

Evaluation:

VITAL (Video Interactions for Teaching and Learning)

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Evaluation: <http://ccnmtl.columbia.edu/projects/evaluations/vital.pdf>

Project Description: Background & Purpose

Prof. Ginsburg's course, "The Development of Mathematical Thinking" at Teachers College, Columbia University, has a unique challenge in that it attempts to make aspects of developmental psychology accessible to a school teaching population. To make connections between his research-oriented content and teaching practice, Prof. Ginsburg employs an extensive collection of videotapes to illustrate specific phenomena and to model techniques adapted from psychology research that can be used in the classroom. In class, he guides students through videos that are linked to the weekly topics, using the time to highlight the important concepts, guide students' viewing of the videos, and encourage discussion and debate.

Students have consistently given high ratings to Prof. Ginsburg and his course. However, he had long desired specific improvements to the ways in which he engaged students both inside and outside of the classroom. Responding to these issues was a primary motivation for Prof. Ginsburg to work with CCNMTL. Some of these issues include:

Easier presentation of video clips (eliminate need for multiple VHS tapes)

Access to primary source videos outside of class

Once they had access, to provide students with opportunities to use the videos to develop personal, disciplined theories about children's abilities and the appropriateness of math instruction in the early grades

To address the third issue, the CCNMTL design process attempted to capture the course's teaching and learning goals in the VITAL environment. These were broken down as follows:

Teaching Goals	→	Learning Tasks
Promoting an understanding of the mathematics that young children know and can do, based on current literature as well as evidence from video sources		<u>Content</u> : Students will cite and provide examples of the concepts and theories of children's mathematical thinking at early stages of cognitive development.
Training teachers in skills adapted from developmental psychology research that can provide insight into the contents of children's minds		<u>Methodology</u> : Students will perform classroom observations, clinical interviews with children, and mathematical activities designed for the classroom
Providing an engaging style of professional development that empowers teachers to think critically and develop personal theories about		<u>Critical thinking</u> : Students will analyze and offer their own explanations for children's behavior, demonstrating critical thinking skills

teaching and learning	in addition to their understanding of theory and educational methodology
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Overview of the Evaluation Process

The evaluation examined three types of materials:

Student work, including weekly assignments, video lessons, and the final assignment

Commentary on the course, including weekly reflections students in the course and Prof. Rochelle Kaplan, guest observer from William Paterson University in NJ

Evaluation materials used throughout the semester, primarily student questionnaires on usability developed by the DR fellow

Population

There were 39 students enrolled in the course from numerous departments. The main categories were Curriculum & Teaching (Early Childhood Education and Special Education), Math/Science/Technology (Mathematics Education), and Human Development (Educational Psychology, Cognitive Studies, and Measurement & Evaluation). There were 29 M.A. candidates, 6 Ed.D., 2 Ed.M., and two “other.”

# of students	Departmental Affiliation
14	Mathematics Education
9	Early Childhood Education
6	Cognitive Studies
3	Special Education
2	Developmental Psychology
2	Educational Psychology
2	Instructional Technology
1	Measurement & Evaluation

Activities

Multimedia essays

VITAL enables students to (1) create, annotate, and save video clips in a personal workspace, and (2) embed their clips directly into the body of an essay by generating an html link to their video clips. This combination of tools allows students to cite concrete video evidence in support of their ideas, which in turn allows the instructor to verify whether students understand the concepts discussed in their essays.

For the course, students were required to use these tools to write multimedia essays in each of the first nine weeks. The format for all of the essays, excluding the ninth, was the same: (1) to connect the video content with the readings, (2) to identify any implications for classroom practice, and (3) to ask any questions that could be addressed in class. The essays were not to exceed 500 words. The course assistants graded the essays before lecture and provided a summary of key points and questions to Prof. Ginsburg so he could address them in his lecture.

In week 9, the essay format was altered to make the question more specifically tailored to the topic, which happened to be Pedagogy. Students were asked to watch a series of video segments from a preschool classroom and to identify and explain three examples of good teaching. This strategy produced a better quality response: essays were more coherent, and students better integrated their video clips into their essay content.

