a tool for thinking. Every mathematics teacher is a language teacher—particularly the **academic language** used to formulate and communicate mathematics learning (Lager, 2006).
- Realize that regular and active classroom participation—in the form of discussing, explaining, writing, and presenting—is crucial to ELLs’ success in mathematics and that ELLs can produce explanations, participate in presentations, and engage in discussions as they are learning English.
- Recognize that ELLs, like English-speaking students, require consistent access to high-cognitive-demand tasks in mathematics.
- Learn to see the evidence of ELLs’ mathematical thinking, hear how ELLs use language to communicate about mathematics, understand the competence that ELLs bring, build on this competence, and provide access to opportunities for advancing their learning.
- Value the home language of each ELL student and find ways to promote its use whenever possible.
- Provide and participate in ongoing professional development to help mathematics teachers shape instructional practices to foster success of ELLs in mathematics, including the development of language-rich classrooms for the benefit of all students.
- Establish district- and schoolwide structures that promote collaboration among teachers of mathematics, specialists in English as a second language, bilingual teachers, and language arts teachers to meld skills and knowledge in the service of ELLs’ learning of mathematics.

Culturally and linguistically diverse students also benefit from particular strategies that invite them to regularly engage in mathematical discourse (Banse, Palacios, Merritt, & Rimm-Kaufman, 2016). This discourse is critical because the ELL students need to have opportunities to talk as well as to listen. Banse et al. (2016) recommend that ELL teachers should proceed as follows:

1. Ask **open-ended** questions that invite student thinking and explanation and support students’ development of conceptual understanding (Figure 1.3).



2. As needed, follow open-ended questions with **close-ended questions** that are scaffolded to help the ELLs focus on one or two options (Figure 1.4).

Figure 1.4

Example

Make a prediction and then fold these two nets to find out if they form a cube.

Nonexample

Fold this net to see how it makes a cube.

3. Scaffold students' responses by repeating, extending, and rephrasing so ELLs can benefit from having additional conversations about their explanations and solutions, which can be extended by peers and/or the teacher (Figure 1.5).

Figure 1.5

Example

You looked at the scatterplot of dog breed heights and weights to see if you could find relationships between the data. You noticed that as the height of the dog increased, the weight also increased. I noticed that you kept tracing your pencil on the line you drew. This is called the best-fit line (pointing to the data).

Nonexample

Let me show you how to find the best-fit line.

4. Model mathematical vocabulary in context, always using correct vocabulary and applying it in context so that ELLs can make connections about meaning (Figure 1.6).

Figure 1.6

Example

The absolute value is the distance from 0.

Nonexample

The absolute value is a positive version of the number presented.

5. Strive to include ELLs in mathematical discourse each day; ideally, both teachers and students should engage in mathematical discourse with ELL students (Figure 1.7).

Figure 1.7

Example	Nonexample
ELL students and non-ELL students work in pairs and participate in flexible grouping.	ELL students are isolated in their own group.



Review the five recommendations for teachers of ELL students. Which ones do you already use in your planning? Which ones would you like to integrate more? How might you do that? Briefly list the details here.

WHAT DO STUDENTS LIVING IN POVERTY NEED?

About 21% of the children living in the United States live below the poverty threshold. Another 22% live in low-income homes, comprising 43%, or 30.6 million, of all the children in the United States (National Center for Children in Poverty, 2017). Given this statistic, it is quite likely that you are teaching at least one child living in poverty.

While it is important to not overgeneralize or make assumptions about children living in poverty, research suggests that some children in this situation may experience prolonged stress that may influence the ways in which they respond to the classroom environment and that may negatively affect school performance (Harvard Center for the Developing Child, 2007). Students may have difficulty concentrating or attending to tasks (Erickson, Drevets, & Schulkin, 2003), reduced ability to navigate in social situations (National Institute of Child Health and Human Development Early Child Care Research Network, 2005), and impaired memory, critical thinking, and creativity (Farah et al., 2006; Lupien, King, Meaney, & McEwen, 2001). While many strategies can support your students who are living in poverty, the following three strategies may support your instructional decision making about lesson planning.

1. **Build upon the students' strengths.** Students in poverty need educators to recognize the strengths that they bring to school. Ensure that you are focusing on and building students' specific strengths by first determining those strengths and then highlighting them during lessons.
2. **Consistently work toward building relationships with your students.** Intentionally pursue relationships with your students. Ensure that you use their names in positive ways, and provide opportunities for students to build relationships with each other. Consider using the students' names and interests in word problems and contexts for lessons.
3. **Seek to understand your students' responses to stressful situations.** Consider why students might be responding to classroom situations in particular ways by observing and noting potential triggers. As you plan your lessons, partner students to increase access to problems. Think about how your problem contexts might engage or alienate students who are living in poverty. For example, problems that focus on acquisition or buying items may create unintentional consequences.

