

Participants

Senior Personnel

Frank Moretti, Ph.D. (Principal Investigator), Co-Founder and Executive Director of the Columbia Center for New Media Teaching and Learning (CCNMTL), Columbia University; Professor of Communications at Teachers College, Columbia University.

Herbert P. Ginsburg, Ph.D. (Co-Principal Investigator), Jacob H. Schiff Professor of Psychology and Education at Teachers College, Columbia University.

Rochelle Goldberg Kaplan, Ph.D. (Investigator), Professor, Department of Elementary and Early Childhood Education at William Paterson University.

A. Maurice Matiz (Senior Personnel), Co-Founder and Director of Technology of the Columbia Center for New Media Teaching and Learning (CCNMTL), Columbia University.

Peter Sommer (Senior Personnel), Director of Education of the Columbia Center for New Media Teaching and Learning (CCNMTL), Columbia University.

Additional Personnel

Janet Eisenband (Graduate TA), Ph.D. Candidate, Teachers College.

Susan Jang (Graduate TA), Ph.D. Candidate, Teachers College.

Anita Kumar (Graduate TA), M.A. Candidate, William Paterson University.

Michael Preston (Graduate TA), Ph.D. Candidate, Teachers College.

Rae Brosnan (Project Manager), M.S., Indiana University

Partner Organizations

Teachers College, Columbia University: Facilities; Collaborative Research; Personnel Exchanges

William Paterson University: In-kind Support; Facilities; Collaborative Research; Personnel Exchanges

Other Collaborators

Arthur Baroody, Ph.D. (External Reviewer), Professor of Mathematics Education at the University of Illinois at Urbana/Champaign.

Cornelia Brunner, Ph.D. (Formative and Summative Evaluator), Associate Director, Center for Children and Technology, Education Development Center, Inc.

Goals & Outcomes

The project's main goal is to develop and distribute a resource that will enhance undergraduate- and graduate-level programs in early childhood mathematics education. This in turn will address the national need for improved instruction in early childhood mathematics. The content and methodology of the proposed resource are based on a series of mathematics education courses taught by Prof. Herbert Ginsburg (Co-PI) at Teachers College, Columbia University, and by Prof. Rochelle Kaplan (Investigator) at William Paterson University. These courses employ learning activities using brief video clips (or "cases") to help students (prospective and practicing teachers) in undergraduate and graduate courses analyze the development of young children's mathematical thinking and learning, and critically examine early mathematics instruction. The proposal's specific goals are to enhance and expand this video-based model so that it will be useful for a broader audience—in particular, mathematics education professors and early childhood education professors who do not have background in the psychology of children's mathematical thinking and learning, and who have limited acquaintance with early mathematics education, but who nevertheless are responsible for the preparation and professional development of early childhood mathematics teachers. To make the model accessible and feasible for this broader audience of professors, and hence for their students, the consortium proposes to develop a learning environment, VITAL. This resource consists of a curriculum, a digital library, and videos, contained within an online community workspace. Already in prototype, VITAL will be completed by CCNMTL, a service enterprise at Columbia University directed by Dr. Frank Moretti (PI). CCNMTL has extensive experience in creating new tools for teaching and learning and in researching their implementation. By the end of the grant period, the resource will be ready to be distributed to teacher-education programs nationwide.

Activities & Findings

Course Preparation

Professor Ginsburg and graduate TAs Janet Eisenband, Susan Jang, and Michael Preston at Teachers College, along with Professor Kaplan and her TA Anita Kumar at William Patterson University, offered graduate courses at their respective institutions during the Fall 2004 semester as described in the grant proposal. These courses focused on the development of mathematical thinking in early childhood and used the online prototype version of VITAL at Teachers College and a version on CD-ROMs at William Patterson University. The purpose of using these resources was to create new possibilities for study and critical analysis in a context that allows for measurement of student learning

gains. As part of offering the courses, Professors Ginsburg and Kaplan developed detailed descriptions of the learning goals and expected outcomes and have begun to develop specific assessment strategies to measure the stated goals.

The faculty and TAs considered a number of issues in developing the Fall 2004 course:

- * How best to introduce students to the concepts presented in the course?
- * How many and which specific readings provide students a thorough and expansive review of the subject?
- * How many and which videos illustrate and inform students of the subject and its complexity?
- * What kinds of activities best promote active student learning?
- * What are the most appropriate forms of assessments?
- * What activities best support students in the transfer of learned concepts to teaching practice?

