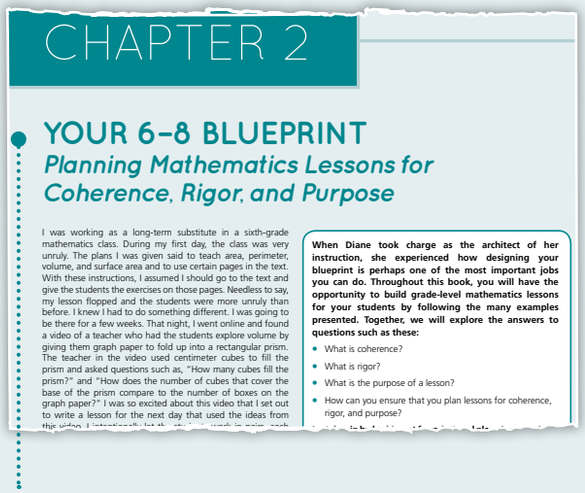
The Mathematics Lesson-Planning Handbook, Grades 6–8

at a Glance

A step-by-step guide to walk you through every facet of planning cohesive, standards-based mathematics lessons, including


CHAPTER 2

YOUR 6–8 BLUEPRINT

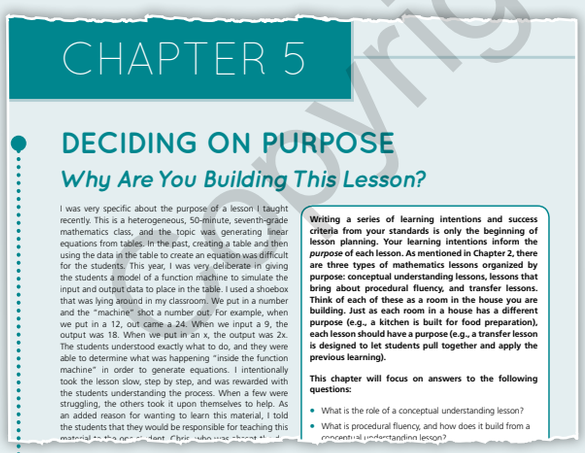
Planning Mathematics Lessons for Coherence, Rigor, and Purpose

I was working as a long-term substitute in a sixth-grade mathematics class. During my first day, the class was very unruly. The plans I was given said to teach area, perimeter, volume, and surface area and to use certain pages in the text. With these instructions, I assumed I should go to the text and give the students the exercises on those pages. Needless to say, my lesson flopped and the students were more unruly than before. I knew I had to do something different. I was going to be there for a few weeks. That night, I went online and found a video of a teacher who had the students explore volume by giving them graph paper to fold up into a rectangular prism. The teacher in the video used centimeter cubes to fill the prism and asked questions such as, "How many cubes fill the prism?" and "How does the number of cubes that cover the base of the prism compare to the number of boxes on the graph paper?" I was so excited about this video that I set out to write a lesson for the next day that used the ideas from this video. I [illegible]

When Diane took charge as the architect of her instruction, she experienced how designing your blueprint is perhaps one of the most important jobs you can do. Throughout this book, you will have the opportunity to build grade-level mathematics lessons for your students by following the many examples presented. Together, we will explore the answers to questions such as these:

- What is coherence?
- What is rigor?
- What is the purpose of a lesson?
- How can you ensure that you plan lessons for coherence, rigor, and purpose?

Using your curriculum to think about all of your lessons as a cohesive progression across units, throughout the year


CHAPTER 5

DECIDING ON PURPOSE

Why Are You Building This Lesson?

I was very specific about the purpose of a lesson I taught recently. This is a heterogeneous, 50-minute, seventh-grade mathematics class, and the topic was generating linear equations from tables. In the past, creating a table and then using the data in the table to create an equation was difficult for the students. This year, I was very deliberate in giving the students a model of a function machine to simulate the input and output data to place in the table. I used a shoebox that was lying around in my classroom. We put in a number and the "machine" shot a number out. For example, when we put in a 12, out came a 24. When we input a 9, the output was 18. When we put in an x, the output was 2x. The students understood exactly what to do, and they were able to determine what was happening "inside the function machine" in order to generate equations. I intentionally took the lesson slow, step by step, and was rewarded with the students understanding the process. When a few were struggling, the others took it upon themselves to help. As an added reason for wanting to learn this material, I told the students that they would be responsible for teaching this material to the next student. Chris, who was absent [illegible]

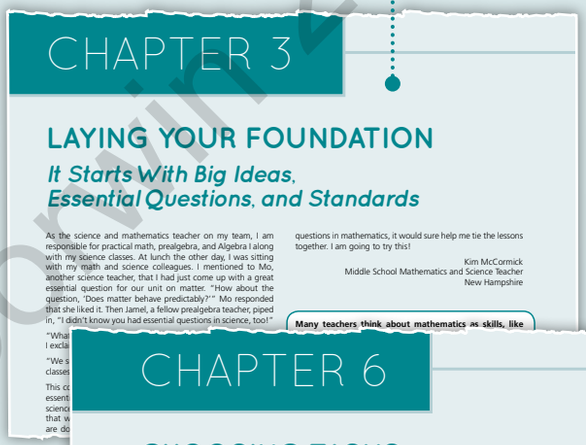
Writing a series of learning intentions and success criteria from your standards is only the beginning of lesson planning. Your learning intentions inform the *purpose* of each lesson. As mentioned in Chapter 2, there are three types of mathematics lessons organized by purpose: conceptual understanding lessons, lessons that bring about procedural fluency, and transfer lessons. Think of each of these as a room in the house you are building. Just as each room in a house has a different purpose (e.g., a kitchen is built for food preparation), each lesson should have a purpose (e.g., a transfer lesson is designed to let students pull together and apply the previous learning).

