

Using Video to Examine Mathematics Teachers' Professional Vision

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January 7, 2014

[www. professionalvision.org](http://www.professionalvision.org)

This research is supported by grants from the National Science Foundation (REC-0133900), the Edison Foundation, and the Arthur Vining Davis Foundations.

Video Resources for Mathematics Teacher Development



The Space of Possibilities

Media Tools

- Digital video library
- Multimedia-based
- Annotation tools

Nature of Video

- Own vs. Others
- Staged vs. Spontaneous
- Produced vs. Raw footage

Task and Social Setting

- Program Goals
- Type of Facilitation
- Individual vs. Group vs. Virtual Group
- Volunteer vs. Required

The BIG Questions

- Do teachers need to view video of their own classrooms?
- How can new digital tools support teacher learning via video?
- What kinds of experiences with video are most likely to promote productive changes in teachers' practice?

My focus for this presentation

- **What kinds of video are useful for teachers?**
- **What might video help teachers to learn?**
- **How might we help teachers collect video from their own classrooms?**

Video Clubs

Groups of teachers watch and discuss video excerpts from their classrooms



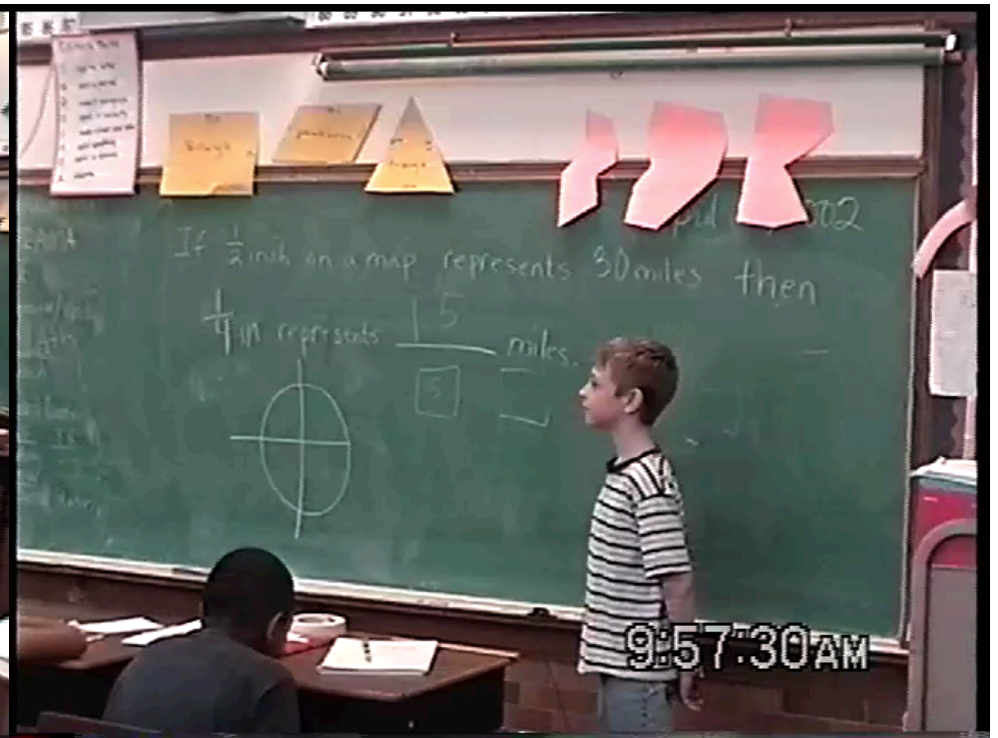
- **Media Tool**
 - ♦ Video viewed on a monitor
- **Nature of Video**
 - ♦ Participants' own classrooms
 - ♦ Spontaneous, raw video
- **Task and Social Setting**
 - ♦ Various designs possible

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What makes a video clip “interesting?”

If $\frac{1}{2}$ inch = 30 miles
Then $\frac{1}{4}$ inch = ? miles



Selecting video student thinking

Three dimensions of classroom video clips of student thinking about mathematics:

WINDOWS into
Student Thinking

Is there evidence of student thinking in the video clip?

