CSCL 2011 in Practice Showcase Workshop

Creativity of Teachers and Peer-Student-Tutors
through Video Media at the Intersection of Content and Cognition

1. Title of session: *Creativity of Teachers and Peer-Student-Tutors through Video Media at the Intersection of Content and Cognition*

2. Proposer(s) and affiliation(s): Eric Hamilton and Nancy Harding, Pepperdine University, Los Angeles, California; Gina and Wendy Chaves, College Ready Academy #5, Los Angeles CA.

The project partnership is in early phases and includes teachers and students from the following.

- Animo Leadership Academy Charter High School, Inglewood California
- College Ready Academy High School #5, Los Angeles, California
- ECOESAD/Espacio Común de Educación Superior a Distancia (Common Space for Public Universities with Distance Education)
- Makerere University School of Education, Kampala Uganda and New Hope Uganda, Luweero, Uganda
- Moi School for Girls, Nairobi Kenya

3. Theme of the session. The primary theme of this interactive workshop is the collaborative exercise of creativity through video media at the intersection of content and cognition. The session focuses on the use of a) media tools for a large collaboration of teachers and student assistants in producing libraries of platform independent mathematics and science media and b) the Japanese lesson study collaboration model applied to video-mediated lessons. The table on page 2 identifies important elements of the workshop.

Project background. The project underlying the workshop involves seeks to explore and implement innovation in mathematics teacher professional development, teacher creativity, intergenerational CSCL, and digital libraries. The project is supported by the US Department of Education's Institute for Education Sciences (IES) [1] and the National Science Foundation (NSF) [2]. The NSF portion of this work began in December, 2010, and includes the newly-forming repository where teachers and student content can be found, at http://teacherscreate.org. This site, while publicly available, is in the early stages of development as of December 2010. The research draws on multiple theoretical frameworks but also features repeated and stepwise alterations in design and implementation. (At a metalevel, for example, the more recently-funded NSF portion of the research is the result of iterations over the ongoing IES-supported research on collaborative workspaces, peer tutoring and pedagogical agents.) While the session and underlying project are primarily organized around mathematics education, the overall framework and the demonstrations are appropriate for other areas, especially including school science.

This CSCL workshop revolves around teachers and students collaboratively developing locally contextualized video media libraries for use in classroom and home settings. The libraries, while an important object of development, are of somewhat secondary importance in the IES and NSF supported research. Instead, that research focuses in part on **how teachers collectively evolve in expertise or develop in their sophistication through the process of producing and editing video**, and in jointly building libraries or repositories of content. They also focus on **leveraging and building the creativity of teachers in coherent communication of subtlety and nuance about mathematical and scientific structure**, and in avoiding or repairing misconceptions.

In this process, teachers become what we refer to as applied microgenetic analysts in using media tools to help advance student intuitions, formalisms and understandings of mathematical and scientific concepts [3]. Beyond a focus on teacher development, the research also involves making digital media more usable in live classroom settings through a series of evolving design principles and in producing

Workshop Type → Topic	CSCL in practice showcase; interactive and participatory demonstration
Remote participants	Teachers and student-peer-tutors in Los Angeles and possibly east Africa, Mexico, or UK
Keywords:	Teacher creativity; intergenerational computer-supported collaborative learning; tacit knowledge; pedagogical content knowledge; teacher professional development; open education resources
Media:	Tablet computers; electronic writing pads usable in Macintosh and Windows; screen capture video production software; mobile devices that show video
Subject area	Primarily STEM fields, with emphasis on mathematics
Website	http://teacherscreate.org
Theory Frames	The underlying project is supported by a theory of personalized learning communities; research on lesson study; nd research on open education resources.

Workshop Features

community digital repositories that are organized and used in a more locally contextualized manner than has been typically envisioned or implemented for open education resources. One of the greatest difficulties of the open education resource movement, we believe, has been the decoupling of resources from the contexts in which they are created in search of generalizability and highest usage. Our emphasis on a) customizing resource repositories jointly owned by its contributors and b) local teacher pedagogical development through content creativity shifts the emphasis to type and quality of local community usage as first priority.