This chapter will focus on answers to the following questions:

- What is the role of a conceptual understanding lesson?
- What is procedural fluency, and how does it build from a conceptual understanding lesson?

Determining whether you're designing a lesson to focus on conceptual understanding, procedural fluency, or transfer of knowledge

Asking yourself essential questions about your standards-based learning intentions, lesson purpose, tasks, materials, lesson format, and how to anticipate and assess student thinking


CHAPTER 3

LAYING YOUR FOUNDATION

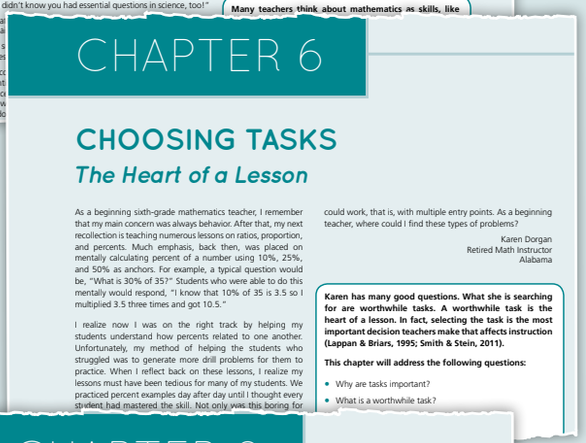
It Starts With Big Ideas, Essential Questions, and Standards

As the science and mathematics teacher on my team, I am responsible for practical math, prealgebra, and Algebra I along with my science classes. At lunch the other day, I was sitting with my math and science colleagues. I mentioned to Mo, another science teacher, that I had just come up with a great essential question for our unit on matter. "How about the question, 'Does matter behave predictably?'" Mo responded that she liked it. Then Jamel, a fellow prealgebra teacher, piped in, "I didn't know you had essential questions in science, too!" "What I excla "We s classe This c essent scienc that w are do

questions in mathematics, it would sure help me tie the lessons together. I am going to try this!

Kim McCormick
Middle School Mathematics and Science Teacher
New Hampshire

Many teachers think about mathematics as skills, like


CHAPTER 6

CHOOSING TASKS

The Heart of a Lesson

As a beginning sixth-grade mathematics teacher, I remember that my main concern was always behavior. After that, my next recollection is teaching numerous lessons on ratios, proportion, and percents. Much emphasis, back then, was placed on mentally calculating percent of a number using 10%, 25%, and 50% as anchors. For example, a typical question would be, "What is 30% of 35?" Students who were able to do this mentally would respond, "I know that 10% of 35 is 3.5 so I multiplied 3.5 three times and got 10.5."

I realize now I was on the right track by helping my students understand how percents related to one another. Unfortunately, my method of helping the students who struggled was to generate more drill problems for them to practice. When I reflect back on these lessons, I realize my lessons must have been tedious for many of my students. We practiced percent examples day after day until I thought every student had mastered the skill. Not only was this boring for

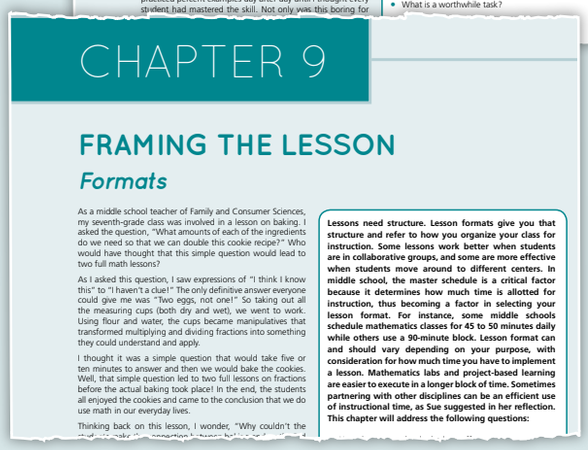
could work, that is, with multiple entry points. As a beginning teacher, where could I find these types of problems?

Karen Dorgan
Retired Math Instructor
Alabama

Karen has many good questions. What she is searching for are worthwhile tasks. A worthwhile task is the heart of a lesson. In fact, selecting the task is the most important decision teachers make that affects instruction (Lappan & Briars, 1995; Smith & Stein, 2011).

This chapter will address the following questions:

- Why are tasks important?
- What is a worthwhile task?


CHAPTER 9

FRAMING THE LESSON

Formats

As a middle school teacher of Family and Consumer Sciences, my seventh-grade class was involved in a lesson on baking. I asked the question, "What amounts of each of the ingredients do we need so that we can double this cookie recipe?" Who would have thought that this simple question would lead to two full math lessons?