DEPTH of
Student Thinking

Are students exploring substantive mathematical ideas?

CLARITY of
Student Thinking

How easy is it to understand the student thinking shown in the video?

Characterizing Video Clips

	Low	Medium	High
WINDOWS into Student Thinking	Little evidence of student thinking from any source	One or more sources of information exist, but little detail provided	Detailed information from one or more sources
DEPTH of Student Thinking	Task is routine for student; calls for memorization or recall on part of student	Some sense-making applied to routine task	Student engages in math sense-making, works on task at conceptual level
CLARITY of Student Thinking	Student thinking not transparent	Much of student thinking transparent, though some ideas may be unclear	Student thinking transparent; viewer sense-making not called for or single interpretation obvious

Research Design

Mapleton Video Club

- 7 elementary school teachers
- Met 1-2 times per month
- Viewed total of 26 video clips
- Goal to explore student thinking
- Researcher served as facilitator

	Low	Medium	High
WINDOWS	10	3	13
DEPTH	8	4	14
CLARITY	14	0	12

Analysis

- Video clips coded along 3 dimensions

Research Design

Analysis Part 2

- Discussions coded along 3 criteria
- Overall ratings assigned to discussions
 - ♦ Med/High \Rightarrow more productive
 - ♦ Low/Med \Rightarrow less productive

	Low	Medium	High
FOCUS ON STUDENT THINKING			
MATH SUBSTANCE OF DISCUSSION			
JOINT SENSE-MAKING			

Analysis Part 3

- Examined relationship between coding of video clips & corresponding discussions

High Depth...

Depth must be sustained for productive discussion

- ◆ “Blip” clips (short bursts of depth) not always pursued by teachers

	Halves	Fourths	Fifths
One	0.5		
Two	1.0		
Three	1.5		
Four	2.0		
Five			
Six			

Video Clip Excerpt

Teacher: Four halves is 2.0. Sasha?

Sasha: I did that Ms. Lempke, but I didn't put the zero at the end.

Teacher: Okay, will you fix it now and put the zero? You got it? So, what would come after the 2.0?...

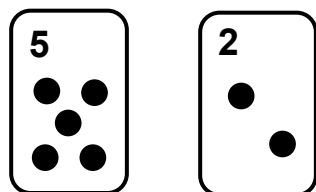
Student 2: How come the 3, it doesn't have the zero at the end?

Low Depth...

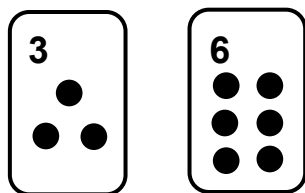
Under the right conditions, Low Depth can lead to productive discussions

- ♦ “Hmm...” Teachers may examine mathematics more deeply than do students in video

Player 1:



Player 2:



Video Club Excerpt

- Wanda: [I noticed] the way he was counting on the card in the later one....He was counting the groups....I think it was three times six.
- Daniel: So what was he doing?
- Frances: He was counting one, two, three, four, five, six. And then he was keeping track, so he knew he counted six one time, six the second time, six the third time.
- Daniel: Well, then he knows what the meaning of multiplication is.
- Wanda: Which is...exactly. I mean, that's the base.

Clarity...

Both high and low clarity clips can lead to productive discussions

- ◆ “What?” clips: What is the student saying?
- ◆ “Wow!” clips: That’s such an interesting method!

<i>Video Clip</i>				<i>Discussion</i>
<u>Windows</u>	<u>Depth</u>	<u>Clarity</u>		
High	High	Low	➡	More Productive
High	High	High	➡	More Productive

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Professional Vision

“Ways of seeing and understanding events that are answerable to the distinctive interests of a particular social group.”

– Goodwin, 1994

Teachers’ Professional Vision:

- Ability to perceive meaningful structure in classroom events

Video Clubs

- Can video clubs help teachers to develop their professional vision?