Peer-Student-Tutors. A second and newer part of this work involves the inclusion of high school students as co-creators with teachers of these videos and of the repository space. For the balance of this narrative, we refer to these individuals as "peer-student-tutors" who produce videos to distinguish them from students who view or use the videos in learning sequences but are not involved in their production. The interaction of teachers and peer-student-tutors entails profoundly rich intergenerational collaborations that we are just beginning to explore. It capitalizes on important findings in research areas that include worked examples, apprentice learning, and peer tutoring. The session includes participation by teachers and students from teacher-researcher partnerships supported by the previously referenced grants from the US Institute for Education Sciences (IES) and National Science Foundation (NSF), and appearing in the bulleted list on page 1. The table above highlights important elements of the workshop.

4. Expected outcomes of the workshop: For the attendees, the workshop will

- show teachers and their university and research partners viable paths for using computer supported collaboration to exploit underutilized creative competencies in teaching – even when, and especially when -- high stakes testing is part of the system context;
- show how to involve students in sophisticated peer teaching arrangement; and
- lead to additional research and practice partnerships.

Additionally, and in the spirit of Stahl and Hesse's observations about CSCL research carried out to refine CSCL theory [4], this CSCL-in-practice session will afford organizers insight, from attending practitioners and researchers, about reshaping the eclectic theoretical frameworks of the effort and implementation practices of the project.

5. Workshop Outline: Here is how we envision a 90 minute session.

15 minutes: Introductions and topical overview of contributing research strands

Following an introduction of attendees and distribution of materials, we will introduce participants to

several relatively disparate research strands. The intent is not to present an analytical overview but rather to establish a basis for the demonstrations and interactions to follow, and the basis from which research design iterations and refinements are carried out.

Teacher creativity: We will emphasize the fact that while nurturing, enhancing mathematics teachers are expected to be conveyers rather than producers of curriculum materials. The prominent role of traditional textbook or reform curriculum producers and curriculum standards and policies, the lack of effective tools for digital representation of mathematics, and the very limited time that teachers have outside of the classroom, all act to crowd out the **creative potential** of teachers to generate content. Mathematics teachers are not expected to be content *producers* but rather are content *conveyors*, following pre-defined curriculum in preparation for accountability tests. At a time of unparalleled ascendency of user-generated content in society more broadly (as evidenced by phenomena such as YouTube), teachers are strangely left out. This is all the more ironic given attention to research on creativity in students, in curriculum developers, and in school leaders. No US federal program or state program explicitly focuses on fostering or leveraging the imagination of teachers in formulation of content [3]. Yet we have found that teachers possess enormous and underutilized reservoirs of creative energy, tacit knowledge, experience, and problem-solving ability about complex pedagogical challenges when furnished collaboration and media software tools – and the opportunity to use those tools.

We will include in this topical overview a summary of widely accepted definitions of creativity, variations that appear in this project, and efforts to build a research-based teacher creativity index.

Challenges to important types of usage of open education resources (OER). The second research thread involves an introduction to challenges in the development and use of digital repositories of educational objects such as applets or simulations. Digital repositories represent enormous potential in education for a broad spectrum of reasons. This portion of the conversation focuses only on the usability of such media in classroom or classroom-related activities (such as home study). Despite, for example, over $100 million in investments in the US Science, Technology, Engineering and Mathematics (STEM) Digitial Library (NSDL) program since 2000, the connection of such resources to learning, especially in classrooms, remains disappointingly remote, as the NSDL Program Announcement explains [5].

Teacher Quality and Professional Development. The third thematic area in the introductory segment of the workshop relates to the primacy of teacher quality in learner experience and to the well-established importance of nurturing rich pedagogical content knowledge ("PCK") in teachers that accommodates deep structural characteristics both of a content area and of student cognition [6-8]. This theme will also stress professional development through Japanese lesson study [9] and highlight the fact that this important tool has not been widely researched for lessons that involve technological mediation [10].

The fourth area involves important findings on the efficacious role that **worked examples** [e.g., 11] and **peer tutoring** [e.g., 12] can exert in learner cognition.