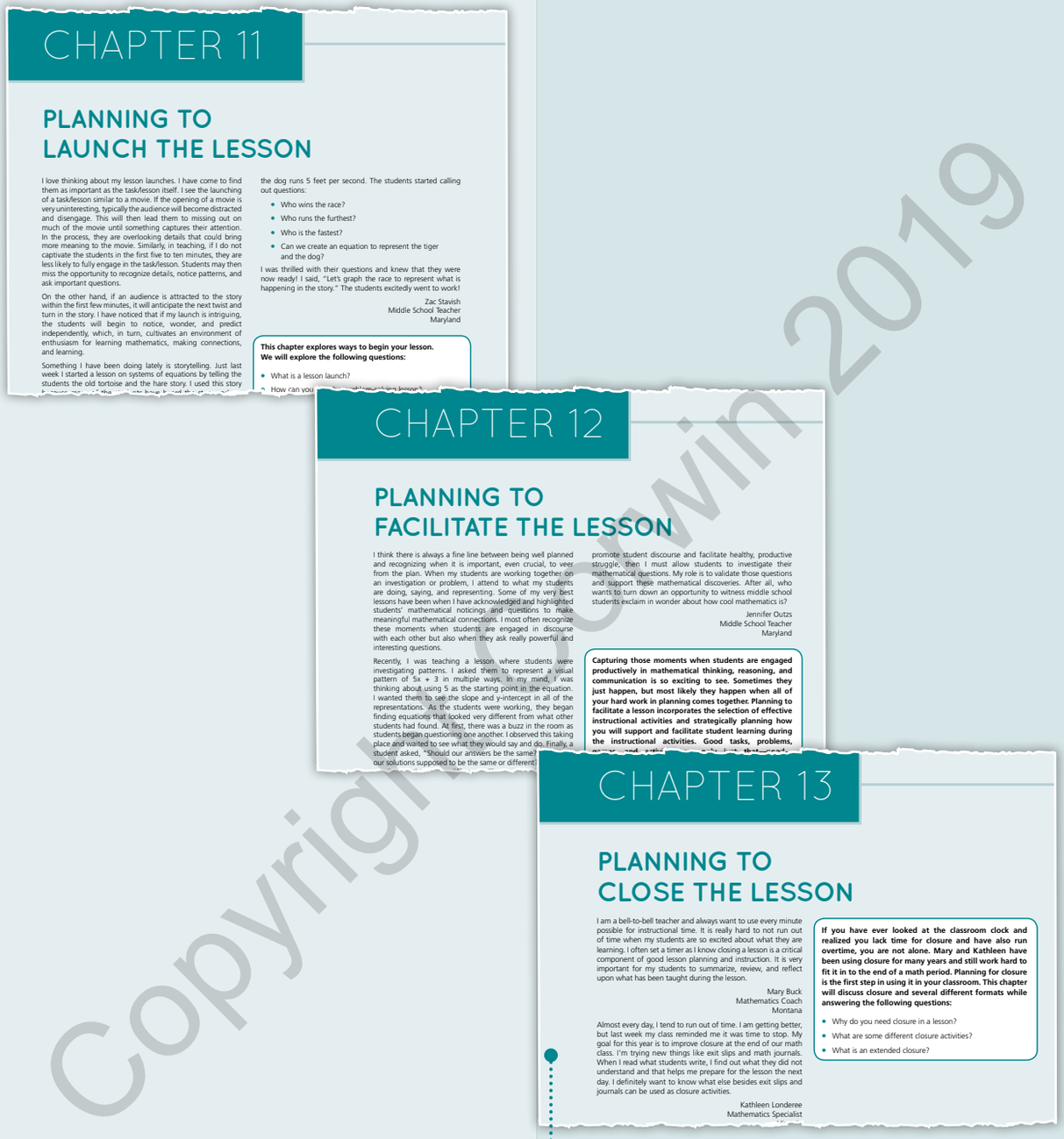
As I asked this question, I saw expressions of "I think I know this" to "I haven't a clue!" The only definitive answer everyone could give me was "Two eggs, not one!" So taking out all the measuring cups (both dry and wet), we went to work. Using flour and water, the cups became manipulatives that transformed multiplying and dividing fractions into something they could understand and apply.

I thought it was a simple question that would take five or ten minutes to answer and then we would bake the cookies. Well, that simple question led to two full lessons on fractions before the actual baking took place! In the end, the students all enjoyed the cookies and came to the conclusion that we do use math in our everyday lives.

Thinking back on this lesson, I wonder, "Why couldn't the [illegible]

Lessons need structure. Lesson formats give you that structure and refer to how you organize your class for instruction. Some lessons work better when students are in collaborative groups, and some are more effective when students move around to different centers. In middle school, the master schedule is a critical factor because it determines how much time is allotted for instruction, thus becoming a factor in selecting your lesson format. For instance, some middle schools schedule mathematics classes for 45 to 50 minutes daily while others use a 90-minute block. Lesson format can and should vary depending on your purpose, with consideration for how much time you have to implement a lesson. Mathematics labs and project-based learning are easier to execute in a longer block of time. Sometimes partnering with other disciplines can be an efficient use of instructional time, as Sue suggested in her reflection. This chapter will address the following questions:

Choosing how to launch, facilitate, and close your lesson



CHAPTER 11

PLANNING TO LAUNCH THE LESSON

I love thinking about my lesson launches. I have come to find them as important as the task/lesson itself. I see the launching of a task/lesson similar to a movie. If the opening of a movie is very uninteresting, typically the audience will become distracted and disengage. This will then lead them to missing out on much of the movie until something captures their attention. In the process, they are overlooking details that could bring more meaning to the movie. Similarly, in teaching, if I do not captivate the students in the first five to ten minutes, they are less likely to fully engage in the task/lesson. Students may then miss the opportunity to recognize details, notice patterns, and ask important questions.