Example: Timmy

Raymond, an eighth-grade teacher, used all three of these strategies to attend to one of his eighth grader's needs. He had noticed that Timmy usually entered the classroom in the morning very agitated and had trouble settling into the routine. The student had developed a pattern of entering the room, slamming his books down, and then engaging in conflict with another student. To counteract this pattern, Raymond decided to greet Timmy at the classroom door to have a positive conversation about how he was doing. Raymond enlisted Timmy's help by asking him to help take photographs for a lesson launch. After about a week of making this effort, Raymond noticed that Timmy was much calmer, focused, and ready to learn at the start of each day. He seemed to look forward to their daily chats and was often ready to tell him a story.



How do you use students' strengths to design instructional activities? Briefly note the details here.

WHAT ARE LEARNING NEEDS?

Every student you teach is distinct, possessing specific learning strengths and learning challenges. Students with explicit learning disabilities typically possess a significant learning challenge in one or more of the following areas: memory, self-regulation, visual processing, language processing (separate from ELL), academic skills, and motor skills. The Individuals With Disabilities Education Act (IDEA) requires public schools to provide the least restrictive environment to students with identified disabilities. Students' **Individualized Education Plan (IEP)** must reflect the individual needs of the students.

As you consider the learning needs of your students, you will need to study their IEPs carefully to determine how you can meet their needs in your instructional planning. You may want to develop learning profiles of your students' mathematics strengths and needs to inform your **instructional decision** making. You might complete a learning profile, along with a special educator or coteacher, for each student with the IEP accommodations at the beginning of the year and then add to it as you learn new information throughout the year.

Example: Rhonda

Figure 1.8 shows a completed learning profile that Aimee created after getting to know Rhonda, a student in her class. In the form, she noted Rhonda's strengths in self-regulating her behavior and her advanced critical thinking skills. After just one day, Aimee was beginning to gather some excellent evidence about Rhonda's strengths.

Figure 1.8

Learner Profile for Mathematics Teaching and Learning					
Name: Rhonda					
Memory and Retention	Self-Regulation	Visual Processing	Language Processing	Academic Skills	Motor Skills
Strengths	Strengths <i>Monitors behavior and expresses her needs with maturity</i>	Strengths	Strengths	Strengths <i>Demonstrates advanced critical thinking skills.</i>	Strengths
Challenges <i>Basic fact retention</i>	Challenges	Challenges	Challenges	Challenges	Challenges <i>Writing explanations</i>

IEP Accommodations:

Provide extra time to write problem-solving explanations.

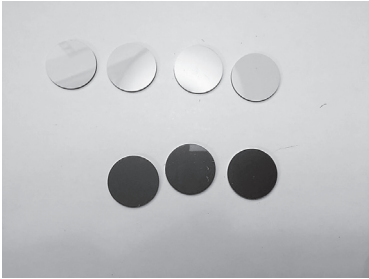
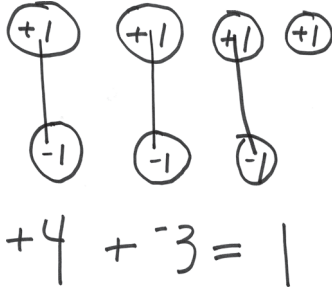
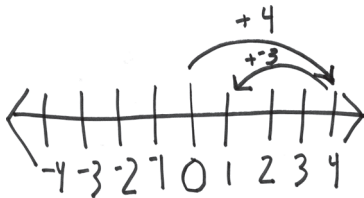
Extra time to complete assignments. Recorder for some assignments.



Download the Learner Profile from resources.corwin.com/mathlessonplanning/6-8

By providing students with opportunities to see and use multiple representations in learning activities, from concrete to abstract, you can support their mathematical understanding. This concrete-to-abstract sequence is described in two ways—Concrete-Representation-Abstract (CRA) and Concrete-Semi-Concrete-Abstract (CSA)—and it supports students with disabilities’ conceptual understanding (Sealand, Johnson, Lockwood, & Medina, 2012). This teaching sequence is very familiar to educators because it begins with concrete experiences using manipulatives, moves to a representational stage where students draw pictures and use visuals to show their thinking, and then provides opportunities for students to apply their learning using abstract symbols. As you make instructional decisions for your students with learning needs, you will want to consider giving ample time for students to use manipulatives (even in middle school!) before moving to the representation stage. They may also need opportunities to move back and forth between the stages of the CRA/CSA sequence to continue to build fluency (Van de Walle, Karp, & Bay-Williams, 2013). For instance, Figure 1.9 shows the concrete to abstract continuum for addition of negative numbers.