The final assignment for the course was an extended multimedia essay (3500-4000 words) that required students to describe a learning activity of their own design and to reflect upon it critically with citations from their own video and the readings. The project integrated the full breadth of the course content as well as important VITAL functionality. Students had to complete a multi-step process that involved designing and implementing a learning

activity based on theories of children’s mathematical abilities; using observation and clinical interviewing skills to assess the children’s learning; documenting the experience with digital video; and reflecting upon the results in a multimedia essay. The final assignment also necessitated a certain level of technological proficiency, since many students had to edit their videos (using iMovie) into a 10-minute segment that could be uploaded to the VITAL library.

Video lessons

VITAL contains several short “video lessons,” which are series of questions linked to specific video clips. Students are guided through each lesson and asked to submit a response to each question before moving on to the next. At any point in the lesson, they can click on a link to view all of their submitted responses on a single page, along with the associated video clips.

The video lessons were designed to train students in two techniques associated with developmental psychology research: (1) naturalistic observation, which is the practice of watching children engage in various activities and identifying behaviors that reveal specific kinds of thinking (mathematical and otherwise), and (2) clinical interviewing, which is a style of interviewing that aims to discover the assumptions and thought processes of subjects.

The video lessons use a scaffolded approach, requiring students to view a video clip or clips, write their reflections in a text space, receive expert commentary on the clip, and then return to the original clip and reflect once again. As the video lessons progress, the amount of expert commentary provided decreases, and students are asked to provide their own observations of the children and researchers in the videos and to back up their opinions with evidence.

Findings

A. Flexible access to course materials improved student learning

Appropriately enough, Prof. Ginsburg’s fundamental motivation for creating VITAL—providing students with access to the videos outside of class—turned out to be one of the most popular and instructionally meaningful features. Students were universally positive about having the ability to watch the videos wherever and whenever they chose. A large number of them had access to broadband connections at home or at work, so fewer students than expected used the labs at TC.

Students found the videos to be critical for understanding the course content and relating them to their own practice. Regarding the video content, one student wrote: “The videos helped to bring the readings to life.” In response to the question “How helpful were the videos in the digital library in terms of allowing you to understand the topic of the class each week?” the majority of students responded “very helpful.” (On a 1-5 scale where 1 was “very helpful” and 5 was “not helpful,” $M=1.33$, $S=0.53$.)

Students were also better prepared for lecture each week. When Prof. Ginsburg reviewed the videos during lecture, students were ready to discuss them in detail because they were already quite familiar with the content. They also had more time to formulate their own interpretations before class, which can be attributed to a number of possible variables: (1) flexible access to the videos and (2) tools for annotating video clips and writing essays, which prompted a certain level of analysis. Students also engaged in debate over interpretation with Prof. Ginsburg and their peers.

Additional student commentary about the videos:

“I especially like the videos that relate to concepts or specifics I read in the readings.”

“Because I compared articles and video clips I had many chances to learn.”

“Integrating readings and videos was very helpful for me to understand the material.”

“I learned a lot of technical conceptual vocabulary concerning mathematical concepts.”

B. Creating video clips helped students learn observation skills and course content, but embedding and citing the

clips in their essays was viewed as overly burdensome.

Students learned very quickly how to excerpt video clips and write essays. They rated the process to be “helpful” for understanding the course content. (M=2.05, S=1) The writing of essays was “helpful” to “somewhat helpful” for preparing to attend lecture each week. (M=2.33, S=0.98)

However, students found the workspace limiting for writing essays due to the small text area and lack of spell-checking and word-counting tools available in most word processors. As a result, most students wrote their essays in a program outside of VITAL and then pasted their text into the workspace. The disadvantages of this method were (1) having to leave VITAL temporarily in order to complete assignments, and (2) having to re-paste inserted video links from the end of the essay, since VITAL automatically places video links at the end of the text in the box, rather than wherever the user places his/her cursor.

This writing process ended up being prescriptive, since using an external editor was clearly the superior method in spite of its technical drawbacks. More significantly, the separation of essay-writing and video embedding made the citation of video an afterthought—a task to be completed in order to satisfy the instructor’s requirements rather than as a valuable tool for supporting theories. The essays were intended to be constructed around the video content, but, in the end, video content was added later, through a relatively tedious process that was divorced from the creation of the essays.