On the other hand, if an audience is attracted to the story within the first few minutes, it will anticipate the next twist and turn in the story. I have noticed that if my launch is intriguing, the students will begin to notice, wonder, and predict independently, which, in turn, cultivates an environment of enthusiasm for learning mathematics, making connections, and learning.

Something I have been doing lately is storytelling. Just last week I started a lesson on systems of equations by telling the students the old tortoise and the hare story. I used this story

the dog runs 5 feet per second. The students started calling out questions:

- Who wins the race?
- Who runs the furthest?
- Who is the fastest?
- Can we create an equation to represent the tiger and the dog?

I was thrilled with their questions and knew that they were now ready! I said, "Let's graph the race to represent what is happening in the story." The students excitedly went to work!

Zac Stavish
Middle School Teacher
Maryland

This chapter explores ways to begin your lesson. We will explore the following questions:

- What is a lesson launch?
- How can you

CHAPTER 12

PLANNING TO FACILITATE THE LESSON

I think there is always a fine line between being well planned and recognizing when it is important, even crucial, to veer from the plan. When my students are working together on an investigation or problem, I attend to what my students are doing, saying, and representing. Some of my very best lessons have been when I have acknowledged and highlighted students' mathematical noticings and questions to make meaningful mathematical connections. I most often recognize these moments when students are engaged in discourse with each other but also when they ask really powerful and interesting questions.

Recently, I was teaching a lesson where students were investigating patterns. I asked them to represent a visual pattern of $5x + 3$ in multiple ways. In my mind, I was thinking about using 5 as the starting point in the equation. I wanted them to see the slope and y-intercept in all of the representations. As the students were working, they began finding equations that looked very different from what other students had found. At first, there was a buzz in the room as students began questioning one another. I observed this taking place and waited to see what they would say and do. Finally, a student asked, "Should our answers be the same? our solutions supposed to be the same or different?

promote student discourse and facilitate healthy, productive struggle, then I must allow students to investigate their mathematical questions. My role is to validate those questions and support these mathematical discoveries. After all, who wants to turn down an opportunity to witness middle school students exclaim in wonder about how cool mathematics is?

Jennifer Outzs
Middle School Teacher
Maryland

Capturing those moments when students are engaged productively in mathematical thinking, reasoning, and communication is so exciting to see. Sometimes they just happen, but most likely they happen when all of your hard work in planning comes together. Planning to facilitate a lesson incorporates the selection of effective instructional activities and strategically planning how you will support and facilitate student learning during the instructional activities. Good tasks, problems,

CHAPTER 13

PLANNING TO CLOSE THE LESSON

I am a bell-to-bell teacher and always want to use every minute possible for instructional time. It is really hard to not run out of time when my students are so excited about what they are learning. I often set a timer as I know closing a lesson is a critical component of good lesson planning and instruction. It is very important for my students to summarize, review, and reflect upon what has been taught during the lesson.

Mary Buck
Mathematics Coach
Montana

Almost every day, I tend to run out of time. I am getting better, but last week my class reminded me it was time to stop. My goal for this year is to improve closure at the end of our math class. I'm trying new things like exit slips and math journals. When I read what students write, I find out what they did not understand and that helps me prepare for the lesson the next day. I definitely want to know what else besides exit slips and journals can be used as closure activities.

Kathleen Londeree
Mathematics Specialist

If you have ever looked at the classroom clock and realized you lack time for closure and have also run overtime, you are not alone. Mary and Kathleen have been using closure for many years and still work hard to fit it in to the end of a math period. Planning for closure is the first step in using it in your classroom. This chapter will discuss closure and several different formats while answering the following questions:

- Why do you need closure in a lesson?
- What are some different closure activities?
- What is an extended closure?

Illustrative vignettes at the start of each chapter focus on a specific part of the lesson-planning process

In every chapter you will find

Figure 6.3 (*Continued*)

Characteristic	1 (Highest Rating)	2	3 (Lowest Rating)	Notes
Problem solving in nature				
Authentic/ interesting				
Equitable				
Active				
Connects to Standards for Mathematical Practice or Process Standards				

online resources Download the Determining a Worthwhile Task Rubric from resources.corwin.com/mathlessonplanning/6-8

Thinking about Jose and Carin and their tasks, rate the tasks using the checklist in Figure 6.3. Discuss your results with a colleague. Whose example is a worthwhile task and why? Note your thoughts below.

HOW DO YOU ADAPT TASKS?

