

The Mathematics Lesson-Planning Handbook, Grades K–2 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 K–2 BLUEPRINT

Planning Mathematics Lessons for Coherence, Rigor, and Purpose

Nick, a second-grade teacher, looked for his teammates, Kelly and Maria, all day. He sent them both notes to see if they could give him a few minutes after school. He really needed to talk to them about this lesson-planning business. He had spent the weekend searching for lessons on the Internet to match the scope and sequence the school district provided. One of his friends from the university had told him about a couple of websites that had good ideas, but he felt like he was just planning a bunch of discrete lessons that didn't necessarily go together. He had had another lesson fall apart today, even though he had spent hours preparing a game for the students to do during math stations. In fact, he had spent so much time preparing the game, he realized during the lesson that he didn't feel as prepared as he had hoped. He kept getting surprised and then sidetracked by the students' misconceptions.

Kelly arrived first. Nick began telling her about his frustration. He said, "Kelly, I don't know how you do it. I am spending all

struggling. I think it is time that we sit down as a team and start planning together."

Nick smiled, relieved at last. "I was really hoping you would say that."

Kelly and Nick are examples of both ends of the lesson-planning spectrum. On one end, Nick is planning daily, just keeping his head above water. On the other hand, Kelly is using the textbook, a good resource, but not enough when state standards, student misconceptions, big ideas, and prior student knowledge need to be considered. Neither rigor nor lesson coherence are part of their discussion. Should they be, and why should they be?

As the architect of your instruction, designing your blueprint is perhaps one of the most important jobs you can do. Throughout this book, you will have the opportunity to build coherent mathematics lessons

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 required by a new district policy, two veteran second-grade teachers, Roberta and Manny, sat down with their school administrative leader to review their students' benchmark assignments. Roberta, who had not yet seen the results, had been nervous all day about this meeting. She knew that Leah, the school principal, supported their work, but the situation was still incredibly nerve-wracking.

Leah pulled up the screen with the results and displayed them. "I can't take a few minutes to look at them before we discuss them."

At first, looked at his face. Leah said the status. There's

Leah said, "I am so glad that all this effort paid off! Now, let's look at what we need to work on."

Roberta said, "My students were completely confused about the representations used for equations."

Manny exclaimed, "Mine were, too! Do you think it has anything to do with the new standards? We always taught equations, but we never used those balances that were on the task. We are going to need to review those new standards."

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

CHAPTER 6

CHOOSING TASKS The Heart of a Lesson

Frustrated, Jessica stared at the mathematics standard and the lesson seed idea provided by her school district (figure 6.1).

Figure 6.1

Standard	Lesson Task
Add up to four two-digit numbers using place value models.	Jacob was on vacation at the beach with his family and found 23 seashells on the beach on Monday. On Tuesday, he found 13 more. On Wednesday, he found 34 seashells. How many seashells did Jacob find?

Figure 6.2

This is a map of Dory's travels.



Dory thinks she will travel a total of 326 miles. Can you help Dory figure out if she is correct? Use place value to prove your thinking, and explain why she is or is not correct.

CHAPTER 5

DECIDING ON PURPOSE

Why Are You Building This Lesson?

"They got it!" first-grade teacher Brian yelled as he burst into the team planning room. His teammates, Moira and Jeanine, looked at each other and smiled. Brian was always so exuberant, which is why they loved working with him.

"Got what, Brian?" Moira prodded.

"I was just about to give up and move on with my mathematics group, and everything clicked today! I decided I needed to give my students a reason for breaking numbers into tens and ones. We have done a lot of work with the cubes and base-ten blocks, but they seemed to be doing it mechanically and not really understanding the patterns and how the number value is connected to the place value and position of the number. So, today, I taught a pretty messy task where they had to 'package' candy into groups of ten. I gave them a customer order and asked them to figure out how many boxes they would need and how many leftover candies they would have. It was so exciting! You know Jeremy?"

Moira and Jeanine nodded and looked at each other, unsure of what Brian would say. They had all been worried about

of ten candies! I think there is a pattern! Is there a pattern for hundreds, too?"

Brian grinned. "I am just so excited that I did this lesson today!"

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?

