Classroom Video Analysis: What Makes a Good Clip and What Makes a Good Task?

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Multiple Contexts and Modes

- Teacher preparation
- Professional Development & Teacher Learning
- Assessment & Measurement
- Video of self versus video of others

→ Develop or assess some competency or skill

Today …

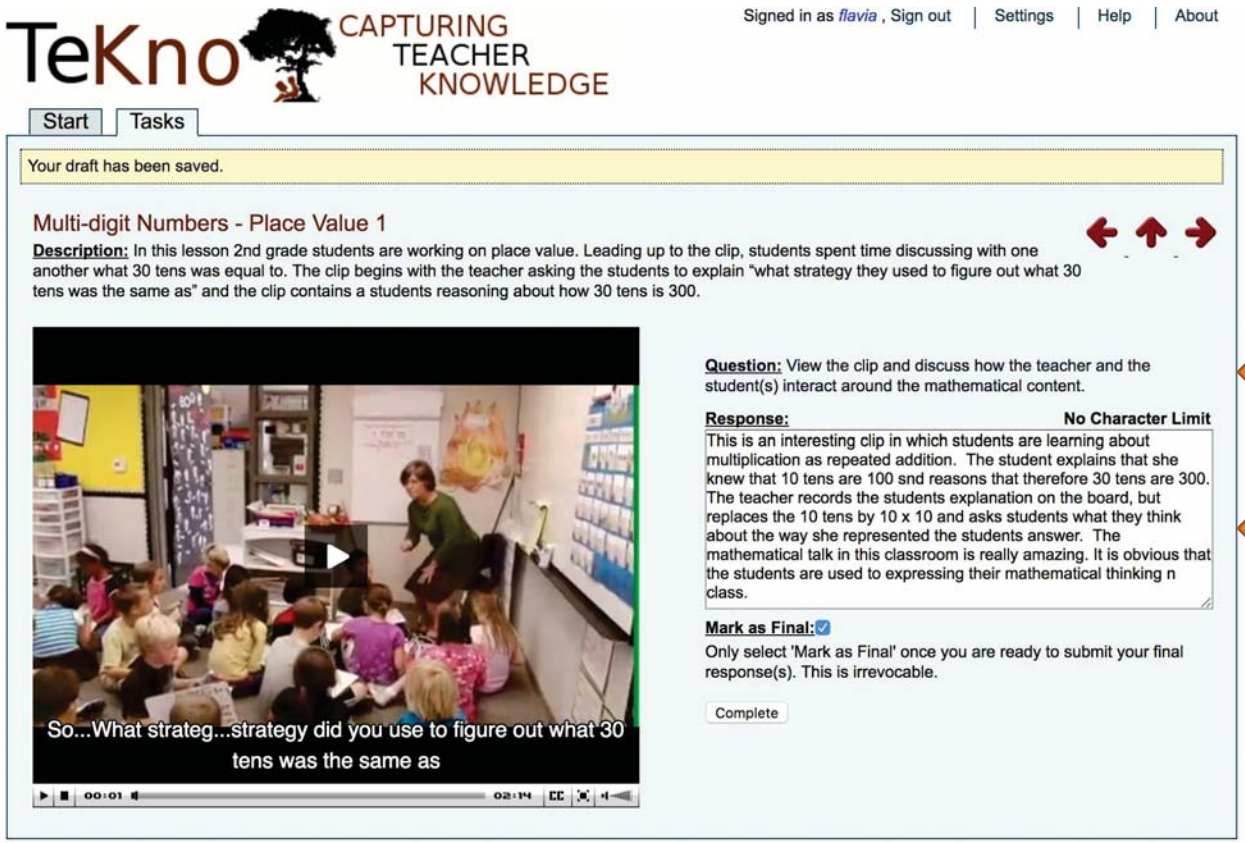
- How and why we use video-based items for measuring usable teaching knowledge?

- What have we learned from our assessment and measurement work about well-functioning clips and tasks?

Classroom Video Analysis Approach

Short Clip Description

Video screen with controls



Task / Prompt

Teacher Response

Measuring ***Usable*** Teaching Knowledge

- What is Usable Teaching Knowledge?

  - Knowledge teachers can access and apply in real teaching situations

- How to elicit usable knowledge?

  - Assessment tasks that reflect common teaching tasks and competencies

- **Two things important**: Having knowledge **and** ability to flexibly combine it

  → knowledge organized for teaching performance

- Less focused on identifying each type of knowledge used

Why Use Video?

