

# Analyzing Videos to Learn to Think Like an Expert Teacher . . .

## Early Childhood Mathematics Education Graduate Courses

Joon Sun Lee, Herbert P. Ginsburg, and Michael D. Preston

**JUST AS YOUNG CHILDREN GROW BORED** with mindless memorizing, rote repetition, and uninspired didactic instruction, so do future early childhood teachers in college classrooms. Both need engaging, challenging, intellectually exciting, and stimulating hands-on and minds-on experiences to learn in a meaningful manner.

In this article, we describe and discuss our experiences as university researchers integrating videos into courses on early childhood mathematics education. Through this novel approach to teacher preparation by the first two authors, master's students at two universities in New York City effectively work toward their certification in early childhood education of children birth through age 8.

The primary goal of the courses is to prepare reflective teachers who can use multiple sources of knowledge in making valid, professional judgments and decisions regarding early mathematics education. We expect our teacher candidates to not only understand the teaching and learning of early mathematics but also ably apply that knowledge in the classroom. To facilitate this, our teaching makes heavy use of videos in and out of the college classroom to expose students to rich, diverse learning and teaching situations involving children in real classrooms. Teacher candidates engage actively in observation, analysis, reflection, and decision making, and the video activities help them to learn to think like expert teachers.

### Development of the VITAL project

With support from the National Science Foundation (NSF), the second author, Herbert Ginsburg, has partnered with the Columbia Center for New Media Teaching and Learning (CCNMTL) on a project titled Video Interactions for Teaching and Learning (VITAL). The goal of this project has been to develop and distribute a resource that will enhance teacher preparation in early childhood mathematics education. The content and methodology of the resource are based on a series of mathematics education courses taught by Ginsburg at Teachers College, Columbia University. One of the special features of his courses was the integration of videos into learning activities in college classrooms and online.

The VITAL project aims to enhance and expand this video-based model so that it will be useful for a broader audience, particularly teacher educators who have limited acquaintance with early mathematics development and learning, but who nevertheless are responsible for the preparation and professional

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development of early childhood teachers in this subject matter. The project is currently undergoing pilot testing and refinement in collaboration with the early childhood education programs at Hunter College at the City University of New York. By May 2009, the VITAL resources will be ready to be distributed to early childhood teacher education programs nationwide. (For more information, go to <http://ccnmtl.columbia.edu/vital/nsf>.)

### Videos in the college classroom

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There are three common ways for teacher candidates to study the realities of teaching and learning in action: (1) conducting classroom observations, (2) watching videos, and (3) reading written descriptions. Among these three methods, we make extensive use of videos because we find that this practice is the most effective and engaging.

Compared to written descriptions, videos can capture richer, more detailed and complex events and situations of learning and teaching. As one teacher candidate noted, “It would be difficult to understand or imagine a lot of the subtle movements or facial expressions [of children] during reading, but the videos provided these images for us to interpret.” Another teacher candidate added, “Someone else’s words could create a different picture in my mind from what actually happened.” Watching the same videos gives students a common framework for sharing their reflections and engaging in discussion.

Compared to live action observations, viewing videos provides convenient access to diverse learners and teachers in a variety of contexts. Through videos, we introduce teacher candidates to a diversity of settings, including many types of math learning and teaching situations. Students watch three sets of video clips. One involves children’s mathematical behaviors during their play or other activities. A second set comprises the teacher’s flexible interviews with children regarding their thinking and problem solving of various mathematical problems (number, shape, pattern, and so on). A third set of videos shows early childhood teachers’ mathematics lessons or teacher interactions with children aimed at enhancing their learning of various mathematical content.

Viewing the videos does not take the form of simply watching an educational television program. Instead, course instructors lead the teacher candidates in active discussions about what they have seen. The instructors replay short excerpts, ask the teacher candidates what each is about, encourage their interpretations of the action, promote follow-up discussions of the interpretations, encourage different viewpoints and argument among students, and press them to cite the evidence they employed to arrive at a particular interpretation. Then, instructors might play the video again to clarify what the child actually said, reexamine the child’s hand movements or facial expressions, and the like.