Building from similar courses offered by Professor Ginsburg in past semesters, the team refined the course, choosing primary source materials from both Ginsburg's and Kaplan's extensive video libraries. As outlined in the work plan for the project, formative weekly assignments and a final summative assignment, all using VITAL, were devised to measure students' progress. The faculty and TAs are using students' required weekly essays (formative assessments) and reflections and final papers (summative assessments) to determine VITAL's impact on learning. The reflections and student assignments offer two distinct and important sources of data about student learning.

Throughout the semester, the team met weekly to share reflections on the design of the course and on students' progress, noting effective methods of instruction and identifying resources to keep or revise in future course offerings. As a result of these sessions, the faculty and TAs have identified key improvements to the course. Importantly, the team will redesign VITAL in response to the classroom experience, making modifications necessary to scale it to undergraduates and to programs with mixed curricula and disciplines. The changes will include the following:

- * Changes to in-class lectures, such as having students apply newly learned theories and concepts to previously analyzed video segments (examining previously viewed video segments in a new way based on new content).
- * Changes to assignments in VITAL. For example, allow students to choose one of three assignment types based on the weekly readings and video studies: (1) explain a belief you held that changed due to the readings/lecture/video; (2) write about a disagreement you have with readings/lecture/video; (3) suggest ways to apply theory to practice.
- * New video segments to capture for use in VITAL in addition to existing material in the video library.
- * Revisions to make the course appropriate for undergraduates and in programs with

mixed curricula and disciplines. For example, design higher-order assignments for graduate students that require them to deepen their understanding of course material based on the advanced work they are doing in their programs of study.

The team is already designing graduate and undergraduate courses to be offered in Fall 2006, including the development of new video, new pedagogical strategies, and new assessment techniques.

Content Development

As mentioned, Professors Ginsburg and Kaplan have extensive video libraries of primary source material to illustrate complex concepts and processes to students. Over 300 video segments have been digitized, yet some video remains to be processed. Further, to date, the team has identified 45 key learning situations and interactions with children to capture. Ten video shoots have been arranged thus far, and various activities are scheduled to be taped at three local NYC schools. In keeping with the proposal, the team plans to record approximately 50 hours of video (containing 150 clinical interviews and 20 classroom observations) with the potential for more video to be captured. Having worked closely with school administrators and teachers to secure their support and parents' approval, and having shot over 16 hours of preliminary test footage (not part of the 50 hours), the team is prepared to gather the needed video. The following is a brief excerpt from the list of new content to capture on video:

Existing topic in syllabus: Concepts in Infants and Little Children

Existing source title in VITAL: Interview, Infant Using Rings

Action recommended: Recreate

Changes recommended: Conduct interview with better shots of dots on the board

Existing topic in syllabus: Counting, Cardinal Numbers, Shape and Space

Existing source title in VITAL: Interview, Counting

Action recommended: Recreate

Changes recommended: Conduct interview with the same number of objects in different configurations; capture the child using the strategy of pushing aside objects in order to count them

Existing topic in syllabus: Everyday Mathematics

Existing source title in VITAL: Interview, Addition task

Action recommended: Recreate

Changes recommended: Conduct interview with more obvious links to equivalence and more/less

Existing topic in syllabus: Concepts in Infants and Little Children

Existing source title in VITAL: Interview, Piaget Conservation

Action recommended: Recreate

Changes recommended: Conduct interview with variations of the task: 1) string attached to object; 2) use candy

The team plans to augment the course through the selection of additional journal articles, the refinement of syllabi, and extensive lesson plans. Expert commentary will be paired with select video that students will view outside of class. The team will examine the usefulness of the commentary in future offerings of the course to determine whether commentary should accompany a greater number of video selections.

Software Development

An enhanced prototype of VITAL was developed to introduce an administrative feature; this addition allows faculty and TAs to create new courses, assignments, and material in VITAL. This development greatly enhances VITAL's usability, as it minimizes the need for support and oversight by skilled technical professionals. While not a "point-and-click" application, VITAL now allows greater flexibility to faculty in managing their own courses. This improvement is crucial in ensuring VITAL's adoption and use by faculty at institutions beyond Columbia University and Teachers College: faculty must be able to adapt VITAL to the unique needs and structures of their courses, not to mention the requirements of the technical infrastructure at their home institutions. The administrative functionality in VITAL allows faculty to tailor VITAL to the specific needs of their working environments.

