

# RUTGERS

Graduate School of Education



*Mice,  
Minds,  
and Society*

# CSCL 2007

**Computer Supported Collaborative Learning**

Pre-Conference Workshops at Rutgers University - July 16 - 18, 2007  
Grand Opening Ceremony at Hyatt Regency New Brunswick - July 18, 2007  
Conference at Hyatt Regency New Brunswick - July 18 - 21, 2007



The International Society of the Learning Sciences



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## WEDNESDAY JULY 18<sup>TH</sup>

1.30 – 3.00 p.m. KEYNOTE ADDRESS: GERHARD FISCHER

### *Designing Socio-Technical Environments in Support of Meta-Design and Social Creativity*

The CSCL community is committed to develop visions, theories, systems, practices, and methods that are specific to CSCL, and not simply inherited from other disciplines. My presentation will attempt to provide elements of a transformational conceptual framework on how learning takes place when the answer is not known (this being the case for complex design problems in numerous domains encountered in lifelong learning activities). The presentation will be focused on *reflective communities* (bringing stakeholders together from many different backgrounds, requiring cultural and epistemological pluralism to make all voices heard), *meta-design* (allowing owners of problems to act as designers and active contributors, and not only as consumers), and *social creativity* (bringing different and often controversial points of view together to create a shared understanding among stakeholders that can lead to new insights, new ideas, and new artifacts). Innovative *socio-technical environments* are needed to make progress in achieving these objectives. Examples and characteristics of such environments will be presented and discussed.

3.30 – 5.00 p.m.

### SYMPOSIUM # 1: Redefining Learning Goals of Very Long-Term Learning Across Many Different Fields Of Activity

Naomi Miyake, Chukyo University  
Roy Pea, Brigid Barron, & Daniel Schwartz, Stanford University  
Rogers Hall, Vanderbilt University

There is a hidden agenda in our modern conception of learning—especially as embodied in education—that the learning experiences gained in one “learning situation” are naturally built-upon, expanded, and integrated with experiences from other learning situations. But we believe this implicit learning assumption has not yet been as substantially researched or discussed as is warranted by its importance. Furthermore, little support has been implemented. In this symposium, in accordance with the conference theme which encourages us to explore interrelations among individual and social cognition with technology, we would help illuminate this hidden agenda. We would take some closer looks at cutting-edge research on knowledge integration of learning outcomes from different classes, across formal and informal learning settings, and for longer time periods than usually taken up by learning science research. We would then propose to define a new set of learning goals as assuring the portability, dependability, and sustainability of learning outcomes.

### PAPER SESSION # 1: TOOL AND INTERFACES

#### Expressive Pen-Based Interfaces for Math Education

Sharon Oviat, Incaa Designs  
Alexander Arthur, Adapx  
Yaro Brock, University of Washington  
Julia Cohen, Dartmouth College

Mathematics students almost exclusively use pencil and paper—that is, they learn without computational support. In this research, 16 high school students varying in ability from low to high participated in a comparative assessment of geometry problem solving using: (1) pencil and paper, (2) an Anoto-based digital stylus and paper interface, (3) a pen tablet interface, and (4) a graphical tablet interface. Cognitive Load Theory correctly predicted that as interfaces departed more from familiar work practice, students experienced greater cognitive load and corresponding reductions in their expressive fluency and planning. The results of this study indicate that students’ communication patterns and meta-cognitive control can be enhanced by pen-based

interfaces during math problem solving activities. In addition, low-performing students do not automatically reap the same advantage as high performers when new interface tools are introduced, which means intervention may be required to avoid expanding the achievement gap between groups unless intervention is undertaken.