You may have experienced a time when you encountered a textbook or school district task that did not match the multiple needs of your learners. Many teachers choose to adapt tasks to increase the cognitive demand (Smith & Stein, 2011) and to provide more entry points for students to reason mathematically. Here are a few examples.

Example: Michael

Michael, a sixth-grade teacher, found the task in Figure 6.4 in his textbook and adapted it to incorporate process standards.

Opportunities to stop and reflect on your own instruction

Examples of each lesson feature from classrooms in Grades 6–8

WHAT IS THE ROLE OF REPRESENTATIONS IN MATHEMATICS LESSONS?

The Annenberg Learner Foundation (2003) offers this definition:

> "Mathematical representation" refers to the wide variety of ways to capture an abstract mathematical concept or relationship. A mathematical representation may be visible, such as a number sentence, a display of manipulative materials, or a graph, but it may also be an internal way of seeing and thinking about a mathematical idea. Regardless of their form, representations can enhance students' communication, reasoning, and problem-solving abilities; help them make connections among ideas; and aid them in learning new concepts and procedures. (para. 2)

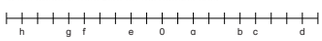
Mathematical concepts are abstract and can be difficult to get across to students. Representations of these concepts can be helpful. Representations can be thought of as a broad category of models. According to Van de Walle, Karp, and Bay-Williams (2016), there are seven ways to represent or model mathematical concepts:

1. Manipulatives
2. Pictures or drawings
3. Symbols
4. Language (written or spoken)
5. Real-world situations
6. Graphs
7. Tables

Selecting a representation is a vital part of your decision making while lesson planning. You must decide, "What representations will help me achieve the learning intentions of today's lesson?" Here is an example of a teacher using a representation to help students make sense of absolute value.

Example: Alfonso

Alfonso, a sixth-grade teacher, showed his students this number line to teach that **absolute value** is the distance from zero on the number line.



Alfonso asks his students to work with a partner to answer the following questions using the number line:

What is the opposite of a?

What is the opposite of f?

What is the opposite of h?

What is the opposite of c?

After the students share and discuss their responses, Alfonso asks this follow-up question: What do you notice about the relationship of your pairs of opposites to the number line? During the class discussion of this question, Alfonso guides his students to discover the concept that each number in a given pair of opposites is the same distance from zero on the number line. Once students have this understanding, Alfonso introduces the symbol | | for absolute value using the letters along with the vocabulary term *absolute value*. For example, he shows that |a| = 2 and |e| = 2. He then replaces the letters on the number line with integers and encourages the students to use the absolute value symbol with the integers such as |–6| = 6, |9| = 9, |5| = 5.

In this example, Alfonso used a number line with letters as a representation for students to discover the concept of absolute value.

Building Unit Coherence

Connecting lesson purposes across a unit develops coherence because you are strategically linking conceptual understanding, procedural fluency, and transfer lessons to build comprehensive understanding of the unit standards. As you develop a lesson, consider the purposes of the lessons that come before and after the lesson you are constructing. Over the course of one unit, you should develop and facilitate lessons with all three purposes, bearing in mind how and when the lesson purposes should be positioned within the unit. Some teachers map out their unit with lesson purposes in mind to ensure that they are developing coherence within lesson purpose (Figure 5.8).

How features of a lesson are interrelated to build cohesiveness across a unit

Figure 5.8

Unit:

Day 1	Day 2	Day 3	Day 4	Day 5
Conceptual	Conceptual	Conceptual	Procedural fluency	Procedural fluency
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
Conceptual	Conceptual	Conceptual	Procedural fluency	Transfer

Now that you have been introduced to the three lesson purposes, reflect on the lessons in your curriculum guide, textbook, or supplemental materials. Can you categorize the lessons into these three categories? Do you notice one type being more prevalent than the others? Note any thoughts or concerns here.

Appendix D

Glossary

absolute value. Distance a number is from zero on the number line.

academic language. The vocabulary used in schools, textbooks, and other school resources.

access to high-quality mathematics instruction. Phrase refers to the National Council of Teachers of Mathematics (NCTM) position statement on equal opportunity to a quality K–12 education for all students. Related to the NCTM position on equitable learning opportunities.

agency. The power to act. Students exercise agency in mathematics when they initiate discussions and actively engage in high-level thinking tasks. When students exercise agency, they reason, critique the reasoning of others, and engage in productive struggle.

algorithm. In mathematics, it is a series of steps or procedures that, when followed accurately, will produce a correct answer.

allocated time. Total amount of time for teacher instruction and student learning.

big ideas. Statements that encompass main concepts in mathematics that cross grade levels, such as place value.

classroom discourse. Conversation that occurs in a classroom. Can be teacher to student(s), student(s) to teacher, or student(s) to student(s).

close-ended questions. Questions with only one correct answer.

closure. The final activity in a lesson with two purposes (1) helps the teacher determine what students have learned and gives direction to next steps and (2) provides students the opportunity to reorganize and summarize the information from a lesson in a meaningful way.

coherence. Logical sequencing of mathematical ideas. Can be vertical, as in across the grades (e.g., 6–8), or can be horizontal, as in across a grade level (e.g., sixth-grade lessons from September through December).

common errors. Mistakes made by students that occur frequently; usually these mistakes are anticipated by the teacher due to their frequency.

conceptual understanding. Comprehension of mathematical concepts, operations, and relationships.

content standards. See ***standards.***

discourse. See ***classroom discourse.***

distributed practice. See ***spaced practice.***

district-wide curriculum. A K–12 document outlining the curriculum for a school system.

drill. Repetitive exercises on a specific math skill or procedure.