- Classrooms are complex environments with competing events
- Authentic
- Specific
- Efficient
- Hypothesis (1): You can only teach (comment on) what you know
- Hypothesis (2): Respondents with different usable knowledge will “see different things”
- Hypothesis (3): Knowledge teachers access and apply when responding to video clips similar to knowledge teachers can draw on in the classroom (good proxy)

Original CVA – General Measure

"Please explain how the teacher and the student(s) interact around the mathematics" (Ball, 2002)

- Captures CK, PCK, MKT, PK, Curriculum Knowledge

- No formal content framework

→ Measures usable mathematics teaching knowledge (perceiving, interpreting, decision making (SI))

CVA-M - Common Core-Aligned

➢ Specific content framework, CCSS-M

➢ Assessment tasks reflect specific teaching tasks or competencies:

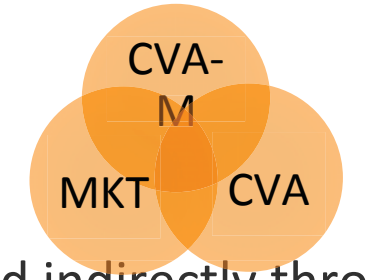
- Generating teacher questions to improve student understanding
- Diagnosing student thinking or understanding
- Relating specific content standards or mathematical practices to teaching episodes

→ Measures usable, Common Core-aligned Mathematics Teaching Knowledge

(perceiving, interpreting, decision making)

CVA & CVA-M Findings at a Glance

- Reliable scores (teachers' scored responses)

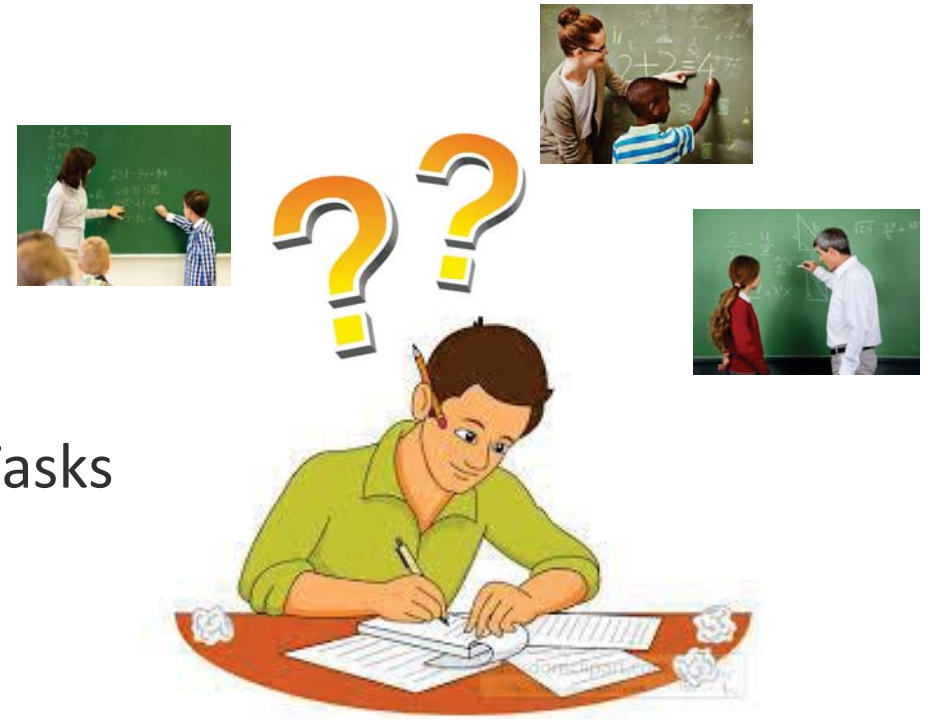


- Evidence for external aspects of validity
  - CVA predicts teachers' own teaching
  - CVA predicts student learning directly and indirectly through instruction
  - CVA-M directly predicts student learning

→ CVA and CVA-M measure *Usable Mathematics Teaching Knowledge*

What does Using Video Require?

- Picking a clip
- Writing a task
- Matching Clips and Tasks



Creating Video-Based Items

- Watch videotaped classroom lessons
- Identify potential clips based on content, pedagogy, theme, stimulus strength
- Map clips to content framework
- Write tasks / prompts that reflect teaching tasks and teacher competencies
- Combine clips with (a) suitable task(s) → item(s)
- Specify expected responses
- Pilot test with few teachers through speak-alouds
- Collect responses from larger sample and score

What is Important for Choosing a Clip?

- (Mathematical) Content Ideas and or pedagogy
- Clip length
- Level of Self-containment

- Amount and type of information contained in the clip
- Number of events in the clip that might attract attention
- Stimulus strength (richness of the clip for eliciting comments)

What is Important When Writing a task?

- *"What do you notice about this teaching episode"*
- *"Please explain how the teacher and student(s) interact with the mathematics"*
- *"If you were a teacher in this situation, what mathematical question would you ask the student and how would that question help improve the student's understanding"*

  "Please explain which mathematical ideas the student in the video clip might or might not understand. Be specific."