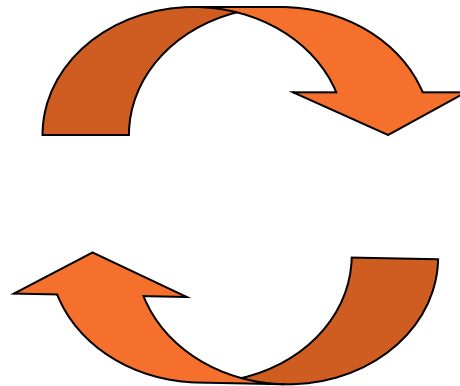


What is Professional Vision?

**Classroom
Interactions**



**Selective
Attention**



**Knowledge-
based
Reasoning**

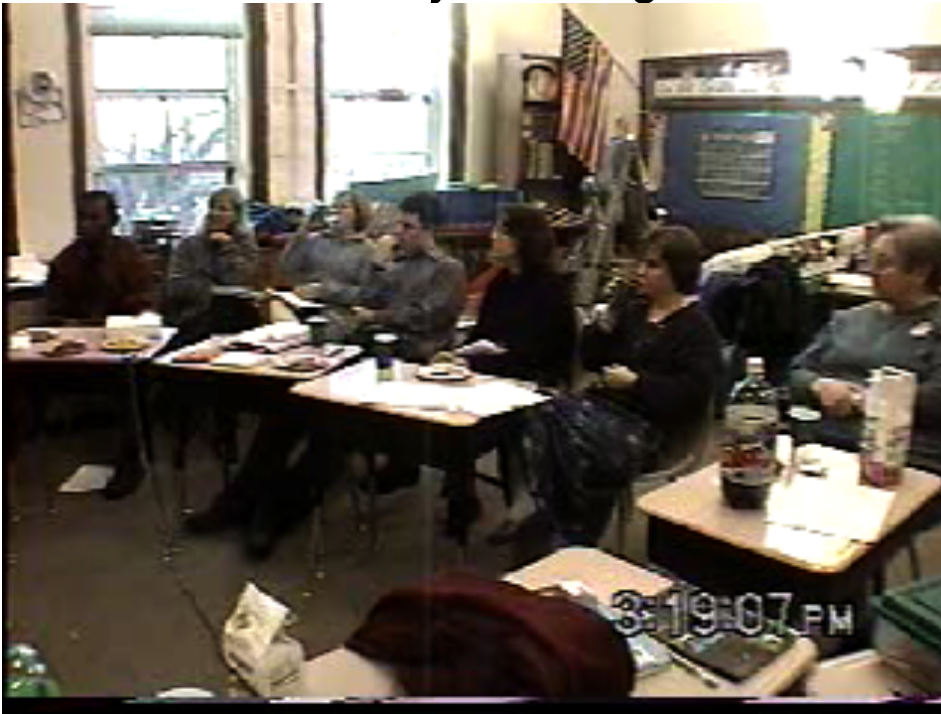
Mapleton Video Club

- 7 elementary school teachers
- Met 1-2 times a month across school year
- Researcher acted as facilitator
- Meetings videotaped and transcribed, and segmented into “idea units”

Selective Attention	Actor	Student, Teacher, Other
	Topic	Math Thinking, Pedagogy, Climate, Management
Knowledge-Based Reasoning	Stance	Describe, Evaluate, Interpret
	Strategy used to explore student ideas	

Learning in the Video Club

Early Meeting



“I like that they were using dry erase.”

Late Meeting



“We’ re just trying to figure out how she got five dollars.”

Learning in the Video Club

Development of Selective Attention

- A shift in *what* teachers noticed
- Initially, teachers raise issues of pedagogy and climate
- Across video clubs, teachers increase focus on student thinking