Nevertheless, because it was required, nearly all of the students embedded videos in their essays, and many students integrated the video content facilely, with explanatory text that demonstrated an understanding of the video clips’ meaning. Some students eventually abandoned the video embedding process in favor of text-only citations of video, explaining that embedding clips was too cumbersome and involved too many steps: clipping a video on one place, accessing it in another, inserting the link into the essay, and then moving the link to the appropriate place.

A significant number of students (14 of 39) felt that writing the essays was helpful. Students also appreciated the ability to view, excerpt, and annotate the videos in the library. However, they said that embedding the video clips in their essays contributed less to their learning, and may have even distracted from it. Some students had difficulty adapting to what they considered a new style of writing, and, for others, technical difficulties interfered with their learning:

“[Making video clips] was helpful in that it clarified examples from the readings. It also made the concepts very concrete. However, all the steps to embed them in the article were time-consuming and added nothing to my learning.”

“I found viewing the videos and taking notes to be very helpful. The process of linking the reading in the essays also helped me to arrange my thoughts. I found that saving video clips and then trying to get them in the right place in my essays to be very distracting. Every time it paused to save it took a long time for the video to restart, and I felt that placing them in the essays did not help much to my understanding”

“It is a new writing process for me to include video references. Therefore, I am not completely comfortable with this additional layer to my writing.”

The essays were graded to reflect the integration of content, specifically, how well the students constructed their understanding of the weekly topic around the videos and readings. A few well-placed video citations—even one or two—were generally adequate if the essay was thoughtfully written. The more adept students integrated their video content as they would use text citations, with their own text framing the citation in order to demonstrate understanding and relevance. On the more advanced end of the spectrum, students would integrate their video citations directly into the body of their essays, carefully explain the video content, and provide analysis. On the other end of the spectrum, students would make video citations but not follow up with adequate explanation or analysis, leaving the reader to guess at the connection being made. However, explicit instructions about using citations in essays were not provided to students, so there was not a uniform expectation of what students would

produce.*

C. Assignments and reflections created an ongoing dialogue between students and instructor

An unanticipated, positive outcome of the intervention was the development of an asynchronous dialogue between Prof. Ginsburg and the students. This dialogue was conducted both online and offline and followed a sequence that was repeated in each week of the course:

Students complete an assignment
 Prof. Ginsburg gives a lecture that incorporates his feedback on the assignments
 Students reflect on what they have learned during the week

The result was highly motivational for the students, who knew that their work and feedback would be read and possibly addressed during lecture. Prof. Ginsburg also benefited, as he had a better sense of what students understood (and did not understand), as well as their unique concerns as representatives of different fields. He was able to respond more immediately to specific concerns and to revise his own course in response to how different readings, videos, and lectures were received.

D. Video lessons were more suited to clinical interviewing than observation

The video lessons were designed to teach observation and interview techniques adapted from psychology research. There are a number of challenges inherent in this goal: (1) to select appropriate videos and write questions that focus attention on the technique being studied, (2) to achieve the intended learning outcome of understanding the technique, and (3) to make the technique relevant for classroom practice, not just the research lab.

The observation lessons tended not to work in the latter sense. The task chosen for the lesson was coding a sample video of two children playing with blocks, first coming up with the codes and then using them to describe the observed behaviors in the video. While this task did focus students' attention at a granular level, only a few students saw its relevance to their practice or felt that their performance improved with repeated watching. In truth, students had already been learning to observe for several weeks by watching the videos in the library and clipping them for their essays. The clipping and annotation tool is probably better for teaching students to observe, and additional video lesson work may seem redundant or overly technical.

Examples of student commentary on the observation lessons:

“I learned how to code or possibly code and identify mathematical concepts during informal games.”
 “I learned a lot about data coding and observing children from a new perspective.”
 “I enjoy the process of learning more each time I watch the clip again.”
 “It was a little bit too much; I didn't feel I have the background in math knowledge to get the most out of it.”