→ Task specificity affects usable knowledge reflected in response

What is Important When Matching Clips to Tasks?

- Not all clips work well with all tasks and vice versa
- More general tasks easier to combine with more clips
- More specific tasks limited to fewer clips

- Subtle Interactions between clips and tasks

Basic Psychometrics

Items	Factor Loadings	Item Difficulty	Item Dicsrimination
Teacher Question 1	.49	.67	.52
Student Thinking 1	.41	.54	.43
Teacher Question 2	**.08**	**.38**	**-.02**
Student Thinking 2	.52	.51	.61

- Teacher Question 2 not a good indicator of measured trait (factor loading (.08) close to “0”; latent trait explains no variance in responses to item
- Teacher Question 2 does not discriminate (-.02) among respondents (item-total correlation near “0”; respondents who got this item correct or a high score have either a high or a low overall score)

What happened?

Why did Teacher Question 2 not work as well as the other Items?

Let's Take a Look at a Video Clip!

Clip Description:
In this clip 6th grade students are learning how to identify a patterns using geometric shapes. The teacher presents the first three shapes on an overhead and asks students how the pattern continues, identifying the rule.

Task:
"If you were a teacher in this situation, what is a mathematical question you might pose to the student(s) and how would the question help improve or extend the students mathematical understanding?"

What is Shown in the Video?

Math problem: Find the rule that describes the pattern of geometric shapes.

Relevant mathematical ideas:

- Patterns can be expressed using the recursive rule (find rule based on previous term): “add 1 side”

- Geometric shapes can be represented as numbers (number of sides)

- Recursive rule can be used to find next geometric shape (or number of sides of next geometric shape) and extend the patterns

Why did the Clip Seem Reasonable for Assessment Purposes?

- Reasonably short (about 3 minutes)
- Sufficiently self-contained
- Clear mathematical problem (find rule for pattern shown in geometric shapes)

- Some complexity, but focus stays on pattern problem
- Not too many competing events that might attract attention
- Good stimulus strength, there are a number of things to comment on

Why did the Task seem Reasonable?

"If you were a teacher in this situation, what is a mathematical question you might pose to the student(s) and how would the question help improve or extend the student's(s') mathematical understanding?"

- Can we write the rule using a mathematical expression or equation? ("n+1")

- Can we represent the pattern by writing a rule for finding the number of side for any shape (explicit rule)? What is important to consider when writing such a rule? (starting number, change from shape to shape, position of shape in sequence)

- How is the recursive rule (based on previous shape) different from the explicit rule (for any shape)?

- Does it matter with how many sides the pattern started?

Four Example Responses

Expected Response	Unexpected Response
I would ask them what the pattern would be if I removed the 2nd and the 4th figures. How would that change the pattern that Nate described? This would take the focus off each individual figure and promote student thinking about the changes from one figure to the other. What was the first pattern? What is the second pattern? How did the pattern change? Are patterns predictable? What if they were not? This line of questioning would promote students critically thinking about what makes a pattern and why a pattern is useful. OR If we were to create a table from this pattern, what would be included in the table? How would the table allow us to extend the mathematics in this lesson? This would help students connect the different representations of patterns, creating a table would link to graphing and writing an algebraic rule.	I would ask them what another term for a 4-sided figure would be. They need to have an understanding of the term quadrilateral, so they know that a square is not the only 4-sided figure. OR What is a polygon? That will help students understand the shapes better. How can you remember the names of the shapes? This will reinforce the prefixes. What are some other possible examples and/or non-examples of each shape? This will increase understanding of each polygon.

Making Sense of Teacher Responses

- How many responses focus on the review of polygons versus the pattern?
- How did the task affect teacher responses?
- What is the primary math? What is the primary learning goal in this clip?
- What do responses focusing on the pattern versus shapes indicate?

Is it a Good Video Analysis Task?