English Language Learner (ELL). A person whose first language is not English but who is learning to speak English.

essential question. A question that unifies all of the lessons on a given topic to bring the coherence and purpose to a unit. purposefully linked to the big idea to frame student inquiry, promote critical thinking, and assist in

t the end of a lesson or group of lessons that provides a sampling of student performance. An exit task is ***exit slip.***

orm of lesson closure where students answer a question about or reflect on the main idea of the lesson hers collect these slips of paper.

Bolded key terms that are defined in a glossary in Appendix D

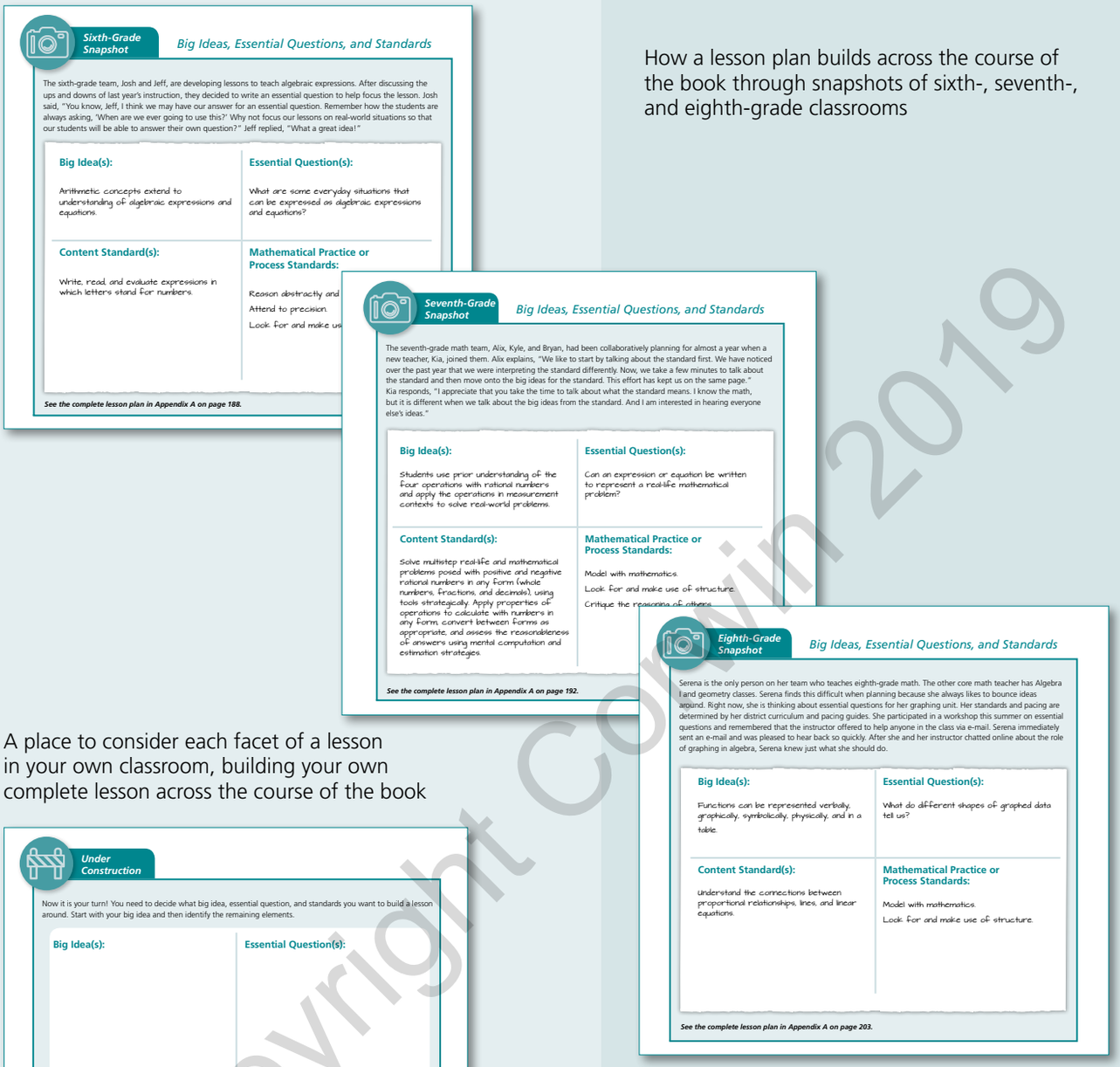
HOW DO IDENTITY AND AGENCY INFLUENCE LESSON PLANNING?

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.

