ENgagement and Achievement through Computational Thinking

Modeling Pattern Recognition Viewing Guide

Lesson 1

Topic and goals

In this Engagement and Achievement through Computational Thinking (ENACT) Pattern Recognition 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 **frame/model** how students identify factors of whole numbers by analyzing both numerical and visual representations. In the first segment, students generate rectangular arrays for a given number and record corresponding factor pairs**.** The video shows a teacher modeling how students might use numeric and visual cues to recognize similarities across posters before sending students off to look at each other's work. In the second segment, students have already examined one another's work and contributed to a class-generated list of observed patterns. Here, the coach models how to explain why a pattern makes sense and how to apply a pattern to solve a different problem.

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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: Modeling pattern recognition

In ENACT Lesson 1, coach models use *pattern recognition,* one of ENACT's five computational thinking (CT) practices.

The goals of the video are to support you to:

- Help your students reflect on patterns they have seen and used in their everyday lives.
- Define a pattern as something that is similar or consistent across multiple examples.
- Unpack the meaning of pattern recognition and what it means to engage in this practice.
- Model using different kinds of information (visual, numeric) to look for patterns.
- Explain why patterns make sense and how to apply patterns to solve problems.

Timestamp	Topic	Notes
0:53	 Student Focus	**Connect to student experiences:** The teacher asks students to explain their existing understanding of patterns provides an opportunity to listen to student voices and **learn about their past experiences and knowledge.**
02:16	 Pedagogy	**Frames the lesson around computational thinking (CT):** The teacher establishes the purpose of the task to help students understand why they are examining patterns and how this focus supports their mathematical thinking. The video models how articulating the goal of the activity provides students with a clear reference point for their work. The teacher connects the task to students' prior experiences using patterns to make sense of mathematical situations.

Timestamp	Topic	Notes
02:41	 Mathematics	**Makes mathematical language explicit:** This video models unpacking the term "pattern recognition" for students. The What Works Clearinghouse practice guide, *assisting students struggling with mathematics,* highlights the importance of making mathematical language explicit to students and supporting their use of the language (Gersten et al., 2009).
04:41	 Pedagogy	**Articulates mathematics concepts needed for solving and connect these concepts to previous learning experiences:** This task is an example of how, when students are introduced to pattern recognition, the process often builds on ideas they have previously encountered. Many students initially assume that a pattern must apply universally, across all numbers or cases. However, much of the work in recognizing and applying patterns—whether in mathematics or other disciplines, involves identifying when patterns hold *and* when they do not. By drawing on earlier understandings, students develop a clearer sense of how patterns behave in different contexts and can apply this thinking more flexibly. This example is especially useful because it prompts students to begin noticing patterns that operate only in specific situations. Depending on how comfortable your students seem with this idea during the introduction, you might continue exploring the pattern across all the posters and model the process of discovering that only odd numbers have only odd factors before moving on.
05:01	 Student Focus	**Support student choice by offering multiple ways** for students to notice and work with patterns. Providing varied entry points helps all students engage in the process of looking for patterns and encourages them to select strategies that make sense to them. Ensuring that every student can participate in the work creates opportunities for them to share their thinking and build on one another's ideas.
05:32	 Computational Thinking	**Organize information** to make pattern recognition more visible connects closely to another CT strategy: abstraction. Using visual organization can help students focus on the essential elements of a problem and better identify what is most important.
07:10	 Pedagogy	**Engage students in pattern recognition:** The video underlines specific parts of each pattern to highlight when the pattern applies. Involving students in deciding what to underline helps them focus on identifying when a pattern holds and reinforces that a pattern can be valid even if it does not apply to every number. Highlighting when a pattern applies also supports discussion about *why* it applies. For example, odd numbers have only odd factors because if an even factor existed, 2 would also be a factor—and multiplying 2 by any whole number produces an even result.

Timestamp	Topic	Notes
10:01	 Computational Thinking	**Build on CT strategie**s: In later lessons, students will build on this work with patterns to develop strategies connected to the CT idea of algorithms. Algorithms are step-by-step procedures for solving a problem, and recognizing a consistent pattern often signals that such a procedure can be created.
10:58	 Student Focus	**Value student thinking and voice:** If you have not yet explored *why* this pattern works, this moment offers another chance to invite students to explain it. Understanding the reasoning behind a pattern helps students feel more confident in their strategies and makes the ideas more memorable.

Reference

Gersten, R., Beckmann, S., Clarke, B., Foegen, A., Marsh, L., Star, J. R., & Witzel, B. (2009). *Assisting Students Struggling with Mathematics: Response to Intervention (RtI) for Elementary and Middle Schools* (NCEE 2009-4060). What Works Clearinghouse, Institute of Education Sciences, U.S. Department of Education. https://eric.ed.gov/?id=ED504995

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