The process of continuously examining the video content encourages teacher candidates to base their interpretations carefully on children’s actions and revise and refine the interpretations in response to new evidence. The video clips we use tend to be brief, sometimes shorter than one minute but typically no longer than two or three. One minute of rich video can generate a good 10 minutes of fruitful discussion. This type of experience helps students to think critically and creatively when approaching various uncertain and irregular contexts of teaching and learning in an actual classroom.

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## Analysis of videos online: Video Interactions for Teaching and Learning (VITAL)

We created an online learning environment, VITAL, through which students can access course materials and extend their classroom experience through online assignments outside of the college classroom. With these videos always available online, users can view (and review) them at places and times of their convenience as many times as they like and at their own pace. The three unique features of the VITAL online environment are: a multimedia syllabus, a video viewer, and an assignment workspace. (To watch a video demonstrating VITAL's primary features, go to <http://ccnmtl.columbia.edu/vital/nsf/environment.html>.)

### Multimedia syllabus

The online multimedia syllabus lists dates, topics, readings, and assignments. In the multimedia syllabus, videos supplement traditional readings. Each of the 15 course sessions is linked to assignments and a collection of video cases relevant to the given topic (see "Image of Multimedia Syllabus"). Students have not only ready access to videos but also tools for careful viewing, analyzing, and communicating their ideas on teaching and learning. Users can view these video cases in a video viewer (described in the next section) linked to the syllabus or proceed

#### Image of Multimedia Syllabus

The screenshot displays the VITAL online learning environment. The browser window title is "VITAL — DEVELOPMENT OF MATHEMATICAL THINKING". The address bar shows the URL: <http://vital.ccnmtl.columbia.edu/ccnmtl/app/vital3/courseHome.smcv?worksitid=122>. The page content is organized as follows:

- Topic:** Everyday number, part 1 (Sep. 21, 2006 – Sep. 27, 2006)
- Essay: Everyday Number, Part 1** (DUE: Sep. 24, 2006 | STATUS: In progress)
  - Instructions:** Watch these clips of TyQuashia and Harry. What do the children know (or not know) about number? Please support your thoughts with evidence from the videos and ideas from the readings. 350 words max.
  - Assignment Videos:**
    - [Conservation of mass: Which side has more soda?](#)
    - [Enumeration and cardinality with bears](#)
- Reflection: Everyday Number, Part 1** (DUE: Sep. 27, 2006 | STATUS: Not Started)
  - Instructions:** Please reflect on the past week's topic. In one or two sentences, write what you found interesting, surprising, or arguable, and why.
- Supplemental Videos:**
  - [Big Math: Bao II](#)
  - [Big Math: Count, Class & Store A](#)
  - [Cardinality with groups of objects](#)
  - [Comparing different amounts of bears](#)
  - [Conservation of equivalence \(2\)](#)
  - [Conservation of number with green cubes](#)
  - [Counting a line of balls](#)
  - [Counting a line of hot dogs](#)
  - [Counting high numbers: Overgeneralization](#)
  - [Counting with number chart](#)
  - [Counting, Zero & Distractions](#)
  - [Counting: circling back to twenty](#)
  - [Counting: configurations](#)
  - [Counting: indicating mistakes](#)
  - [Enumeration strategies: pushing aside](#)
  - [Production of an amount: Test of cardinality](#)
  - [Subitizing](#)
  - [Which line has more cubes?](#)
  - [Which side has more \(2\)](#)

directly to the assignment workspace (described below) to view the video cases in the context of a particular assignment.

### Video viewer

In the video viewer, users not only view and review video cases, but using a note-taking space, they can also select, annotate, and save parts of video clips (see “Image of Video Viewer”). These annotated and saved video segments can be repurposed later when the teacher candidates write a multimedia essay in the VITAL assignment workspace.

### Assignment workspace

The assignment workspace is where users work on their assignments. VITAL includes two types of assignments: multimedia essays and guided lessons. The multimedia essays are written in response to open-ended, exploratory questions on certain topics or concepts of early mathematics education. They consist of text combined with excerpts clipped from the digital videos, embedded as links in the multimedia essays.