The clinical interview lessons were more successful than the observation lessons, but the instructors felt that their structure and content could be improved (the first level of challenge described above) to make each lesson's intent more clear to the student. After the course, the interview lessons were re-written to focus more explicitly first on the

* More detailed evaluation materials, which examine the work of a sample of students from the course across four assignments, are available that provide for a more thorough analysis of the multimedia essays. This analysis reveals that students employed a variety of styles and levels of analysis in their essays, and provides some hypotheses for the breadth of results. There is also a discussion of the use of the video clipping tool, which decreased as students progressed in the course, probably for the reasons discussed above. (Please contact CCNMTL, if you wish access to these materials.)

subject (the child), and second on the interviewer. A third video lesson was created to guide the student through the following sequence of actions:

- Observe behavior and form a hypothesis
- Establish an alternative hypothesis
- State evidence to support your hypotheses
- Explain how you would retest

Prof. Ginsburg felt that this model accurately separated out the steps involved in conducting an interview, and that by understanding each step in isolation, students would gradually internalize the process and improve their own interviewing technique. The impact of this strategy will be tested in future implementations of VITAL.

Recommendations

A. As new videos are developed, it may be valuable to make more explicit connections between the visual and written content, to allow students to watch the specific experiments and tasks described in the readings. Prof. Rochelle Kaplan (William Paterson University) also made the following observation about the video content:

“I’d like to work on building a detailed developmental sequence of observations and experiences that would help teacher-students get a clear idea of how symbol systems for mathematics develop from the preschool period through early school learning. I think the informal symbol systems that children use need to be highlighted and understood as the basis for making sense of formal symbols in kindergarten through second or third grade. Again, we would need additional videotapes for this, particularly on the informal constructions that children use.”

We might also expand the digital library as per the original specification, in which the library also included text assets such as journal articles, definitions of key terms used in the course, and samples of mathematics curricula.

B. The many steps involved in making clips and writing essays should be consolidated into a simple, linear process that does not overly tax the student while they are concentrating on the course content. For example, video clips created in the digital library should be made accessible without having to leave the library and find them in the workspace. The workspace should be simplified, and the free text area for essay writing should be larger and incorporate some basic word-processing features, to allow students to format their work and perhaps perform other tasks, such as spell check. Video links should be inserted into the essay wherever the user designates, rather than only at the end. Finally, students should be trained in the functionality of VITAL as well as given guidelines for essay writing and video citation, so that the instructor’s expectations are more transparent.

C. In the second version of VITAL, student reflections were added to the syllabus as a required essay to be submitted via the workspace. In a future version of VITAL, it would be interesting to try to capture this dialogue entirely online, in addition to Prof. Ginsburg’s response to assignments in lecture. Some form of threaded discussion local to particular topics or assignments would allow students to continue the dialogue after lecture and allow for greater interaction among peers.

D. The video lessons have already been redesigned according to feedback from the first implementation. Lessons specific to observation should probably be discontinued as lessons, and a new assignment format closer to the multimedia essay should be created. This format might incorporate aspects of the Deconstructor tool, which enables users to capture frames or short clips of video and code them. Newly developed lessons in clinical interviewing should be evaluated in future implementations of VITAL in order to test whether the design goals are met on each level.

E. A research framework for VITAL was developed for the proposal to the National Science Foundation, and the redesigned VITAL will be evaluated according to that framework. Generally speaking, future studies of VITAL would benefit from using control groups and pre- and post-testing in order to measure the impact of the intervention.

Other experimental manipulations corresponding to specific learning goals should be developed in order to prove or disprove specific hypotheses about learning in the context of each task. Specific research questions should be developed well in advance of the course so that researcher roles can be well defined and materials prepared well before they are needed.

Possible paths for future research:

- Compare performance on a video analysis task between VITAL and non-VITAL groups:
 - Digital library and no digital library
 - Workspace and no workspace
 - Video lesson and no video lesson
- Compare content mastery (understanding the key concepts) between VITAL and non-VITAL groups
- Test for a relationship between students' academic background and their performance on specific tasks in the course
- Test for a relationship between essay and video lesson performance and final project performance
- Test for a relationship between students' analysis of materials and their use of evidence, video clipping, different students, different assignments; specifically, which variable is the best predictor of critical thinking?