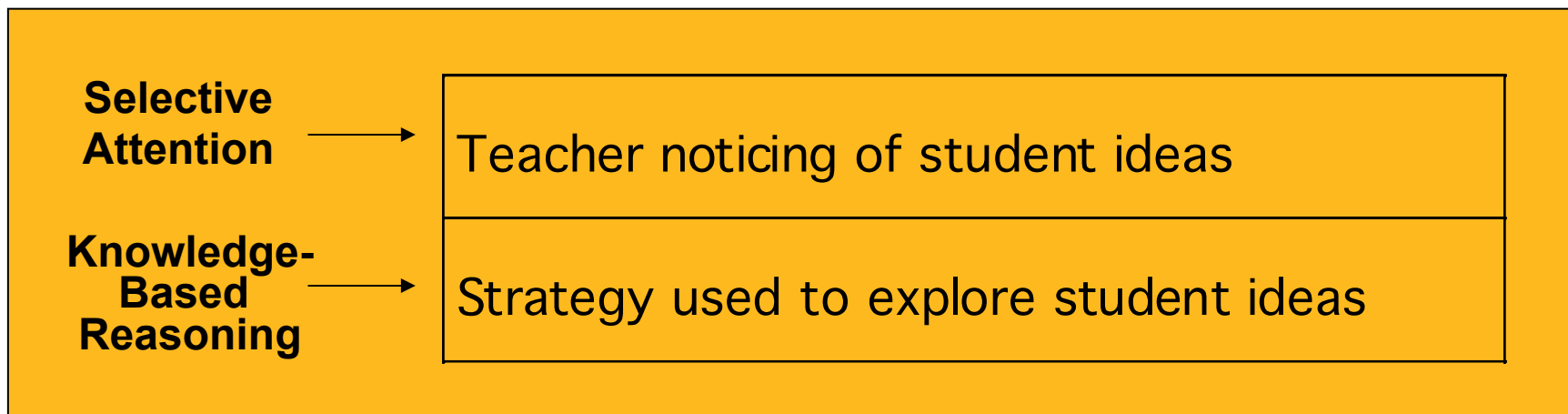
Learning in the Video Club

Development of Knowledge-Based Reasoning

- A shift in *how* student thinking was discussed
- From direct restatements to deep analysis of student ideas
- From description and evaluation to interpretation

Professional Vision in Instruction

- Do we see similar changes in professional vision during instruction?



Professional Vision in Instruction

- Observed teachers' instruction early and late in school year
 - ♦ 3 - 6 observations per teacher
- Analysis focused on whole-class discussions
 - ♦ Discussions segmented into 2-minute intervals
 - Identified confirming and disconfirming evidence of teachers "noticing" student thinking
 - Identified confirming and disconfirming evidence of teachers reasoning about student thinking
 - Evidence of reasoning about student thinking coded in terms of strategy used

Professional Vision in Instruction

■ Development of Selective Attention

- ◆ Student ideas become objects of inquiry for teachers

Early Observation

T: How do I find $3/8$? Nina?
 St: Umm...
 T: That's okay, Sam?
 St: Count to three.
 T: What do we do to find $1/3$?

Late Observation

"I'm interested, I've never heard of that."
 "I'd like to know how that came out, but I'm not sure I'm following it."

Teacher	Early Observation(s)			Late Observation(s)		
	N	Disconfirming Evidence	Confirming Evidence	N	Disconfirming Evidence	Confirming Evidence
Daniel	30	43%	77%	18	22%	94%
Drew	11	100%	27%	10	40%	80%
Elena	18	39%	67%	9	22%	89%
Frances	15	80%	7%	8	13%	88%
Linda	9	55%	55%	11	45%	100%
Wanda	20	80%	15%	28	2%	75%
Yvette	22	73%	9%	25	36%	44%

Professional Vision in Instruction

- Development of Knowledge-Based Reasoning
 - Teachers apply strategies from video club to instruction
 - Increased in-depth reasoning about student ideas

Early Observation

“No, that’s not the right answer. Does someone else want to try?”

“Ashley divided the hexagon into five triangles.”

Late Observation

“Stop. What do you mean ‘since there’s two things behind the line?’ ”

“Now these two approaches seem different.”

Teacher	Early Observation(s)					Late Observation(s)				
	N	No reasoning of student ideas	Restate student ideas	Explore meaning of student ideas	Generalize/synthesize student ideas	N	No reasoning of student ideas	Restate student ideas	Explore meaning of student ideas	Generalize/synthesize student ideas
Daniel	23	0%	100%	17%	0%	17	0%	24%	82%	47%
Drew	3	0%	100%	0%	0%	8	0%	100%	63%	25%
Elena	12	17%	67%	58%	0%	8	0%	25%	88%	63%
Frances	1	0%	100%	0%	0%	7	0%	43%	57%	0%
Linda	5	40%	60%	0%	0%	11	36%	100%	55%	9%
Wanda	3	67%	0%	33%	0%	21	5%	62%	72%	5%
Yvette	2	50%	50%	0%	0%	11	9%	73%	18%	0%