How a lesson plan builds across the course of the book through snapshots of sixth-, seventh-, and eighth-grade classrooms



Sixth-Grade Snapshot *Big Ideas, Essential Questions, and Standards*

The sixth-grade team, Josh and Jeff, are developing lessons to teach algebraic expressions. After discussing the ups and downs of last year's instruction, they decided to write an essential question to help focus the lesson. Josh said, "You know, Jeff, I think we may have our answer for an essential question. Remember how the students are always asking, 'When are we ever going to use this?' Why not focus our lessons on real-world situations so that our students will be able to answer their own question?" Jeff replied, "What a great idea!"

Big Idea(s):
Arithmetic concepts extend to understanding of algebraic expressions and equations.

Essential Question(s):
What are some everyday situations that can be expressed as algebraic expressions and equations?

Content Standard(s):
Write, read, and evaluate expressions in which letters stand for numbers.

Mathematical Practice or Process Standards:
Reason abstractly and
Attend to precision.
Look for and make us

See the complete lesson plan in Appendix A on page 188.

Seventh-Grade Snapshot *Big Ideas, Essential Questions, and Standards*

The seventh-grade math team, Alix, Kyle, and Bryan, had been collaboratively planning for almost a year when a new teacher, Kia, joined them. Alix explains, "We like to start by talking about the standard first. We have noticed over the past year that we were interpreting the standard differently. Now, we take a few minutes to talk about the standard and then move onto the big ideas for the standard. This effort has kept us on the same page." Kia responds, "I appreciate that you take the time to talk about what the standard means. I know the math, but it is different when we talk about the big ideas from the standard. And I am interested in hearing everyone else's ideas."

Big Idea(s):
Students use prior understanding of the four operations with rational numbers and apply the operations in measurement contexts to solve real-world problems.

Essential Question(s):
Can an expression or equation be written to represent a real-life mathematical problem?

Content Standard(s):
Solve multistep real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form, convert between forms as appropriate, and assess the reasonableness of answers using mental computation and estimation strategies.

Mathematical Practice or Process Standards:
Model with mathematics.
Look for and make use of structure.
Critique the reasoning of others.

See the complete lesson plan in Appendix A on page 192.

Eighth-Grade Snapshot *Big Ideas, Essential Questions, and Standards*

Serena is the only person on her team who teaches eighth-grade math. The other core math teacher has Algebra I and geometry classes. Serena finds this difficult when planning because she always likes to bounce ideas around. Right now, she is thinking about essential questions for her graphing unit. Her standards and pacing are determined by her district curriculum and pacing guides. She participated in a workshop this summer on essential questions and remembered that the instructor offered to help anyone in the class via e-mail. Serena immediately sent an e-mail and was pleased to hear back so quickly. After she and her instructor chatted online about the role of graphing in algebra, Serena knew just what she should do.

Big Idea(s):
Functions can be represented verbally, graphically, symbolically, physically, and in a table.

Essential Question(s):
What do different shapes of graphed data tell us?

Content Standard(s):
Understand the connections between proportional relationships, lines, and linear equations.

Mathematical Practice or Process Standards:
Model with mathematics.
Look for and make use of structure.

See the complete lesson plan in Appendix A on page 203.

A place to consider each facet of a lesson in your own classroom, building your own complete lesson across the course of the book

Under Construction

Now it is your turn! You need to decide what big idea, essential question, and standards you want to build a lesson around. Start with your big idea and then identify the remaining elements.

Big Idea(s):

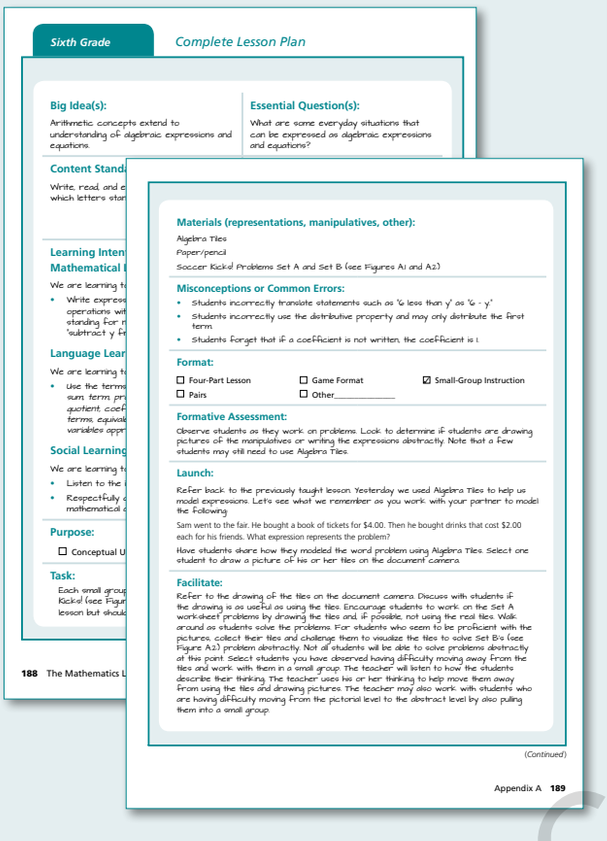
Essential Question(s):

Content Standard(s):

Mathematical Practice or Process Standards:

online resources Download the full Lesson-Planning Template from resources.corwin.com/mathlessonplanning/6-8
Remember that you can use the online version of the lesson plan template to begin compiling each section into the full template as your lesson plan grows.

