# ENgagement and Achievement through Computational Thinking

## Structuring Opportunities for Debugging Viewing Guide

## Lesson 8

## Topic and goals

In this Engagement and Achievement through Computational Thinking (ENACT) Debugging 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 **prompting/structuring** a lesson on how making thinking visible supports the CT practice of debugging. In the first part, the ENACT coach models how to record strategies and intermediate steps during problem solving so that students' reasoning is clear and traceable. The coach then shows how students can compare their work with a partner to uncover and correct any "bugs" in their thinking. In the second part, the coach models how to follow up on students' debugging processes and facilitate reflection on how making their thinking visible helped them identify and correct errors. Although the video uses sample student work for illustrative purposes, offering students opportunities to share their own work can help normalize the process of noticing and fixing mistakes as part of mathematical problem solving.

The mathematical focus of the lesson is using percentages to compare ratios. However, the broader approach of encouraging students to record intermediate steps and compare their reasoning with a partner can be applied across many mathematical contexts and problem types. These practices support students in developing the habits of mind needed for effective debugging in any setting.

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**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: Structuring opportunities for debugging

In ENACT Lesson 8, a coach models how to provide structured opportunities for students to use *debugging* by foreshadowing the debugging opportunities early in the lesson and supporting student reflection at the end of the lesson.

**The goals of the video are to support you to:**

- Model how to record strategies and intermediate steps in problem solving.
- Facilitate reflection on how it was helpful for students to make their thinking visible.

| Timestamp | Topic | Notes |
|---|---|---|
| 00:43 | Student Focus | Connect to student experiences: Basketball may be a familiar context for some students, providing an opportunity for them to share relevant out-of-school knowledge. If students are not familiar with basketball, you might show a brief clip of a free-throw attempt to help them understand the situation. You could also adapt the problem to use a sport or activity your students enjoy so the context feels meaningful and accessible. |
| 01:55 | Pedagogy | Support thoughtful participation: Giving students time to think before sharing with the class helps more students contribute to the discussion. For example, some students may notice that Angel is using percentages to compare the free-throw ratios for each team. If a student shares this idea, build on their thinking by asking why percentages are useful for making comparisons. The video also models questioning strategies that can help students develop this insight even if they are not yet able to express it on their own. |

| Timestamp | Topic | Notes |
|---|---|---|
| 02:25 | Computational Thinking | **Highlight abstraction within debugging:** As students examine Angel's drawings, they are making sense of an abstraction of the free-throw problem. Adding information to the drawings allows them to further develop that abstraction and clarify the key relationships.<br>**Connect representations to debugging:** Although the focus of the video is on debugging, the bar drawings can also be discussed as abstractions that emphasize important percentage benchmarks. Recognizing how these visual representations simplify and organize the situation can support students as they identify and correct errors in their reasoning. |
| 04:01 | Mathematics | **Connect percentages to comparison of ratios:** Percentages offer a convenient and familiar way to compare ratios because they express quantities using a common scale.<br>**Support development of key mathematical ideas:** This problem is designed to strengthen students' understanding of percentages as tools for comparing ratios—an idea that is useful both in the classroom and in everyday situations. |
| 04:29 | Student Focus | **Connect to student experiences:** To help students build their understanding of decomposition, you can invite them to share times when they have broken a task or problem into smaller parts in other classes or outside of school. Students might describe writing an essay in sections (introduction, body, conclusion), investigating a science question one variable at a time, or completing chores step by step. Using their own examples helps reinforce how decomposition can make complex problems more manageable. |
| 06:47 | Pedagogy | **Support debugging through structured collaboration:** Providing students time to work with a partner as they complete the bar diagrams can help them articulate and check their thinking step by step. If students are already working in pairs, you can extend this by having each partnership compare their work with another team. These structured comparisons offer additional opportunities for students to identify and correct "bugs" in their reasoning. |
| 08:27 | Pedagogy | **Support debugging through analysis of student work:** You might show an example of work from a student partnership and invite the class to discuss, in pairs or small groups, what they think each student did and where a possible "bug" might be. This approach encourages students to articulate their reasoning, compare interpretations, and practice identifying errors in a supportive and structured way. |
| 10:07 | Mathematics | **Highlight multiple valid mathematical strategies:** When labeling percentage benchmarks, some students may use estimation while others rely on exact calculations. Small differences in values—such as how students label 25 percent or 50 percent—reflect different approaches rather than errors.<br>**Clarify mathematical intent:** The example in the video illustrates that both estimation and exact computation are mathematically valid strategies for this task. Recognizing these differences helps keep the focus on reasoning about percentages, rather than on requiring a single method. |

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