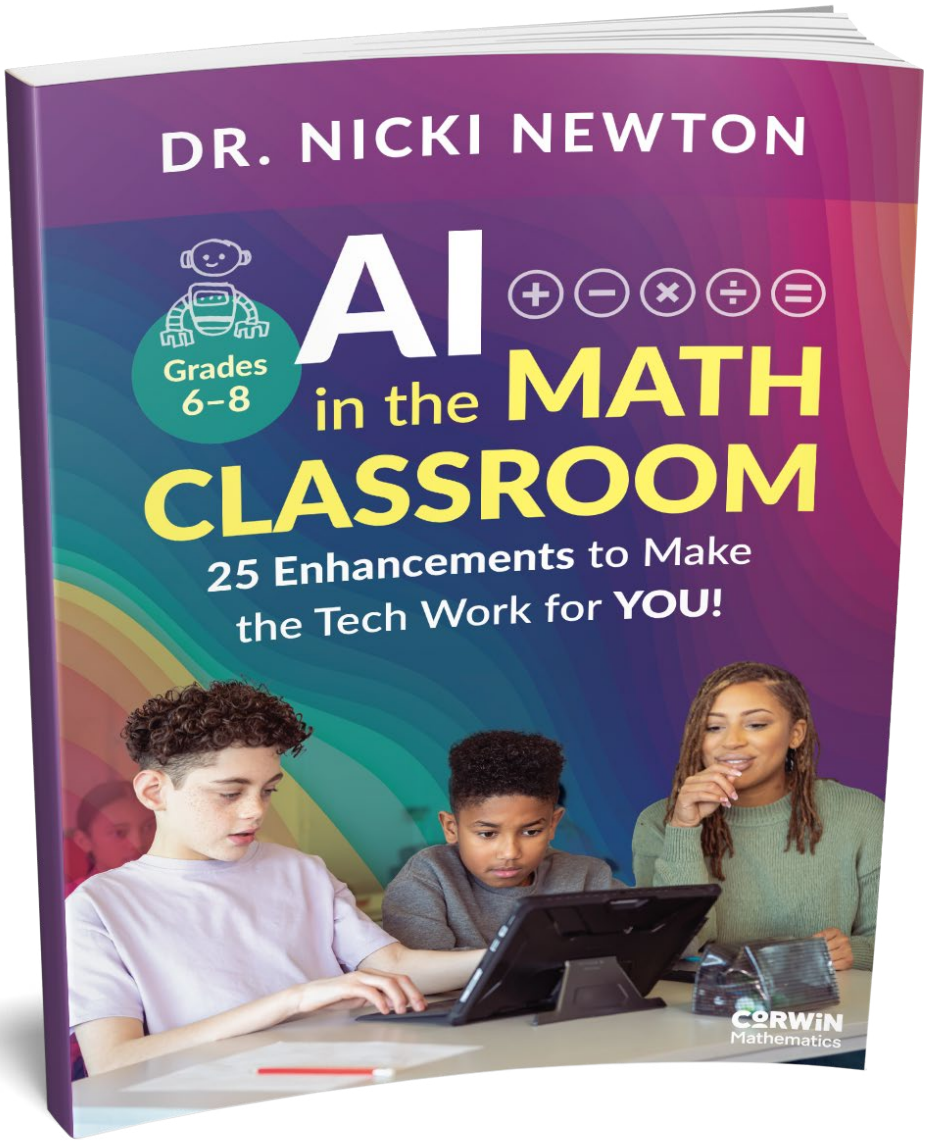
CORWIN

Complimentary excerpt



Click here to learn more about this title

Source: istock.com/SDI Production

CHAPTER 4

COLLABORATIVE LESSON PLANNING

AI as Your Co-Planner

Picture this: It's Thursday afternoon. You've survived the longest fire drill ever, three Chromebook meltdowns, one lunchtime "friendship crisis," and several rounds of "Is this going to be graded?" Winter break is right around the corner but still not quite close enough, and meanwhile, the end-of-term-grading portal opened up and is whispering in your ear.

You sit there in your desk chair, clutching your ice-cold coffee, and tell yourself that you will not give up your entire weekend lesson planning.

Enter artificial intelligence (AI).

AI is your new planning buddy—the assistant you didn't know you needed but now can't live without. No, it's not going to read your students' minds or help some folks get a bit more organized, but it *can* help you get a standards-based lesson plan done faster, easier, and more creatively than ever before.

So, sit down with your teacher planner, notes, and your favorite drink, and let's see what AI can do to help you.