To achieve the goal outlined in the proposal of building a community workspace and improving the functionality of VITAL, over ten formal discussions and brainstorming sessions with the technical and educational teams were held. These sessions, along with focus groups, interviews, and student feedback surveys, have equipped VITAL designers and developers with an array of suggestions and improvements to the functionality and usability of the tool. In partnership with the faculty, the designers will prioritize the suggestions and improvements into three categories: high, medium, and low. High will include features that must be changed or added because of their significance to the technical operation and pedagogical utility of VITAL; medium will be features that were not initially identified in the project but that would augment the usability and usefulness of VITAL; low priority items are those that would improve VITAL but that are not integral to its use and success. The robust list of improvements and suggested new features will inform the developers of the technical specifications required to program the changes. As with the development of the curriculum and course material, the team will continually reflect on the type and quality of the changes being made, revising their initial

ideas when necessary to achieve the best solution. Specifically, the existing VITAL tool will undergo changes to its core construction, database, and graphical user interface to provide a better experience for student and faculty users.

Further, the team is examining issues surrounding the implementation of VITAL at institutions outside of Columbia University and Teacher's College. The technical complexity of VITAL (namely, authenticating users via the institution's user identification system) requires careful consideration of how it will integrate with complex enterprise systems at partner institutions. For this reason, the CCNMTL programming team is investigating the potential integration of VITAL with the open-source collaboration and learning environment Sakai. As part of the Open Knowledge Initiative (OKI), Sakai adopters will use standard methods for bridging Sakai with enterprise systems. Sakai is expected to have widespread appeal to institutions across the world in part because of the standards it follows, and CCNMTL anticipates many of our VITAL partners to adopt Sakai. Developing VITAL as part of Sakai may ease its installation and use at our partner institutions.

Quality Assurance and Content Review

Together with Cornelia Brunner, Associate Director, Center for Children and Technology, Education Development Center, Inc., Professor Ginsburg and the TAs are examining how best to evaluate VITAL's ability to deepen students' critical thinking. Although the evaluation will not be conducted until Fall 2006 and beyond, the team is analyzing a number of strategies to determine how best to approach and conduct the evaluation of VITAL.

In considering the evaluation methodology, the team must take into account the ways in which VITAL will be used in other institutions and by faculty in diverse but related fields, such as developmental, cognitive, and educational psychology, teacher professional development, and clinical practice. To understand how faculty in these departments would approach, use, and evaluate the course material and VITAL, the CCNMTL and Teachers College team convened our faculty partners from other universities on January 7, 2005. Attendees included the following participants:

VITAL NSF PARTNER ATTENDEES

Arthur Baroody, Professor
University of Illinois
Curriculum & Instruction

Cornelia Brunner, Associate Director
Center for Children and Technology

Beth Casey, Professor
Boston College
Lynch School of Education
Department of Counseling, Development and Educational Psychology

Susan Golbeck, Associate Professor
Rutgers University
Graduate School of Education

Carole Greenes, Associate Dean
Boston University
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Research Development and Advanced Academic Program

Rochelle Kaplan, Professor
William Paterson University
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Deborah Najee-ullah, Associate Professor
Georgia State University
Department of Early Childhood Education

Roberta Schorr, Professor
Rutgers University
Department of Education and Academic Fund

Joon Sun Lee, Assistant Professor
Department of Curriculum & Teaching
Hunter College School of Education

VITAL NSF COLUMBIA UNIVERSITY ATTENDEES

Frank Moretti, Professor of Communications
Teachers College, Columbia University
Executive Director
Columbia Center for New Media Teaching and Learning

Herbert Ginsburg, Professor
Teachers College, Columbia University
Human Development Department

Ted Bongiovanni, Associate Director for Production

CCNMTL

Rae Brosnan, Senior Educational Technologist, VITAL Project Manager
CCNMTL

Kendra Crook, Outreach & Communication Manager
CCNMTL

Janet Eisenberg, Graduate Teaching Assistant on VITAL Project

Susan Jang, Graduate Teaching Assistant on VITAL Project

Michael Preston, Associate Educational Technologist
CCNMTL

The day-long meeting at Columbia resulted in a wide range of tangible and intangible outcomes: eliciting ideas from faculty partners about how VITAL could augment their teaching, identifying the curricular approaches and needs of partner institutions, and building momentum and excitement about the project. Such strong beginnings to the long-term partnerships brought about by the grant will serve the partners and development team well.