Image of Video Viewer

The screenshot displays the VITAL Video Viewer interface. The browser window title is "http://vital.ccnmtl.columbia.edu - VITAL: Video Viewer - Enumeration and cardinality with bears". The page title is "Enumeration and cardinality with bears".

The interface is divided into two main sections:

- Left Section (Video Player):**
  - Header: "CREATE CLIP"
  - Video: A video player showing a man and a child at a table with red objects. The video progress is at 00:00:01 / 00:01:37.
  - Controls: "Set start:" and "Set end:" buttons, both set to 00:00:00.
  - Title: "Counting strategies"
  - Note: "Harry can successfully count the bears as long as he can control their position"
  - Tags: "Add/Remove tags" link
  - Save button
- Right Section (My Clips):**
  - Header: "My Clips"
  - Filters: "Show: All clips for this video" and "Group by: Clip Title"
  - Clips List:
    - Enumeration and cardinality with bears
      - Can't conserve (Modified: 2006/11/29-16:18:42)
        - Clip Time: 00:00:32 - 00:01:12
        - Tags: conservation, counting
        - Note Content: Harry cannot yet conserve -- even though the number has not changed, he does not assume and recounts after their positions have changed
      - Still won't assume the number has remained constant (Modified: 2006/11/29-16:23:48)
        - Clip Time: 00:01:17 - 00:01:29
        - Tags: conservation, counting
        - Note Content: Once covered up, he won't assume the number is the same even though he has already counted several times

## Image of Assignment Workspace

The screenshot displays the VITAL (Development of Mathematical Thinking) assignment workspace. At the top, the course title "DEVELOPMENT OF MATHEMATICAL THINKING" is visible, along with navigation links for "Course Home", "Course Library", and "Manage My Clips". The current topic is "Everyday number, part 1" and the assignment is "Everyday number, part 1", with a due date of "Sep. 24, 2006" and a status of "In progress".

The workspace is divided into several sections:

- Instructions:** A section for the student to watch clips and provide evidence for their ideas.
- Preview:** A section showing the student's draft essay content, with a word count of 97.
- Assignment Videos:** A list of video clips available for the assignment, including "Conception of more: Which side has more dots?", "Enumeration and cardinality with bears", and "Can't conserve".
- Video Viewer:** A window showing a video clip titled "Enumeration and cardinality with bears" featuring a young boy sitting at a table with red objects.
- Text Editor:** A section for the student to write their response, with a "Print" and "Edit" button.

**In creating their multimedia essays, candidates cite the selected video segments and explain how each segment relates to their ideas.**

To develop their ideas and select the most relevant moments in the video clips as evidence to support their ideas, the teacher candidates must watch and analyze the relevant video cases carefully and reflect deeply on the given questions, which are meant to synthesize the course discussions and readings. In creating their multimedia essays, candidates cite the selected video segments (as they would text from an article or book) and explain how each segment is related to their ideas (see "Image of Assignment Workspace"). Completed multimedia essays are "published" within the VITAL environment and thereby shared with the instructor and other students for critique and discussion.

In the guided lessons, as the word *guided* denotes, the structure of the lessons creates a more directed and focused experience. We developed the guided lessons used in the courses specifically to enhance teacher candidates' abilities to conduct observations of and interviews with young children. The teacher candidates are guided through a series of video clips of children in observation or clinical interview settings. The candidates are prompted to view a segment, stop the video, answer a guided question, and then repeat this same process with more information or additional footage, simulating the experience of interacting with a child.

## Implications for early childhood teacher preparation

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Teacher candidates were not only excited to see children's mathematical concepts that had been covered in their readings, but also found their video learning experiences particularly helpful in the following aspects.