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

CHAPTER 9

FRAMING THE LESSON Formats

Imani, along with her colleagues, Diamond and Bonnie, had been teaching kindergarten the same way every day for the past five years. At this point, Imani really wanted to shake up the way they had been organizing the math class. She felt like it had not been meeting all of her students' needs, particularly the stragglers, who were not working unless she was constantly reminding them, and she wanted to try some new things to engage them and all of her students. They needed more opportunities to talk with one another and learn how to work together on problems. In order to facilitate this kind of shared experience, Imani knew that she would need to be available to monitor the students while they were working; she did not want to be tied up in an instructional group. She still believed in small-group instruction; she just felt that her students needed to be working together more often.

As Imani sat down with her team, she shared the following: "I think we really need to take a look at our lesson format. We have been using the same center/math rotations for years. I am not sure we are building enough opportunities for math

Diamond agreed. She said, "I would love to try some different formats. Perhaps we can begin with pairs and see how that goes. I think the students will be very excited about solving some problems together. We can also work on the social learning intentions at the same time!"

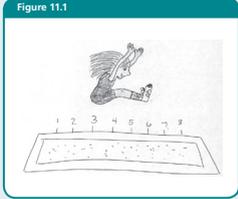
Bonnie was also on board. She said, "Let's do it! I suggest that we begin with the inventory task we did in the workshop last week. Let's plan this conceptual lesson first, try it out, and come back and share our thoughts."

Lessons need structure. Lesson formats give you that structure. Lesson formats refer to how you organize your class for the lesson. Some lessons work better when students are in collaborative groups, and some are more effective when students move around to different centers. For instance, rotating stations may be a good decision for a procedural fluency lesson but not for the introductory lesson on a new concept. As you select a lesson format for a particular lesson, you should base

CHAPTER 11

PLANNING TO LAUNCH THE LESSON

Amirah, a second-grade teacher, began her lesson by displaying the picture in Figure 11.1.



Amirah asked, "What do you notice about the picture? Please let me know about something your Turn and Talk Buddy noticed."

Hands waved wildly in the air as students strained to share their partners' observations. Amirah wrote quickly to include what they saw. Then she asked her students to share their think and wonders (Figure 11.2).

Figure 11.2

See	Think and Wonder
It looks like a sandbox.	Will she fall?
The girl is jumping.	What team is she on?
The girl is in the air.	How high is she in the air?
The girl might fall.	How far can she jump?
There are numbers.	What are the numbers for?

CHAPTER 12

PLANNING TO FACILITATE THE LESSON

Janey, a kindergarten teacher, had always imagined herself as an educator. As a child, she collected worksheets from her teachers and stored them in her basement, which she set up as a school. She cajoled neighborhood friends into playing school with her for hours on end.

By the time that Janey actually started teaching, she knew that the approach to education had shifted from her own days as a student. She recognized the need to encourage her students to construct meaning through carefully planned activities and to allow her students to talk to each other, explain their thinking, and even productively struggle, but she still felt conflicted with how to best support her students' communication skills. She hated to watch them struggle, even a little bit. She frequently found herself falling right into the trap of saving a student way too early instead of asking a question or providing a suggestion. Just the other day, one of her students, Jeremy, had asked for help, and she had picked up a pencil and scribbled showing him what to do. She hadn't even realized it until she glanced at him and caught him grinning from ear to ear.

very fashionable principal. For the lesson, the students traced their principal on paper, measured, and designed clothes for her paper cutout to wear. The project concluded with a fashion show of all the paper principal cutouts and clothing designs, complete with measurements. Robb, Janey and David had been amazed at how well the kindergartners had worked on the project, particularly as they had negotiated decisions about who would measure Mrs. Palmer. Janey and David had spent all of their time supporting the students and questioning them as they worked.

As the teachers discussed this lesson with their math coach, David asked, "So how can we capture that kind of energy and student-centered learning every day?"

Witnessing those moments when students are engaged productively in mathematical thinking, reasoning, and communication is so eye-opening. Sometimes they

CHAPTER 13

PLANNING TO CLOSE THE LESSON

The second-grade team members at Hollins Elementary School were discussing some of their closure experiences.

"Closure?" questioned Abe, a third-year teacher. "I hardly ever get a chance for closure. My lessons always go to the last minute and sometimes even run over into recess."

"I have that problem sometimes," chimed in Jane, the veteran teacher in the group. "I am getting better, but last week, my class had to remind me to stop because it was time for lunch! My goal for this year is to improve my closure. I'm working on it."