WHY LESSON PLANNING MATTERS

Research is clear—effective lesson planning and high-quality mathematical discourse are cornerstones of student learning for the following reasons:

- **Planning matters:** Teachers with structured, intentional lesson plans create more opportunities for student learning (Clark & Peterson, 1986).
- **Differentiation matters:** Students grow most when they learn in their zone of proximal development (Vygotsky, 1978).
- **Questioning matters:** Mathematical discourse deepens reasoning, agency, and problem-solving (Chapin et al., 2013).

And here's the kicker: All three of these activities and goals are notoriously time intensive. AI gives you a way to design faster, adapt quicker, and generate targeted supports in minutes.

CHAPTER OVERVIEW

In this chapter, we are going to look at how AI can become your planning buddy, differentiation sidekick, and questioning coach. We'll look at five AI-enhanced strategies to take your teaching to the next level:

1. **AI Enhancement #1: Lesson Planning in Seconds**—Watch AI turn your prompts into guided math plans in record time.
2. **AI Enhancement #2: Instant Workstations**—Differentiated workstations support learners in their zone of proximal development.
3. **AI Enhancement #3: Questioning That Sparks Math Talk**—AI prompts push thinking at DOK Levels 1–3.

4. **AI Enhancement #4: Planning for Multilingual Learners**—AI scaffolds academic language and math talk for every voice.
5. **AI Enhancement #5: Brain Breaks With a Purpose**—AI provides quick resources for when you need something *right now.*

AI ENHANCEMENT #1: LESSON PLANNING IN SECONDS

With a single detailed prompt, you can generate a complete math plan in mere seconds. This isn't just a basic template; it's a fully structured, intentional lesson that follows the concrete–pictorial–abstract (CPA) learning cycle, complete with learning targets and success criteria, DOK levels, and more tailored to your students. This shift moves you beyond the hours of planning, freeing you to invest your time and expertise in the art of teaching itself. AI introduces an easier, more in-depth, faster path to lesson planning.

Here's what it looks like:

- **Traditional:** You spend hours searching the Web and TikTok, flipping through binders, and rewriting lessons for the twelfth time.
- **AI-Enhanced:** You type one detailed prompt and get a CPA lesson cycle in seconds.

Model Round: Lesson Planning

Using our handy-dandy SCRIPT framework to create excellent prompts, here is what we can ask AI to do to kick off the lesson-planning machine and what it can give back to us.

Dr. Nicki's Prompt: *I need a sixth-grade lesson plan for guided math intervention for a small group that is working on dividing fractions. In fifth grade, students worked on dividing a whole number by a unit fraction. In sixth grade, students worked on dividing a whole number by any fraction. In this lesson scaffold from the fifth- grade standard into the sixth-grade standard, I want to teach it concretely, pictorially, and abstractly. I need the learning target, the success criteria, vocabulary, sentence stems, exit slips, and teacher notes on multilingual learners (MLLs) and neurodiverse students. I would also like questioning with the six WIDA levels of language proficiency and questions scaffolded around DOK 1, 2, 3.*

Claude Sonnet 4 AI: *I'll create a comprehensive sixth-grade guided math intervention lesson plan for your small group focusing on dividing whole numbers by any fraction. This will bridge from the embedded review concept to the new learning target with extensive scaffolding for multilingual learners and neurodiverse students* (Exhibit 4.1).

You can see a portion of the lesson plan here and retrieve the entire lesson plan at the companion website.

Exhibit 4.1 • *Claude Sonnet 4 AI Response for a Guided Math Intervention Lesson Plan*

Lesson Overview

Grade Level: 6th Grade

Small Group Size: 3–6 students

Duration: 25–30 minutes

Content Focus: Division of whole numbers by fractions; Division of fractions by whole numbers

Learning Target: Students will be able to divide a whole number by any fraction by understanding the relationship between division and multiplication, using visual models and the standard algorithm.

Success Criteria: Students will know they are successful when they can

- ✓ Explain why dividing by a fraction is the same as multiplying by its reciprocal
- ✓ Create a visual model (area model or number line) showing a whole number divided by a fraction
- ✓ Solve whole number ÷ fraction problems using the standard algorithm
- ✓ Explain their solution process using mathematical vocabulary
- ✓ Apply the concept to solve a real-world problem

Embedded Review (5 minutes)

Concept: Division of fractions by whole numbers and unit fractions

Purpose: Activate prior knowledge and build bridge to new learning

Review Activity: "Show What You Know"

- ▸ Present: $4 \div \frac{1}{4}$ and $\frac{1}{2} \div 2$

Questioning Sequence:

- ▸ "What does division mean in this problem?"
- ▸ "How can we model this with a picture?"
- ▸ "What happens to the size of our pieces when we divide?"

Connection Statement: "Today, we're flipping the situation. Instead of dividing a fraction by a whole number, we're dividing a whole number by a fraction. Think about what that might mean."

