ICLS 2010 Pre-Conference Workshop

I. SUBMISSION INFORMATION

WORKSHOP TITLE:	**Analyzing Knowledge Sharing and Knowledge Co-Construction**
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II. BRIEF DESCRIPTION

Provide a brief description (75 words maximum) that will appear on the ICLS 2010 website.

This daylong workshop brings together researchers from different sub-communities of the learning sciences, who have developed and applied coding schemes that can be used to identify and classify collaborative moves in small group discussions within or across disciplines. These sub-communities represent a spectrum of perspectives related to the packaging and status of knowledge within that process. At one end of the spectrum, researchers have assumed the knowledge is static but distributed among experts by discipline, and knowledge units are revealed and then organized within the conversations combining different expertise (producing *shared knowledge*). At the other end of the spectrum, researchers have assumed that knowledge is dynamic, and that knowledge itself is repackaged, transformed, constructed or emergent within the conversation (producing *co-constructed knowledge*). The workshop will present, compare and analyze a selection of coding schemes designed to capture these different perspectives on shared and co-constructed knowledge building. It will apply them to a common corpus from the discipline of mathematics in order to facilitate a productive exchange among research sub-communities.

III. AUDIENCE DESCRIPTION

Estimated number of attendees: 25

Description of the target audience (75 words maximum):

The workshop will bring together researchers from the LS, CSCL and CKI communities; the workshop proposers are active participants in all of these and will personally solicit relevant participants. The workshop will include researchers who will present and explain coding schemes that they have developed and/or applied in their research. The authors of the schemes listed above will be personally invited to attend and present. In addition, researchers and graduate students interested in tools for the assessment of knowledge building will be welcome.

IV. LENGTH AND PREFERRED TIME

The morning workshops session is from 9:00 AM to 12:30 PM with a break from 10:30-11:00. The lunch break is 12:30 PM to 2:00 PM. The afternoon session is from 2:00 PM to 5:30 PM with a break from 3:30-4:00.
Please indicate your preferred time slot by ranking the slots below. If you are proposing a whole day workshop or will only consider a single slot for the half day, just select a single slot.

__X_ Monday Full Day (9-5:30)
____ Monday Half-Day Morning (9-12:30)
____ Monday Half-Day Afternoon (2-5:30)
____ Tuesday Half-Day Morning (2-5:30)

V. PROPOSAL

Group Knowledge Building

An important contemporary theory of learning within the learning sciences and CSCL is the theory of knowledge building (Bereiter, 2002; Scardamalia & Bereiter, 1996). This theory notes that knowledge in the disciplines is typically constructed by ideas being made public, becoming successively refined and resulting in knowledge artifacts (technical terms, theories, documents, tools). The knowledge-building theory then suggests that students could effectively learn about a discipline by similarly engaging in group knowledge-building efforts. The processes by which knowledge is shared, transformed, integrated, and even co-constructed through conversational interactions has been a fascination of the Learning Sciences (LS), Computer-Supported Collaborative Learning (CSCL) and Collaborative Knowledge Interoperability (CKI) communities for at least the past decade (Letsky et al., 2009; Resnick, Levine & Teasley, 1991; Stahl, 2006).

Many classrooms and on-line learning environments have attempted to promote student learning through instituting collaborative knowledge building. A variety of techniques have been developed and used in recent years, often including computer support. Within the learning sciences, one common approach is to classify the utterances of students involved in knowledge-building activities according to a coding scheme and to use the results of this classification to map out and understand the process. In order to design appropriate dynamic support that is capable of operating effectively in real time, we must understand the collaborative discussion processes well enough to formalize them in terms of categories that can be automatically identified in units of conversational data. For instance, we must be able to see if different participants are contributing to the shared knowledge (Resnick et al., 1991; Robbins & Aydede, 2009; Salomon, 1993) from existing stores of disciplinary expertise or if multiple participants are co-constructing knowledge that is new to all of them through a process like inter-animation of perspectives (Wegerif, 2007), transactional building on each other (Joshi & Rosé, 2007; Wegner, 1986), successive refinement of public knowledge artifacts (Bereiter, 2002), macro-cognition (Letsky et al., 2009) or group cognition (Stahl, 2006).

Coding Schemes

A number of coding schemes have been developed and tested for the purpose of assessing knowledge-sharing and knowledge-building activities, which we will leverage for this workshop among others that may be proposed by workshop participants. Many of these schemes have been developed with specific research questions in mind or corresponding to particular experimental circumstances (media of interaction, knowledge discipline, etc.). These coding schemes each represent a different point along the continuum from knowledge sharing to knowledge co-construction in terms of the associated notion of packaging and status of knowledge. An issue that repeatedly arises in relation to these coding schemes is the feasibility of automating the analysis of data in terms of the scheme.