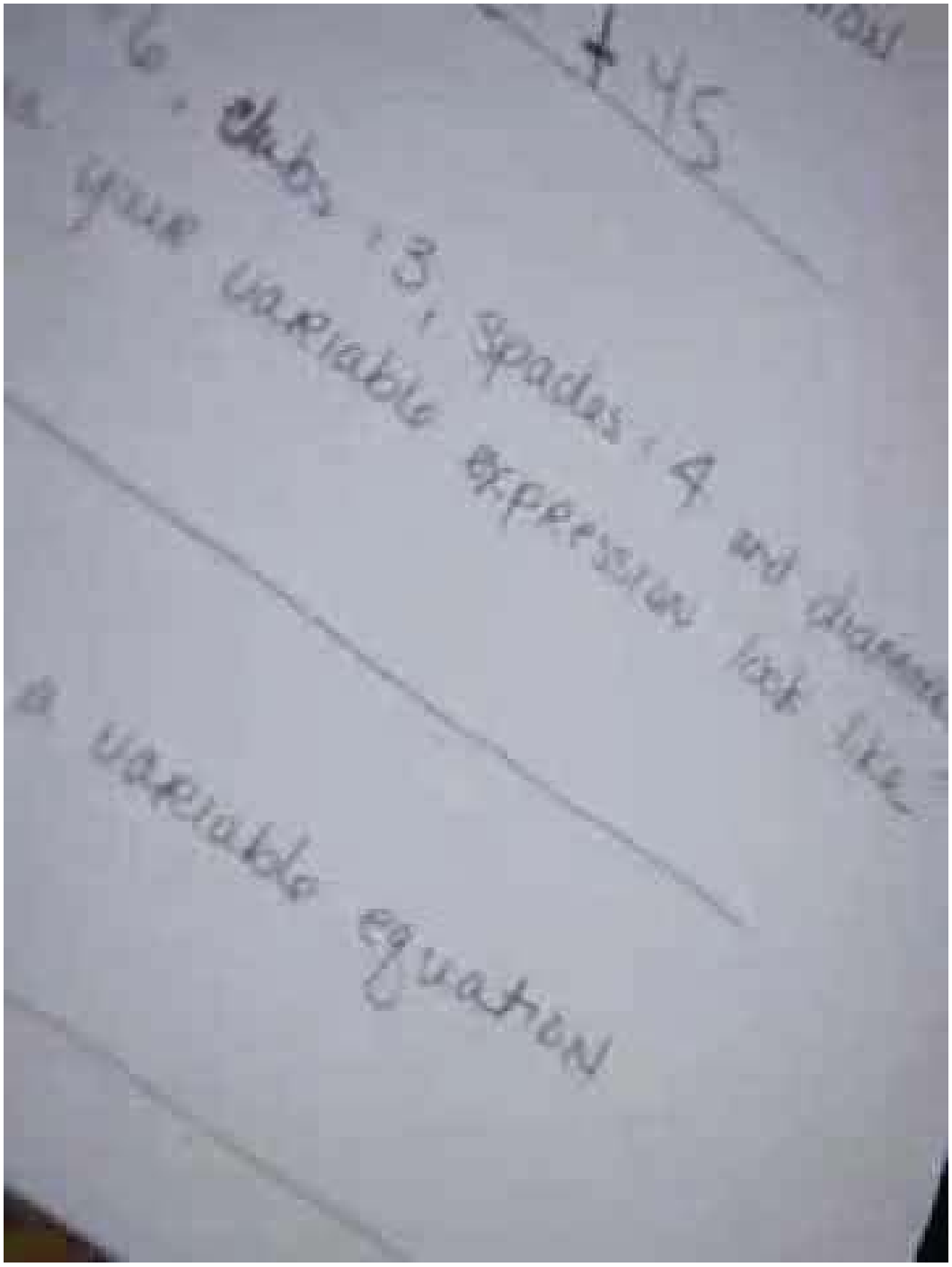
- For assessment:
  - Combine with more general task
  - Make task more specific
- For teacher preparation:
  - Possibly too challenging with review of polygons within pattern problem
- For teacher learning (PD):
  - Possibly good clip to explore content and student thinking around pattern & review of polygons within the problem

A Second Example: Hand of Cards

Clip Description:
In this clip students are learning how to write variable expressions based on the cards they were given by the teacher. The teacher uses one student's hand of cards as an example to write the expression on the board and then assigns students to represent their own hand of cards using an expression.

Task:

"Please explain how teacher and students interact with the mathematics and each other"


+45
6 clubs, 3 spades, 4 and diamond
your variable expression look like
a variable equation

It could have been a Good Video Task

- What is the variable in this scenario? Does 4h indicate 4 hearts or 4 times the value of hearts?
- Which values change and which values remain the same? Are the cards constant and the value of suits variable or are the values of suits constant and the cards variable.
- How does the problem context map onto the actual context in most card games? Do suit values change or do hands change?

→ Teacher responses might have relied too heavily on inferences about the task

What Makes a Good Clip and a Good Task?

- In addition to clip length, content or pedagogical focus, and level of self-containment …. **broadness / narrowness of the measured competency**

- For narrow competency

  - No/only minor ambiguity in depicted teaching episode

  (i.e., clear mathematical problem, teaching and learning goal)

  - Low(er) inference

  - Single primary mathematical idea

  - Narrow prompt

What Makes a Good Clip and a Good Task?

- For broader competency / expertise:

  - Some ambiguity in depicted teaching episode

  (i.e., more ambiguity in mathematical problem, teaching and learning goal)

  - High(er) inference

  - More than one important (mathematical) idea

  - More general prompt