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Teacher-Captured Video

Approach
#1

A New Genre of Video Camera

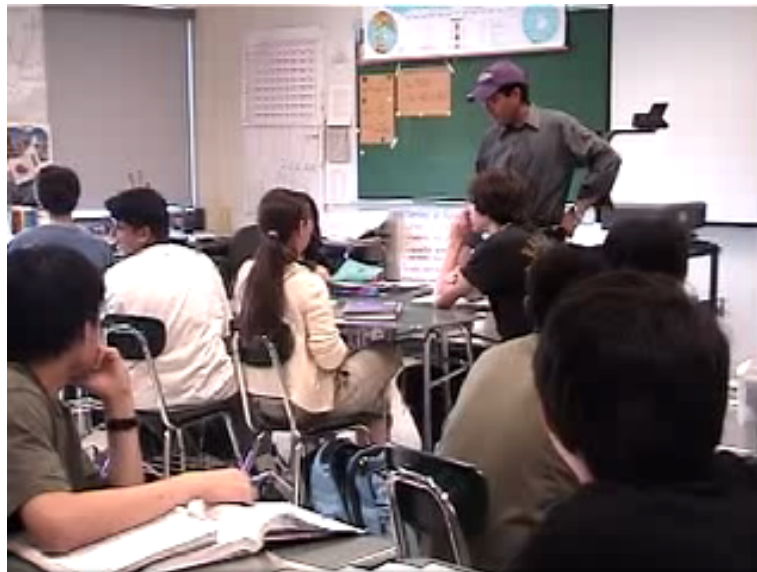
- Small, wearable video camera
- Offers teacher-perspective video
- Permits “selective archiving” of video
 - ♦ Constantly records but doesn’t save
 - ♦ Pressing the save button saves the previous 30 seconds of video



Teacher-Captured Video

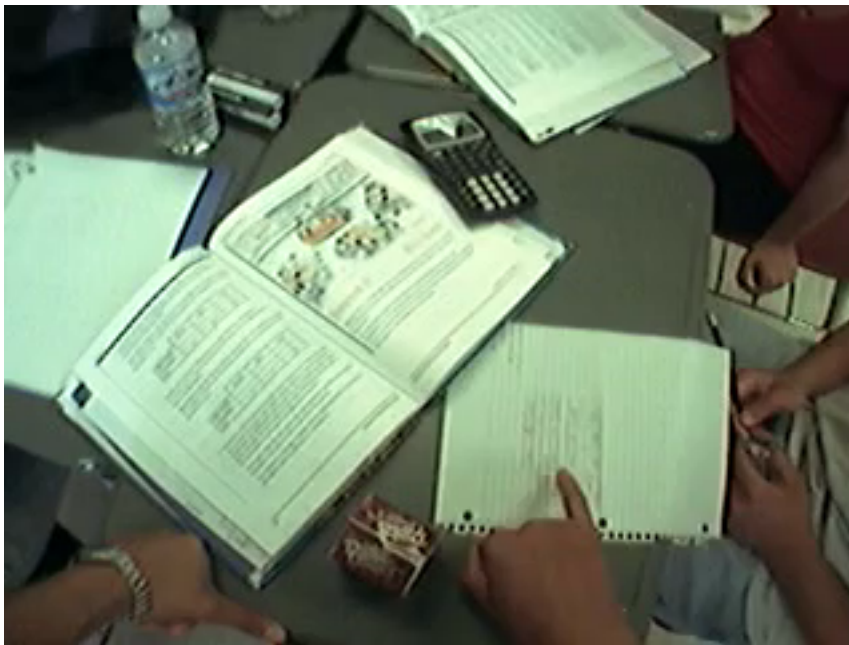
Approach
#1

- Teachers asked to capture “interesting moments”
- Window into “professional-vision-in-action”



What does this look like?

Teacher-captured clip



“How did you get the 75?”

Teacher watches clip



“That’s an example of where they were having trouble understanding...”