A sample of published schemes follows:

- Berkowitz & Gibbs schema (Berkowitz & Gibbs, 1983)
- Nancy Cooke schema (Gorman et al., 2009)
- Gunawardena schema (Gunawardena, Lowe & Anderson, 1997)
- Kai Hakkarainen schema: (Hakkarainen, 2009)
- J-W Strijbos schema (Strijbos & Stahl, 2007)
- Jan von Aalst schema (van Aalst, 2009)
- Norm Warner schema (Warner, Letsky & Cowen, 2005)
- Weinberger & Fischer schema (Weinberger & Fischer, 2006)

Target Discipline: Mathematics

In order to provide a helpful focus for the workshop, we will consider the applicability of various coding schemes to a dataset from the VMT Project (Stahl, 2009). This data involves three students working in an online environment that integrates text chat with a shared whiteboard. This is a synchronous, text-based interaction. The utterances are typically very brief. In addition to chat postings, the students engage in drawing diagrams. The chat and drawing are often tightly integrated. The students are engaged in exploring a mathematical world, or set of problems that they and others propose. They discuss how 2-D and 3-D patterns of lines grow from stage to stage. They do this in textual narrative, graphical drawings and symbolic expressions (Çakır, Zemel & Stahl, 2009). This poses a challenging dataset for a coding scheme to classify in a way that will be useful for assessing both knowledge sharing and knowledge building by the student group.

Antecedents of Knowledge-Building Coding

Coding schemes to explicate the degree of knowledge building in virtual environments may be aided by analysis of interaction patterns that focus on the frequency, lag, size and dimensionality of interactions between members in a rich environment like VMT. To seed thinking about antecedents to knowledge building the workshop organizers will perform network analysis on the 3,000 chat postings and 3,000 other actions in the VMT data set identify statistical patterns or cycles of interaction. The resulting networks will be bipartite (users and objects) and regular. Since the networks in this corpus are closed and small, this pre-workshop analysis will focus on small network evolution and elaborating semantically meaningful measures of tie strength between members. Evolution means developing a time-series set of network views, and possibly addressing the state of the network as a feature that contributes to the other forms of analysis. Through the efforts of this workshop, we may also derive measures of tie strength from the results of the knowledge-building coding schemes.

References

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Warner, N., Letsky, M., & Cowen, M. (2005). *Cognitive model of team collaboration: Macrocognitive focus.* Paper presented at the 49th Annual Meeting of the Human Factors and Ergonomic Society, Santa Monica, CA: Human Factors and Ergonomics Society.

Wegerif, R. (2007). *Dialogic, education and technology: Expanding the space of learning*. New York, NY: Kluwer-Springer.

Wegner, D. (1986). Transactive memory: A contemporary analysis of the group mind. In B. Mullen & G. R. Goethals (Eds.), *Theories of group behavior* (pp. 185-208). New York, NY: Springer Verlag.

Weinberger, A., & Fischer, F. (2006). A framework to analyze argumentative knowledge construction in computer-supported collaborative learning. *Computers & Education*.

VI. Syllabus

Describe the structure of the session and the workshop activities (max 600 words)

The goal of the workshop is to advance the state-of-the-art of coding group knowledge building in disciplines. In particular, the workshop will aim to define a coding scheme, a set of coding schemes or criteria for a coding scheme that is well suited for formalizing and tracking group knowledge-building processes in a setting like the VMT case study of text chat and shared whiteboard for math exploration by a small group of students.

Participants who want to present a coding scheme will be asked to write a two- to four-page position paper describing their present work developing coding schemes for group knowledge building in disciplines. Participants not intending to present their own scheme in the workshop will be asked to provide a one-page statement of research interest. These materials will be shared with all participants prior to the workshop. Participants will also have access to the VMT data set prior to the workshop, and will be encouraged to consider specific coding strategies in the context of this specific data set.

VII. Instructional Staff

Identify instructor(s) and any resource persons or speakers staffing the session. Indicate their previous experience and specific qualifications for this session, including 1 or 2 relevant publications.

Gerry Stahl has investigated issues and theories related to how small groups build knowledge together (Stahl, 2006). He has directed the Virtual Math Teams Project (Stahl, 2009), which studies the interactions within online groups of students exploring math problems. He is Executive Editor of the *International Journal of Computer-Supported Collaborative Learning*. He teaches at the College of Information Science and Technology at Drexel University in Philadelphia and collaborates with the Math Forum at Drexel.

Carolyn Rosé is an Assistant Professor in the school of Computer Science at Carnegie Mellon University, with a joint appointment between the Language Technologies Institute and the Human-Computer Interaction Institute. She serves as an Executive Committee member of the Pittsburgh Science of Learning Center and co-thrust leader of its Social and Communicative Factors in Learning thrust. Her research team has worked on analyses of collaborative learning interactions in both text and speech, pairs and small groups, middle school through college aged, in the US and abroad, in a variety of subjects such as math, science, engineering and psychology. Her team has produced tools for supporting automatic collaborative learning process analyses, including TagHelper tools, which has a user base of over 1,200 users from 69 countries.

Sean Goggins is an Assistant Professor in the College of Information Science and Technology at Drexel University in Philadelphia and is a member of the Group Cognition Lab, headed by Gerry Stahl. Sean has researched: synchronous and asynchronous learning teams, using content analysis to measure knowledge co-construction; theories of human information behavior, to analyze learner interactions with information; and social network analysis built from log data, to explicate the relationship between group development and knowledge co-construction in online groups. Sean's work at the Group Cognition Lab explores the development of automated methods for early identification of interaction patterns, and information uses that correspond with higher levels of knowledge co-construction.

VIII. Audiovisual Equipment

Each of the workshop rooms will be equipped with a standard LCD projector, screen, and podium. Workshop organisers are responsible for bringing their own laptop(s). The hotel can arrange to have equipment available at standard conference rates. Please describe any additional needs (such as a cabled Internet connection). The conference organisers will contact the workshop organisers prior to the conference to confirm costs and needs.

Nothing special.