Celia, a second-year teacher, spoke up. "I went to a workshop this summer and they talked about how important closure is to determine how students are grasping a lesson. I have been trying some of the suggestions. I like using exit slips, and my kids seem to like them. I let them write me notes at the end of the lesson to tell me if there was anything they didn't understand. I have been using those notes to help me launch

Jane said, "It's funny that you mentioned a workshop. I went to a workshop about closure two years ago. We discussed how closure is about reflection. And we used exit slips, too, but we learned that there are other things you can do, like pair sharing. Another option is to do a more in-depth exit task, like we learned in the formative assessment workshop."

"Stop keeping all these ideas a secret!" Abe said. Then he smiled and added, "You two need to do a closure workshop for me!"

If you have ever looked at the clock and realized that you not only lack time for closure but also have run overtime, you are not alone. Abe, Jane, and Celia have been working on closure for a few years and continue to struggle to fit it all in. Planning for closure is the first step in using it your classroom. This chapter will discuss closure and several different closure formats while answering the following questions:

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

In every chapter you will find

Based on these characteristics, it is important to point out that all worthwhile tasks are problems, but not all problems are worthwhile tasks.

To determine if a task is worthwhile for you to use in a lesson, use the rubric shown in Figure 6.3. The first column identifies the characteristic, and the next three columns allow you to rate the degree to which you feel the task has met that characteristic by checking the box, with 1 being not acceptable and 3 being a good example of that characteristic. The final column is for any comments you would like to discuss with your colleagues.

Figure 6.3

Characteristic	1	2	3	Notes
Uses significant mathematics for the grade level				
Rich				
Problem solving in nature				
Authentic/interesting				
Equitable				
Active				
Connects to Standards for Mathematical Practice or Process Standards				
High cognitive demand				

 This Determining a Worthwhile Task Rubric can be downloaded for your use at resources.corwin.com/mathlessonplanning/k-2

 **Thinking about Jennifer and Carlos 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.**

Examples of each lesson feature from classrooms in Grades K–2

Opportunities to stop and reflect on your own instruction

WHAT IS THE ROLE OF REPRESENTATIONS IN MATHEMATICS LESSONS?

The Ammerberg Learner Foundation (2005) 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)

Since mathematical concepts are abstract, when teachers teach, they represent the concepts in a variety of ways. Representations can be thought of as a broad category of models. According to Van de Walle et al. (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 achieve the learning intentions of today’s lesson?” Here is an example of a teacher using a representation to help students make sense of rounding.

Example: Alvaro

When planning a lesson that involves rounding two-digit numbers, Alvaro, a second-grade teacher, decided to use a number line from 20 to 30. When he asked his students to place the number 23 on the number line, he asked, “Is 23 closer to 20 or 30?”

Alvaro used a number line as a representation to model the relationship of the numbers from 20 to 30 in order. By using this representation, students can easily see that 23 is closer to 20 than 30, working toward a conceptual understanding of rounding.

The charts in Figures 7.1, 7.2, and 7.3 show examples of representations that can be used with selected standards.

Figure 7.1

Kindergarten Counting and Cardinality Standards	Representation
Know number names and the count sequence.	
Count to 100 by ones and by tens.	

(Continued)



Kindergarten Snapshot

Big Ideas, Essential Questions, and Standards

Kindergarten teachers know that counting—especially learning how to use numbers to answer the question “How many?”—is a big idea. Three teachers, Marilyn, Eliza, and Rena, want to ensure that their kindergarten students have internalized counting and can use it as a strategy when they need it. To help the children make connections, they decide to hold regular class discussions with their students about when they use counting in their life outside of school. Once they decide on the big idea (“Use numbers to represent quantities”) and the essential question (“How can numbers help us in everyday life?”), the standards fall into place for them.

Big Idea(s):

Use numbers to represent quantities.

Essential Question(s):

How can numbers help us in everyday life?

Content Standard(s):

Write numbers from 0 to 20. Represent a number of objects with a written numeral 0 to 20 (with 0 representing a count of no objects).

Mathematical Practice and/or Process Standards:

Construct viable arguments and critique the reasoning of others.
Attend to precision.

See the complete lesson plan in Appendix A on page 178.