To foster ongoing support and involvement of the institutional partnerships, CCNMTL is developing an online project workspace in which faculty can grapple with features, issues, and developments of the course and resources. As a first step, the faculty will submit the course goals and syllabi of their existing courses, will comment on video segments from Professors Ginsburg and Kaplan's libraries, and will discuss current research and professional literature they find relevant and thought-provoking to the project. The principle investigators believe that this forum will instill a sense of ownership and dedication to the project by the partners. By fostering weekly or monthly contributions by partners through this workspace, the project will remain fresh and faculty energized by the momentum and timely work being accomplished.

Finally, the faculty, TAs, and development team have made numerous presentations about VITAL to local and area audiences. Professor Ginsburg, Janet Eisenband, Susan Jang, and Michael Preston will present a paper about VITAL at the annual meeting of the American Educational Research Association (AERA) in April 2005. The team is awaiting approval of a proposed VITAL paper for ED-MEDIA in June.

Project Management

A number of other activities related to the advancement of the project have occurred since

the inception of the project. Namely, key staff have been hired and tasked to work on the project, including a project manager and a video production assistant. As the designers identify new features and improvements of the VITAL software, CCNMTL will hire and task programmers with implementing these enhancements.

Using the CCNMTL custom-created project management tool, the project manager continually assesses the progress of the project, noting completed milestones and assigning new tasks to project personnel. Personnel report their progress using the tool, and the project manager verifies the completion of the task. In this way, the entire team – from senior personnel to staff – remain abreast of the completed, current, impending, and future tasks.

Summary of Key Milestones Reached

Course Preparation and Content Production

Designed curricular activities:

- Defined learning purposes and outcomes for graduate courses
- Selected primary source materials
- Devised assessment strategies

Identified and selected resources:

- Digitized video clips
- Identified and digitized journal articles
- Created and developed lesson plans
- Captured expert commentary

Developed new resources:

- Identified video content mapped to tasks and syllabus

Software Development

- Defined technical specification to inform programming tasks
- Modified functionality of student workspace
- Constructed the administrative component
- Constructed the user database

Quality Assurance and Content Review

- Identified evaluation measures and methodology
- Convened partner institutions
- Presented progress and current findings

Training and Development

Technical staff at the CCNMTL have provided extensive training and support to

Professor Kaplan and Anita Kumar on videotaping material for the VITAL digital library. This support includes advice on technical specifications and equipment, hands-on training for using the equipment, and email and telephone support for troubleshooting.

The Graduate TAs have received valuable professional development from their work in the classroom, their weekly meetings with fellow TAs and the project faculty, and their participation in executing the grant.

Outreach Activities

As the team is in the development phase of the project, we have focused our efforts on developing VITAL's functionality. As we finalize the technical and curricular features of VITAL, we will present our efforts to the larger education community.

Publications and Products

Ginsburg, H. P., Jang, S., Preston, M., Appel, A., & VanEsselstyn, D. (2004). "Learning to Think about Early Childhood Mathematics Education: A course." In C. Greenes & J. Tsankova (Eds.), *Challenging Young Children Mathematically* (pp. 40-56). Boston, MA: Houghton Mifflin.

Moretti, F., Pinto, L., Kelsey, R., Sosulski, K. (to be published 2005). "What We Have Learned and How We Have Learned It. Examples of Best Practices of New Media Services and Development Centers in Higher Education." In B. Lehmann & E. Bloh (Hrsg.), *Online-Pädagogik, Bd. 3: Referenzmodelle und Praxisbeispiele*. Baltmannsweiler: Schneider.

Moretti, F. (2005). "Support in the Use of New Media." In M. Melling (Ed.), *Supporting e-learning: a guide for library and information managers* (pp. 85-111). London, England: Facet Publishing.

Contributions to Other Disciplines

The team is very excited by the expansion of the VITAL technology to other courses and disciplines. The technology has been recontextualized for other programs, including the Clinical Psychology program in the School of Social Work among others. The faculty in these disciplines have benefited from the pedagogical offerings provided by VITAL's technical features and have voiced their strong support of using VITAL for future courses in these and other areas.

Contributions Beyond Science and Engineering

The team has also engaged new institutional and faculty partners through demonstrations and presentations of VITAL. VITAL has been integral in exciting clients from other universities and Columbia University's American Language Program (ALP) about the possibilities for new teaching venues and methods. Presently, CCNMTL has partnered with ALP educators in developing a resource for Teaching Assistants. This project, expected to continue through 2006, continues the exploration of innovative teaching both in and out of the classroom.