Mathematical Vocabulary

Tier 2 (General Academic):

- divide, multiply, additive inverse, multiplicative inverse, relationship, model

Tier 3 (Domain-Specific):

- reciprocal, inverse operation, numerator, denominator, quotient, dividend, divisor

Vocabulary Development Strategy

Create a visual vocabulary anchor chart with the following:

- Word in English
- Cognates (when available): reciprocal/recíproco, fraction/fracción
- Visual representation
- Student-friendly definition
- Example sentence frame

Sentence Stems for Language Support

WIDA Level 1–2 (Entering/Emerging):

- "I see _____ divided by _____."
- "First, I _____. Next, I _____."
- "The reciprocal is _____."
- "The answer is _____."

WIDA Level 3–4 (Developing/Expanding):

- "To divide _____ by _____, I multiply by the reciprocal because _____."
- "This model shows that _____."
- "When I divide by a fraction less than 1, the quotient becomes larger/greater because _____."
- "I know my answer is reasonable because _____."

WIDA Level 5–6 (Bridging/Reaching):

- "The relationship between division and multiplication of fractions demonstrates that _____."
- "Dividing by a fraction is equivalent to multiplying by its reciprocal because _____."

(Continued)

(Continued)

- "This problem can be interpreted as asking _____."
- "I can justify my solution by _____."

Lesson Sequence: Concrete-Pictorial-Abstract Progression

Part 1: Concrete Exploration (8–10 minutes)

- *DOK Level 1–2:* Recall, understand, apply
- *Problem Context:* "Miguel has 3 pizzas. Each serving is $\frac{1}{4}$ of a pizza. How many servings does he have?"

Materials Needed:

- Fraction circles or paper circles
- Colored pencils
- Manipulatives (fraction bars, tiles)

Guided Exploration:

1. "Let's use our fraction circles to act this out."
2. Students physically divide 3 whole circles into fourths.
3. Count the total pieces: "How many fourths did we create?"

Key Question (DOK 2): "Why did we get *more* pieces even though we were dividing?"

Expected Response: "Because we divided into smaller pieces, we got more of them."

Bridge Statement: "So $3 \div \frac{1}{4} = 12$. When we divide by a fraction less than one, we get a larger number. Let's see why this connects to multiplication."

Part 2: Pictorial Representation (8–10 minutes)

- *DOK Level 2–3:* Apply, analyze
- *Problem:* $4 \div \frac{2}{3}$
- *Visual Model 1:* Area Model
    1. Draw 4 rectangles (representing 4 wholes).
    2. "If each group is $\frac{2}{3}$, let's first divide each whole into thirds."
    3. Shade groups of $\frac{2}{3}$ using different colors.
    4. Count: "How many groups of $\frac{2}{3}$ fit into 4 wholes?"

Guided Questions (DOK 3):

- "How many thirds are in 4 wholes?" (12 thirds)
- "If we need two-thirds to make one group, how many groups can we make?" (6 groups)
- "What multiplication problem does this represent?" ($4 \times \frac{3}{2} = \frac{12}{2} = 6$)

Visual Model 2: Number Line (Alternative Approach)

1. Draw a number line from 0 to 4.
2. Mark $\frac{2}{3}$ intervals (jump by $\frac{2}{3}$).
3. Count jumps until reaching 4.
4. "How many jumps of $\frac{2}{3}$ did it take to get to 4?"
5. "First, divide your number line into thirds. Then, circle every two marks—that's one group of $\frac{2}{3}$. Count the groups."

*Connection Question (DOK 3): "*Compare our visual model answer to using the algorithm $4 \times \frac{3}{2}$. What do you notice?"

Part 3: Abstract Algorithm (7–10 minutes)

- *DOK Level 2–3:* Apply, analyze, justify
- *Algorithm Introduction:* "When we divide by a fraction, we multiply by its reciprocal."
- ***Step-by-Step Process:*** Problem: $5 \div \frac{3}{4}$
  1. Identify the divisor: $\frac{3}{4}$
  2. Find the reciprocal: "Flip the fraction to get $\frac{4}{3}$"
  3. Change $\div$ to $\times$: $5 \times \frac{4}{3}$
  4. Multiply: $\frac{5}{1} \times \frac{4}{3} = \frac{20}{3}$
  5. Simplify: $\frac{20}{3} = 6\frac{2}{3}$

Reasoning Questions (DOK 3):

- "Why does this work? Let's think back to our models."
- "What does $6\frac{2}{3}$ mean in our context?"
- "Does this answer make sense? How do you know?"

