VIDEO NOTES: ***4th Grade* Math Lesson on Numerical Patterns***

Video Links: **Numerical Patterns (Part 1)**, **Numerical Patterns (Part 2)**
Common Core State Standard: Operations and Algebraic Thinking (CCSS.4.OA.C.5)
Compass Component and Rating: Engaging students in learning (3c), *Effective Proficient*
Lesson Objective: Understand how patterns develop by analyzing the similarities and differences in two sets of patterns.

Common Core State Standard(s)
Operations and Algebraic Thinking (CCSS.4.OA.C.5): Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself.

Compass Component 3c: Engaging Students in Learning (Rating: *Effective Proficient*)		
Indicators	**Evidence**	**Common Core Connection**
Most students are intellectually engaged in the lesson.	• Students interact with each other, noticing the differences in patterns and drawing connections between the problem and real-world examples, the shirt. For example, a student says, "*So that's staying the same and this is the pattern."* Second student responds, "*Yeah. It'd be like that. And then pattern 2 would be like …"* First student says, "*It's funny, because pattern 3 goes 3 like this."* Second student responds, "*Yeah. Same with a pattern on your shirt. It's a pattern."* (Part 1: 3:19) • Students pose questions to the presenters to further understand their thinking behind the creation of the pattern.	In this numerical patterns activity, all students have extensive time to explain their thinking and persevere in solving challenging problems (Math.Practice.MP1**)** that are related to standard CCSS.4.OA.C.5.

Lesson tasks have multiple correct responses or approaches and/or demand higher-order thinking.	• Students identify differences between the solution they created and the solution given by the presenting group. Neither group is deemed incorrect, as their development of the pattern is supported by their explanations. This reinforces the math concept of using various methods to arrive at a solution. • Students explain how they believe the "Learner" developed the pattern. By explaining their thinking though the lens of the "Learner," students engage analysis and evaluation-level thinking. • Students examine various solutions to understand how they differ from their own. By comparing solutions, students learn to self-assess and then revise their thinking and processes.	Students generate patterns that follow a rule, which aligns to standard CCSS.4.OA.C.5. Furthermore, students demonstrate conceptual understanding by analyzing the structure of a set of patterns for which the rule was not provided to help determine what Learner B may have been thinking (Math.Practice.MP7). Then they explain their reasoning to the class while critiquing others' reasoning (Math.Practice.MP3).
Students have some choice in how they complete learning tasks.	• Students choose how work is completed in the pairs. The teacher says, *"I'll give you 30 seconds to divvy up the work as far as who is Learner A and who is Learner B…"* (Part 1: 1:45) • Students can choose to work out the problem using colored square tiles or markers. By choosing the work they complete as well as the materials, students assess their own learning needs and styles and then make choices that will help them to be successful in the learning task.	
Materials and resources support the learning goals and require intellectual engagement, as appropriate.	• Teacher gives students markers and square tiles in order to manipulate pattern examples and represent the growth of the pattern	

WHAT COULD THIS TEACHER DO TO IMPROVE?

What did the teacher do in this lesson?	*Highly Effective* Indicators	What could the teacher do to move to *Highly Effective*? (example actions)
At the end of the lesson, the teacher asks students to write down "just one comment or one question." This serves as the students' Exit Ticket.	Students have an opportunity for reflection and closure to consolidate their understanding.	Provide more structure to the reflection, posing an application question for students to answer or establishing criteria for the response. This will require students to reflect on and summarize what they have learned.

During the Closure portion of the lesson (Part 2), the presenters are engaged, as well as the student that is posing questions. The remaining students in class are passively listening.	Virtually all students are highly engaged in the lesson.	Create a discussion sheet for students to record information such as alternate solutions to their problem which they had not considered, questions that remain for presenters, or new ideas that were sparked by the conversation. This will help students to think about work, processes, solutions, and ideas beyond what was discussed during their pair work. Students will have a deeper understanding of the content by reflecting on the learning accomplished by the entire class, not just themselves.

**Inside Mathematics* denotes this video as a 5th grade lesson. For the purpose of assessing its alignment to Common Core standards, the LDOE has rated and reviewed this video in a 4th grade context.