

ENgagement and Achievement through Computational Thinking

Modeling Algorithms Viewing Guide

Lesson 4

Topic and goals

In this Engagement and Achievement through Computational Thinking (ENACT) Algorithms Lesson video, a teacher models how to integrate computational thinking (CT) strategies into your classroom. Framing, prompting, and highlighting are designed to empower students to take ownership of CT strategies.

The goals of the video are to support you in:

- **framing** a lesson or task that provides students with an opportunity to apply one or more CT strategies.
- **prompting** students (either verbally or using resources) as they work on a problem by applying CT strategies.
- **highlighting** examples of when and how students used CT strategies to complete their work.

Questions to consider when planning:

- What are some strategies my students could use to solve the problems in this lesson?
- How might a CT strategy already be part of or add to what they are already doing?
- How might I recognize when my students are using CT strategies?
- How might I identify when it would be helpful to prompt a student to use CT strategies?

As teachers become comfortable with framing, prompting, and highlighting, students will feel more empowered to take ownership of the CT strategies and integrate them into how they solve math problems.

Context

The examples in this video demonstrate **framing** a lesson to apply an algorithm—in this case, the order of operations—to evaluate a simple mathematical expression. Although the focus here is on using an algorithm that has already been developed, the approach applies broadly to any situation in which students follow step-by-step procedures to solve problems. Later videos in the series will shift from applying an existing algorithm to supporting students in developing their own, helping them deepen their understanding of how algorithms emerge from patterns and structured reasoning.

Any numerical expression could be substituted for the one displayed in the video. However, it may be useful to start with one that has different possible values, depending on the order in which operations are carried out. The strategies modeled in the video will work best if students have already been introduced to the concept of the order of operations and have experimented to realize that $3 + 4 \times 6$ could have a value of either 42 or 27, depending on whether the addition or the multiplication is done first. This video uses an expression without parentheses or exponents to illustrate that some steps of an algorithm will not apply to every problem. In the example in the video, the parentheses and exponents steps do not apply. Thoughtfully considering whether steps apply to a problem may be a new idea for your students.



Video notes: As you view the video, icons (below) will appear, indicating content related to CT strategies, student-focused practices, pedagogy, and/or mathematics. When an icon appears, you may want to pause the video to read the associated notes in exhibit 1.



Computational Thinking

When this icon appears, the focus will be on CT strategies that are being modeled through framing, prompting, and/or highlighting. The focus is on the strategy.



Student Focus

When this icon appears, the focus will be on student-focused practices that are being used: connecting to student experiences, supporting student choice by enabling multiple approaches to problems, valuing student thinking and voice, supporting student collaboration.



Pedagogy

When this icon appears, the focus will be on the teaching techniques that use interactive teaching and student learning, and/or assessing formatively.



Mathematics



When this icon appears, the focus will be on specific math concepts that are needed for solving the problem and connecting them to previous learning, and/or observing student work.




Exhibit 1. Notes for ENACT video: Modeling algorithms

In ENACT Lesson 4, a coach models the use of *algorithms*, one of ENACT’s five computational thinking (CT) practices.

The goals of the video are to support you to:

- Define algorithms as a systematic approach or step-by-step approach to solving a problem or completing a task.
- Demonstrate how algorithms are used in daily life and mathematics.
- Model how to thoughtfully apply the steps of an algorithm to a problem.

Timestamp	Topic	Notes
00:53	 Student Focus	Connect to student experiences and value student voice: Although the video provides a few examples of step-by-step instructions, be sure to listen to and include the examples your students offer. Inviting them to share familiar routines or brief stories from their own experiences helps connect the work to their prior knowledge and brings their voices into the discussion.
03:40	 Student Focus	Connect to student experiences: If students share examples of algorithms beyond the ones shown in the video, return to those examples throughout the lesson. Drawing on familiar routines from their lives helps students see the relevance of algorithmic thinking. For instance, instructions for a card game may say to “play a card” without specifying which one, requiring players to decide based on the cards they hold. In tic-tac-toe, directions may tell players to mark a square, but students must choose the square based on previous moves. Using their own examples reinforces connections to everyday decision-making and problem solving.

Timestamp	Topic	Notes
04:52	 Pedagogy	<p>Support scaffolding of new routines: Students may be unsure how to proceed when the first step of an algorithm does not clearly apply to the problem at hand. Beginning with a simple expression helps establish the structure of the order of operations and gives students experience recognizing that not every step will be relevant in every situation.</p>
05:57	 Computational Thinking	<p>Connect decomposition to algorithmic thinking: Some students may notice that multiplying 4 and 6 first and rewriting the expression is itself an example of decomposition. The order of operations functions as an algorithm that guides how to break an expression into smaller steps.</p> <p>Clarifies why an algorithm is needed: Unlike decomposing a number to find a factorization—where the order of the steps does not change the result—the sequence used to simplify an expression affects its value. This distinction illustrates why having an agreed-upon algorithm, such as the order of operations, is essential.</p>
06:49	 Computational Thinking	<p>Introduces algorithms through use of an established procedure: This section provides an initial introduction to the CT practice of algorithms by focusing on applying an algorithm that has already been developed.</p> <p>Connects algorithm creation to pattern recognition: Developing algorithms often grow out of noticing consistent patterns in reasoning. When the same line of thinking can be applied across multiple problems, that repeated structure can be organized into a step-by-step process—an algorithm—that systematizes the reasoning.</p>

This viewing guide is part of a series of training resources related to REL Midwest’s ENACT partnership.