### Observing closely and analyzing carefully

One teacher candidate's statement that she was "able to hone my observations and obtain a razor-sharp analysis" resonated with many teacher candidates. For teacher candidates with limited experience and knowledge, it is difficult to effectively observe all the complexity of learning and teaching on the spot or by watching a video once. Thus, to promote their deeper understanding of these complexities, they view the same video clips multiple times and learn to pay careful attention to both children's verbal and nonverbal behaviors and classroom cues and signals in diverse contexts.

***In Your Classroom:*** Videotape young children playing, for example, with blocks in the classroom. Watch the video carefully. What mathematical concepts are the children exploring? You may be surprised to discover the children's remarkable and rich mathematical interests and abilities.

### Making judgments based on evidence

Teacher candidates are encouraged to view (and review) videos with a careful and critical eye, not only to observe carefully but to think critically as well. To make valid pedagogical judgments and decisions in their classrooms, teachers should be able to interpret the key aspects of the mathematical learning and thinking that underlie children's observed behaviors using the multiple types of evidence they have gathered. In our classroom discussions and online assignments, we ask students to gather relevant evidence or facts carefully, to reason critically about what the evidence means, and to make informed decisions based on this analysis to foster a habit of critical thinking based on evidence.

***In Your Classroom:*** Based on your observation of the children in the video you made, assess and evaluate the children's learning and understanding of mathematics. Be sure to support your judgments with evidence from the video of specific children, not young children in general.

### Gaining insight into the thinking behind experts' practices

When we show videos of expert teachers or researchers interacting with young children, at each important moment we pause and ask teacher candidates a question, such as, "What would you have done in the same situation?" Then we present them with the experts' explanation as to why they did it the way they did. Many of our students found this experience to be helpful as they gained insights into experts' thinking processes and expanded their perspectives on teaching and learning in complex situations.

***In Your Classroom:*** Videotape your mentor teacher or an experienced colleague working with young children. Watch the video together, and ask the teacher to provide a running commentary on what he or she was thinking at the moment. Entering the minds of others is an interesting as well as informative experience.

### Becoming aware of one's own teaching practices through self-examination

For their final projects, teacher candidates plan, teach, and videotape their own math lesson or activity in an authentic classroom environment. Then they write multimedia essays about their own teaching, studying and annotating the video clips of their classroom performance. The students placed high value on this assignment as particularly “helpful (and humbling),” because “my perception of my teaching is quite different from how it actually comes across in context, seeing myself and analyzing myself in the footage.” Another teacher candidate stated,

I was reviewing the lesson, and I was able to analyze a child's reaction in a completely different light than I had at the actual time of the interaction. Going over the clip repeated times helped me reinterpret the response and realize she had actually gotten a concept that I had previously thought she missed.

***In Your Classroom:*** It may take some time to get comfortable with seeing yourself on screen, but it is worth your time and effort to videotape yourself in the classroom and watch the video carefully. It may give you an opportunity to reflect on your teaching and see if you, indeed, practice what you preach.

### Feeling encouraged to use technology in one's classroom and school

Integrating technology into college classrooms assists teacher candidates in learning and getting comfortable with the technology and, furthermore, helps prepare them for the incorporation of technology into their classrooms. Some teacher candidates had to spend time getting acquainted with the concept of editing and writing with video. However, all of our teacher candidates, regardless of their initial computer savviness, appreciated having technology in their graduate courses.

One teacher candidate proudly stated, “It was a pain at first. But once I got past the fear of learning a new subject, then I gained new skills, which may not have been achieved otherwise.” Another teacher candidate thanked the instructor for “demonstrating that technology and education can be combined effectively” and “for giving me the incentive and renewed enthusiasm for supporting technology as a means to seeing things from the children's perspectives and learning from them.”

***In Your Classroom:*** Use video technology in your own classroom. Share the videos you make with colleagues and with young children and their families as well. Children enjoy seeing themselves on screen and talking about their learning experiences. You will probably also find that parents can't get enough of seeing their children.

### Conclusion

Our experiences and those of our teacher candidates show that learning through videos in and out of college classrooms is more enjoyable, stimulating, meaningful, and effective than mere memorization of current theories or research findings. We believe that the use of videos to learn about learning and teaching will also be interesting and informative for classroom practitioners.

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