Tapping into Professional Vision

- Distribution of Clips
 - ♦ On average captured 18 clips per hour
 - ♦ Clips captured throughout the course of a lesson
- Teachers could generally recall why they captured a clip
 - ♦ Not creating post-hoc explanations
 - ♦ Not afraid to say when they did not remember

Tapping into Professional Vision

- Teachers' reasons were varied and complex
 - ♦ Related to different “topics” (management, climate, pedagogy, student thinking)
 - ♦ Focused vs. extended reflections
 - ♦ Concerned with whether events deviated or aligned with expectations

Tapping into Professional Vision

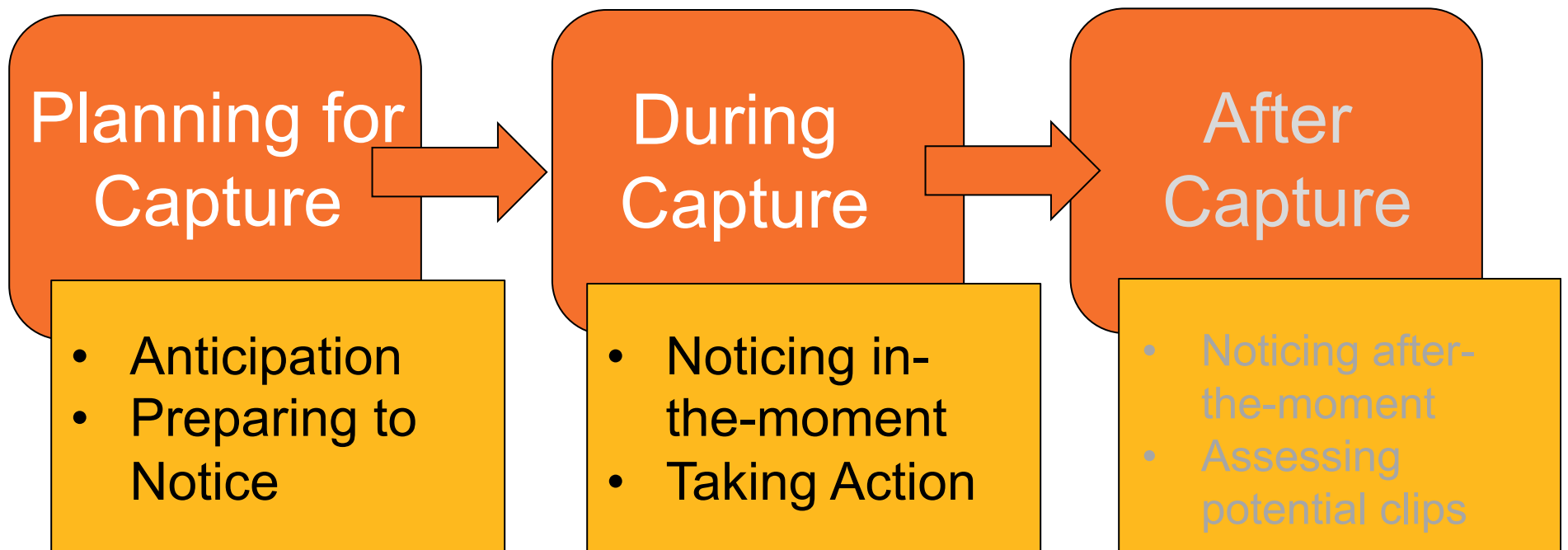
- Teachers “aware of awareness” (Mason, 2011)

“Pressing the button is important because there is this intense...meta-pedagogical thing happening... You really have to be in the moment to know that last 30 seconds was important. It is a lot different than watching it two days later as a whole chunk and not being able to really hone in on what [the interesting moments] were.”

Teacher-Captured Video

Approach
#2

- Use of small one-touch video cameras
- Teachers select excerpts of lessons to videotape prior to instruction



Teacher-Captured Video

Approach
#2

- **Tensions for teachers**
 - **Identifying & eliciting student thinking**
 - **Good clips vs. Good teaching**
 - **High vs. Low clarity**
 - **Breadth of ideas vs. Detailed ideas**

The BIG Questions

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