These four areas themes will be treated briefly and discussed in the context of a theory of personalized learning communities [13] to establish the rationale for a comprehensive approach to the research projects underlying this session. We will allude to and make reference to

- strategic planning and development of digital media to furnish alternate instructional forms, anticipate and address student misconceptions, and face important subtleties or nuance in content that are difficult to address in live classroom settings;
- finding a large space for teachers to perfect their unique and individual teaching styles while customizing instruction for their own students in environments that include or emphasize high-stakes accountability;
- forming a cumulative and living body of work that is available to students, teachers, parents, and intelligent agents in live tutoring and instructional settings;
- benefitting from the advances of lesson study in digital media and repository development; and

- fashioning new ways for students to interact with each other and with teachers in digital media.

25 minutes: Hands-on demonstration and participation

We will give a hands-on (accelerated) demonstration of how teachers and students are introduced to the media creation process. We will have several tablet computers and pen pad devices available. We will allow participants to create sample lessons or worked examples. We will furnish instructions and "non-trivial" design principles that guide teacher and peer-student-tutor development of effective, classroom-suitable media.

The intention is not simply to have participants create media, but to reflect verbally and in the group context on how the process of producing and editing content becomes an exacting exercise of mapping content to cognition. Although our research efforts are in early stages, we have already developed a sizable body of interview data in which teachers reflect deeply on the competencies that they find themselves exercising and growing during media [3]. Again, the underlying project is not limited to the repositories that are produced– the outcomes more importantly include how teachers and students change and become more mathematically sophisticated and powerful in the collaborative process of producing the repositories.

15 minutes: Simulated lesson study

In the next section of the workshop, we will simulate a lesson study. This involves participating teachers and peer-student tutors seeking to understand and perfect each other's videos using the lesson study methodology brought to US audiences by researchers such as Catherine Lewis [14]. We will do this, if circumstances permit, with participants both locally at the conference and remotely.

10 minutes: Reflections by teachers and peer-student-teachers with audience interaction

The entire workshop is meant to entail open discussion and hands-on activity throughout. This segment of the workshop involves more purposeful Q and A by the audience with the peer-student-tutors, the teachers, and researchers involved in the project. The Q & A will be free-ranging depending on the audience, of course. The kinds of questions that the peer-student-tutors and teachers in the project may expect include whether or how the library creation exercise or expands creativity; how or whether it alters pedagogical concentration, precision of explanation, technological fluency, confidence in furnishing individualized instruction; whether it alters their willingness to delve deeply into student misconceptions or difficult nuances. In past study, we have found that teachers speak eloquently and surprisingly to these questions. In this workshop format, we expect CSCL attendees to challenge the assumptions and probe the experience of the teachers and peer-student-tutors.

15 minutes: Adapting other simulation and applet content: demonstration of leveraging OER

One of the most important elements of this research effort is mobilizing existing digital infrastructure. The workshop thus far has emphasized building content *de novo.* Of course, there is a large body of content applets and simulations that are freely available as open education resources. Yet these are often very difficult to use in real-time classroom settings, and may involve mismatched flash versions or other non-portable software. That is, a teacher can locate a valuable or compelling applet resource freely available online, but it might not be useful with a whole class or lend itself to adaptation to full class lesson; and it might not be readily available when a student poses a question during a class discussion or in private study. It likely requires trial-and-error parameterizing and validation. In this project, teachers and peer-teaching students do all of this in advance; they determine which parameters (e.g., values for variables, or scale of axes, etc.) most effectively highlight ideas that they want to convey, and then they can fill in values, move sliders, and use pallets etc. By capturing the teacher's running of the applet to platform-independent and mobile-enabled video, students and parents have more ready access to the underlying mathematical idea, and can see how to perform the applet if they wish to parameterize it on their own. Instruction on individual applets is time intensive and distracting in live classrooms. It just

cannot happen frequently, nor is it realistic to expect otherwise. But by pre-testing, authenticating and storing an effective applet created elsewhere, teachers can make it reliably available to students.

10 minutes: Partnership development

This project reflects a sort of thin-client, sharable and adaptable approach to professional development, creativity, and student involvement with teachers in mathematics teaching. It relies on and elicits teacher and peer-student-tutor creativity and ingenuity. In the final section of the workshop, we seek to build collaborative possibilities for this approach and gain insight from the audience about ways to refine and improve the underlying framework and implementation of the effort. We also seek to build partnerships with others who are interested in adopting the approach.

References

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