Appendix A shows how the complete lesson plan has come together for each grade


Sixth Grade

Complete Lesson Plan

Big Idea(s):

Arithmetic concepts extend to understanding of algebraic expressions and equations.

Essential Question(s):

What are some everyday situations that can be expressed as algebraic expressions and equations?

Content Stand

Write, read, and e
which letters star

Learning Inten
Mathematical

We are learning t

- Write expres
operations wit
standing for n
"subtract y fr

Language Lear

We are learning t

- Use the terms
sum, term, pr
quotient, coef
terms, equival
variables appr

Social Learning

We are learning t

- Listen to the
- Respectfully
mathematical

Purpose:

☐ Conceptual U

Task:

Each small group
Kicks! (see Figur
lesson but should

188 The Mathematics L

Materials (representations, manipulatives, other):

Algebra Tiles

Paper/pencil

Soccer Kicks! Problems Set A and Set B (see Figures A1 and A2)

Misconceptions or Common Errors:

- Students incorrectly translate statements such as "6 less than y" as "6 - y."
- Students incorrectly use the distributive property and may only distribute the first term.
- Students forget that if a coefficient is not written, the coefficient is 1.

Format:

☐ Four-Part Lesson ☐ Game Format ☑ Small-Group Instruction
☐ Pairs ☐ Other_____

Formative Assessment:

Observe students as they work on problems. Look to determine if students are drawing pictures of the manipulatives or writing the expressions abstractly. Note that a few students may still need to use Algebra Tiles.

Launch:

Refer back to the previously taught lesson. Yesterday we used Algebra Tiles to help us model expressions. Let's see what we remember as you work with your partner to model the following.

Sam went to the fair. He bought a book of tickets for $4.00. Then he bought drinks that cost $2.00 each for his friends. What expression represents the problem?

Have students share how they modeled the word problem using Algebra Tiles. Select one student to draw a picture of his or her tiles on the document camera.

Facilitate:

Refer to the drawing of the tiles on the document camera. Discuss with students if the drawing is as useful as using the tiles. Encourage students to work on the Set A worksheet problems by drawing the tiles and, if possible, not using the real tiles. Walk around as students solve the problems. For students who seem to be proficient with the pictures, collect their tiles and challenge them to visualize the tiles to solve Set B's (see Figure A2) problem abstractly. Not all students will be able to solve problems abstractly at this point. Select students you have observed having difficulty moving away from the tiles and work with them in a small group. The teacher will listen to how the students describe their thinking. The teacher uses his or her thinking to help move them away from using the tiles and drawing pictures. The teacher may also work with students who are having difficulty moving from the pictorial level to the abstract level by also pulling them into a small group.

(Continued)

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Appendix B includes a blank lesson-planning template for your ongoing use (also available for download at resources.corwin.com/mathlessonplanning/6-8)


Lesson-Planning Template

Big Idea(s):

Essential Question(s):

Content Standard(s):

Mathematical Practice or Process Standards:

Learning Intention(s) (mathematical/language/social):

Success Criteria (written in student voice):

Purpose:

☐ Conceptual Understanding ☐ Procedural Fluency ☐ Transfer

Task:

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Materials (representations, manipulatives, other):

Misconceptions or Common Errors:

Format:

☐ Four-Part Lesson ☐ Game Format ☐ Small-Group Instruction
☐ Pairs ☐ Other_____

Formative Assessment:

Launch:

Facilitate:

Closure:

Download the Lesson-Planning Template from resources.corwin.com/mathlessonplanning/6-8

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Appendix C includes additional key reading and online resources


Appendix C

Further Reading/Resources

Online

Mathematics Content, Standards, and Virtual Manipulatives

http://www.achievethecore.org

A nonprofit organization dedicated to helping teachers and school leaders implement high-quality, college- and career-ready standards. The site includes planning materials, professional development resources, assessment information, and implementation support.

http://illustrativemathematics.org

A variety of videos, tasks, and suggestions for professional development accessible to all teachers.

http://ime.math.arizona.edu/progressions

The series of progressions documents written by leading researchers in the field summarizing the standards progressions for specific mathematical content domains.

http://nlvm.usu.edu

The National Library of Virtual Manipulatives offers a library of uniquely interactive, web-based virtual manipulatives or concept tutorials for mathematics instruction.

Sources for Problems, Tasks, and Lesson Protocols

https://fstockus.wordpress.com/numberless-word-problem

Numberless word problems designed to provide scaffolding that allows students the opportunity to develop a better understanding of the underlying structure of word problems.

https://gfletchy.com

3-Act Lessons and Mathematical Progressions videos for Grades K–7.

http://www.pz.harvard.edu/projects/visible-thinking

Harvard Zero Project describes thinking routines that can be applied to K–12 mathematics classrooms.

http://illuminations.nctm.org

A collection of high-quality tasks, lessons, and activities that align with the Common Core standards and include the standards for mathematical practice.

http://mathforum.org

The Math Forum at NCTM provides a plethora of online resources, including Problem of the Week and the Notice and Wonder protocol.

http://mathpickle.com

A free online resource of original mathematical puzzles, games, and unsolved problems for K–12 teachers. It is supported by the American Institute of Mathematics.

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