(Continued)

(Continued)

Practice Problems With Scaffolding:

- Level 1 (DOK 1–2): $2 \div \frac{1}{3}$

  Support: Visual provided, sentence frame: "The reciprocal of $\frac{1}{3}$ is _____."
- Level 2 (DOK 2): $6 \div \frac{2}{5}$

  Support: Partial algorithm shown, students complete steps
- Level 3 (DOK 3): $8 \div \frac{5}{6}$

  Support: Create own visual model or use algorithm, explain reasoning

Differentiation for Neurodiverse Learners

For Students With Executive Function Challenges

- Provide step-by-step checklist with boxes to check off
- Use color-coding: divisor in one color, reciprocal in another
- Break problems into smaller chunks with visual timers
- Offer "anchor" example to reference

For Students With Processing Speed Differences

- Reduce number of practice problems (focus on quality over quantity)
- Allow extra processing time before calling on students
- Provide pre-drawn models to label/complete
- Use "turn and talk" for formulating responses before sharing with group

For Students With Attention Differences

- Use movement breaks (stand up between problem types)
- Incorporate tactile manipulatives throughout
- Vary voice tone and volume strategically
- Provide fidgets during listening portions

For Students With Working Memory Challenges

- Reference anchor chart for each problem
- Use graphic organizer to track steps
- Allow use of calculator for computation after conceptual understanding shown
- Repeat key information in multiple modalities

Multilingual Learner Supports

Before the Lesson

- Preteach vocabulary with visuals and L1 connections where possible.
- Provide reference sheet with key terms and symbols.
- Review sentence stems students will use.

During the Lesson

- Recast student responses into more sophisticated language naturally.
- Use gestures and physical demonstrations.
- Pause frequently to allow processing time (wait time: 7–10 seconds).
- Encourage native language use during "turn and talk" for concept clarification.
- Display visual models throughout entire lesson.

After the Lesson

- Provide written summary of key concepts in student-friendly language.
- Offer sentence stems for home practice explanations.
- Create vocabulary journal entry with personal example.

Scaffolding Questions by DOK Level

DOK Level 1 (Recall)

- "What is the reciprocal of $\frac{2}{3}$?"
- "What operation do we use instead of division?"
- "How many fourths are in 2 wholes?"

DOK Level 2 (Skill/Concept)

- "How do you find the reciprocal of any fraction?"
- "Why do we multiply by the reciprocal when dividing by a fraction?"
- "What model best represents this division problem?"

DOK Level 3 (Strategic Thinking)

- "How does your visual model connect to the algorithm?"
- "What pattern do you notice when you divide by fractions less than 1? Greater than 1?"
- "How would you explain this to someone who was absent today?"
- "Create your own word problem that would use this operation."

(Continued)

(Continued)

Exit Slip Questions (choose based on student readiness)

- Level 1 (DOK 1–2): Solve: $3 \div \frac{1}{2} =$ _____
  Show your work with a model or the algorithm.
- Level 2 (DOK 2–3): Solve: $5 \div \frac{3}{4} =$ _____
  Explain in words or pictures why your answer makes sense.
- Level 3 (DOK 3): A recipe calls for $\frac{1}{3}$ cup of sugar per batch. You have 4 cups of sugar. How many batches can you make? Show two different ways to solve this problem and explain which method you prefer and why.

Teacher Notes on Common Misconceptions

- Misconception #1: "Division always makes numbers smaller."

  Intervention: Use concrete examples showing $6 \div \frac{1}{2} = 12$. Ask "Why did the answer get bigger?" Emphasize that dividing by fractions less than 1 creates more groups.
- Misconception #2: "Just flip both numbers."

  Intervention: Make sure the students understand dividing by fractions first conceptually. Then, if you teach them to flip the divisor, explain exactly what that means and why it works. Use consistent color-coding in examples.
- Misconception #3: "I can just do fraction ÷ whole number the same way."

  Intervention: Show both types side-by-side. $\frac{2}{3} \div 4$ vs. $4 \div \frac{2}{3}$. Discuss what each means contextually. Notice that $\frac{2}{3} \div 4$ means we're breaking a fraction into smaller pieces. Today's new work, $4 \div \frac{2}{3}$, asks how many fractional pieces fit into a whole. These are different questions.

online resources You may find the expanded version of this lesson plan on the companion website at https://companion.corwin.com/courses/AIintheMathClassroom6-8

Practice Round: Lesson Planning

Here is a prompt you can start to try on your own: *"I need a three-lesson intervention cycle for a group of students who _____. I would like the intervention cycle to be concrete, pictorial, and abstract. Please include the learning target and the success criteria, the vocabulary, and the sentence stems. Include teacher notes on MLLs and neurodiverse students. Discuss error patterns and misconceptions. Include exit slips and questioning at DOK levels 1, 2, 3."*

Your Prompt:

_____

_____

AI Response:

_____

_____