How a lesson plan builds across the course of the book through snapshots of kindergarten, first-, and second-grade classrooms



First-Grade Snapshot

Big Ideas, Essential Questions, and Standards

First-grade team Sarita, Jen, and Karlo are beginning to write their lessons on tens and ones. After discussing the ups and downs of last year's teaching of the topic, they decide they want an essential question that will guide them in keeping children from developing the misconception that there is only one way to decompose a number into tens and ones, a problem they ran into last year. They decide that they will focus the children on answering this question: “How can a number be represented with tens and ones in more than one way?”

Big Idea(s):

Group with tens and ones. For place value.

Essential Question(s):

How can a number be represented with tens and ones in more than one way?

Content Standard(s):

Understand that the two digits of a two-digit number represent amounts of tens and ones.

Mathematical Practice or Process Standards:

Construct viable arguments and critique the reasoning of others.
Attend to precision.

See the complete lesson plan in Appendix A on page 183.



Second-Grade Snapshot

Big Ideas, Essential Questions, and Standards

Second-grade teachers Aliyah and Dwayne are starting the year with the topic of place value. Aliyah notes that while her students can answer questions about place value, this year she wants students to show a greater understanding of place value concepts with more depth. Dwayne says that he wants to know more about whether his students understand the importance of the role of ten in our number system. Together they decide to use those thoughts to create the essential question that guides all of their lessons on this topic: “How is the number ten used in our system with ones and hundreds?”

Big Idea(s):

Extend the base-ten system to relationship among the unit.

Essential Question(s):

How is the number 10 used in our number system with ones and hundreds?

Content Standard(s):

Demonstrate that each digit of a three-digit number represents amounts of hundreds, tens, and ones (e.g., 347 is 3 hundreds, 4 tens, 7 ones).

Mathematical Practice and/or Process Standards:

Construct viable arguments and critique the reasoning of others.
Attend to precision.

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

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 and/or Process Standards:

Download the full Lesson-Planning Template from resources.corwin.com/math/lessonplanning/2. 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

Kindergarten Snapshot Complete Lesson Plan

Big Idea(s): Use numbers to represent quantities.

Essential Question(s): How can numbers help us in everyday life?

Content Standard: Write numbers up to 20 (with 0 no objects).

Learning Intention: We are learning to understand and represent objects.

Mathematics:

- Recall or identify objects.
- Make a match.

Language Learning:

- Write or read after hearing teacher or use math group set.

Social Learning:

- Listen to each other.
- Ask questions.
- Explain how objects or hear.

Purpose:
 Conceptual Understanding Procedural Fluency Transfer

Task:

How Many Insects?

The insects are crawling all over the leaves! We need to find out how many insects are on each leaf. How can we find out?



Note: The downloadable student worksheets contain 11 leaves representing numbers 10 to 20.

Materials (representations, manipulatives, other): Two-color counters

Misconceptions or Common Errors:

- Students may count every dot without subitizing.
- Students cannot decompose teen numbers.
- Students may struggle with one-to-one correspondence.
- Students read teen numbers like 1 as one-ty-one or one-one.

Format:
 Four-Part Lesson Game Format Small-Group Instruction
 Pairs Other _____

Formative Assessment: Use observation checklist to observe the following:

- One-to-one correspondence
- Grouping of tens and some ones
- Counting technique
- Conservation

(Continued)

Appendix A 179

A blank lesson-planning template in Appendix B (also available for download at resources.corwin.com/mathlessonplanning/k-2) for your ongoing use

Lesson-Planning Template

Big Idea(s):

Essential Question(s):

Content Standard(s):

Mathematical Practice or Process Standard(s):

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

Success Criteria: (written in student voice)

Purpose:
 Conceptual Understanding Procedural Fluency Transfer

Task:

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/k-2

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Additional key reading and online resources you may find useful in Appendix C

Appendix C

Further Reading/Resources

Online

Mathematics Content, Standards, and Virtual Manipulatives
<http://www.illustrativemathematics.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.

Illustrative Mathematics
<http://illustrativemathematics.org>
 A variety of videos, tasks, and suggestions for professional development accessible to all teachers.

IME Progressions
<http://ime.math.arizona.edu/progressions>
 The series of progression documents written by leading researchers in the field summarizing the standards progressions for specific mathematical content domains.

NVLM
<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://batoclas.wordpress.com/numberless-word-problems>
 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://fletch.com>
 Three-Act Lessons and Mathematical Progressions videos for Grades K-7.

<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.

<http://utich.maths.org>
 Free enrichment materials, curriculum maps, and professional development for mathematics teachers.

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