Figure 1.9

Concrete	Representation/ Semi-Abstract	Abstract
	 $+4 + -3 = 1$ 	$4 + -3 = 1$



How do you integrate your students' learning needs into your instructional planning? Briefly note the details here.

WHAT ARE THE UNIQUE NEEDS OF THE ADOLESCENT?

As a middle school teacher, you know that early adolescence is a special time between the elementary and middle school years when your students experience swift intellectual and social-emotional developmental changes. In fact, the middle school was founded on the idea that young adolescents' developmental needs should be at the forefront of the middle school educational experience. Middle school educators championed the opportunity to make decisions about curricular design, pedagogical strategies, and assessment practices (Eichhorn, 1966). The Association for Middle Level Education (AMLE, 2010) report, *This We Believe: Keys to Educating*

Adolescents, highlights four essential attributes that middle schools must have to best address the unique needs of adolescents:

Developmentally responsive—Using the distinctive nature of young adolescents as the foundation upon which all decisions about school organization, policies, curriculum, instruction, and assessment are made

Challenging—Ensuring that every student learns and every member of the learning community is held to high expectations

Empowering—Providing all students with the knowledge and skills they need to take responsibility for their lives, to address life's challenges, to function successfully at all levels of society, and to be creators of knowledge

Equitable—Advocating for and ensuring every student's right to learn and providing appropriately challenging and relevant learning opportunities for every student

In addition to the four essential attributes, the AMLE highlights five evidence-based practices of effective middle-level education:

- Educators value young adolescents and are prepared to teach them.
- Students and teachers are engaged in active, purposeful learning.
- Curriculum is challenging, exploratory, integrative, and relevant.
- Educators use multiple learning and teaching approaches.
- Varied and ongoing assessments advance learning as well as measure it.

The AMLE essential attributes, coupled with the evidence-based practices, emphasize the importance for teachers to understand the unique developmental needs of their students and plan for and facilitate instruction that incorporates and responds to those needs. As you most assuredly have noticed, middle school students' physical, intellectual, social, and emotional development is unique during this stage of their lives (Scales, 2010). These developmental characteristics interconnect with one another and can be influenced by race, ethnicity, gender, culture, environment, and family (Caskey & Anfara, 2014).

Physical Development: A quick visual survey of your own classroom may demonstrate the vast array of middle school physical development. In fact, early adolescents experience an accelerated period of physical growth, second only to the birth to two years old range! Contrary to the infant growth period, the adolescent development is fraught with extreme, rapid, and uneven development (Kellough & Kellough, 2008). Adolescents need to alternately move their bodies and rest, and they need many opportunities and structure to pace their ever-abounding energy!

Intellectual Development: As Alix described in the opening reflection, adolescents are innately curious, enjoy active learning experiences, and prefer social learning over passive learning activities (Kellough & Kellough, 2008). They are moving from concrete to more abstract thinking processes (Piaget, 1964), although their cognitive function varies wildly within the span of the middle school years. Your teaching practices and the students' learning opportunities strengthen connections in the brain, which heavily influences future learning (Wilson & Horch, 2002). In short, your decisions have long-lasting impact! They also enjoy humor, but sarcasm should be used with caution. They are keenly interested in authentic problems and need to see how academic exercises can be applied to their lives (Kellough & Kellough, 2008).

Social and Emotional Development: Once again, a simple trip through the halls of a middle school provides evidence of the adolescents' burgeoning social and emotional development. Peer influence is at the forefront of this development. Although the family is very important to the middle school student, adolescents have a strong desire to associate with their friends. They are often conflicted in their desire to be independent and develop a personal identity while at the same time adhere to the peer groups' social norms (Brighton, 2007). They want to belong and need many opportunities in the classroom to develop healthy and positive relationships with one another (Scales, 2010). You can design collaborative activities that focus on rich problem-solving experiences to support productive social and emotional development for your students.

WHAT ARE THE COMMON THEMES?

As you were reading this chapter, you may have thought that many of the suggested strategies could be applied to all of your learners. Instructional decision making begins with building relationships with students by getting to know them. This newfound knowledge helps you to create positive connections and build a learning community that fosters a rich learning environment. When you know your students, you can make the very best instructional decisions that will best meet their academic and social-emotional needs. Knowledge and awareness of your students' learning needs makes for purposeful lesson planning.



Consider all of the learning needs discussed in this chapter. Make a list of your own students' learning needs using the categories listed in this chapter. What do you notice? What will you need to keep in mind as you plan your lessons? Record your thoughts and concerns below.