### **An Efficient and Flexible Technical Approach to Develop and Deliver Online Peer Assessment**

Yongwu Miao & Rob Koper, Open University of the Netherlands

Peer assessment is a special form of collaborative learning, in which peer students learn through assessing others' work. Recently, the design of collaboration scripts is a new focus area within the CSCL community. In this paper, we present a method based on open e-learning standards to script peer assessment processes. A standard-compatible tool can help users to script various forms of peer assessment in a machine-interpretable form. Such peer assessment scripts then can be executed on today's open technical e-learning infrastructure. In comparison with typical software development approaches to support online peer assessment, this technical approach is more efficient and flexible.

### **Evaluating the Effect of Feedback from a CSCL Problem Solving Environment on Learning, Interaction, and Perceived Interdependence**

Gahgene Gweon, Carolyn Rose, Emil Albright & Yue Cu, Carnegie Mellon University

In this paper, we explore the effect of the form of feedback offered by a computer supported collaborative learning (CSCL) environment on the roles that students see themselves as taking and that their behavior reflects. We do this by experimentally contrasting collaboration in two feedback configurations, one which is identical to the state-of-the-art in intelligent tutoring technology (Immediate Feedback), and one which is based on a long line of investigation of the use of worked out examples for instruction (Delayed Feedback). While our conclusions remain tentative due to the small sample size, the data reveal a consistent gender by condition interaction pattern across questionnaire, test, and discourse data in which male students prefer and benefit more from collaboration in the Immediate Feedback condition where they are more likely to take on the role of a help provider rather than a help receiver while the patterns is the opposite for females.

## **PAPER SESSION # 2: GAMES**

### **Tracing Insider Knowledge Across Time and Spaces: A Connective Ethnography in a Teen Online Game World**

Deborah Fields & Yasmin Kafai, University of California, Los Angeles

In this study our goal is to conduct a "connective ethnography" that focuses on how gaming expertise spreads across a network of youth at an after-school club that simultaneously participates in a multi-player virtual environment (MUVE). We draw on multiple sources of information: observations, interviews, video recordings, online tracking and chat data, and hundreds of hours of play in the virtual environment of Whyville ourselves. By focusing on one particular type of insider knowledge, called teleporting, we traced youth learning in a variety of online and offline social contexts, both from friends in the club and outside members of Whyville. We elaborate on the unplanned social events that served as instigators for peaks in learning activity and the methodological challenges underlying the synthesis of diverse types of data that allowed us to follow youth across multiple spaces and times.

### **Massively Multiplayer Online Games & Education: An Outline of Research**

Constance Steinkuehler, University of Wisconsin-Madison

For those with a vested interest in online technologies for learning, the knowledge and skills that constitute successful participation in massively multiplayer online games (MMOs) places them squarely among the most promising new digital technologies to date. In this paper, I broadly outline the qualitative results of a two and a half year cognitive ethnography of the MMO Lineage and describe the current trajectory of research we are now pursuing, based on those findings: (a) the empirical investigation of focused research questions in order to document and analyze those core practices that constitute gameplay in virtual worlds, and (b) the development of educational activities for after school clubs that capitalize on those capacities found

throughout our research. This essay concludes with a reflection on the multiple relationships between games and education, highlighting the potential for such technologies to transform not only the means of education but also perhaps the goals.

### **Tools of Play: Coordinating Games, Characters, and Actions while Learning to Play Video games**

Tom Satwicz, University of Georgia  
Reed Stevens, University of Washington

Through an analysis of game play, this paper attempts to understand an individual's role in coordinating a distributed system for learning. A core issue for CSCL that this paper deals with is the mismatch between common measures for learning that are based on individual traits and outcomes and the learning process that is distributed across people and artifacts. Rather than bridge this mismatch through a group assessment performance, it is suggested in this paper that learning scientists instead consider assessing an individual's adaptive reorganization in a socio-technical system. Video game play was selected as a context for looking at collaborative learning because it represents an emergent social activity young people commonly engage in. Additionally, recent claims that game play involves deep learning have not been thoroughly investigated with ethnographic research; this research project begins to address this gap.

### **INTERACTIVE SESSION # 1: CSCL TOOLS AND CONTEXTS**

#### **Technology in a Context: Enabling Students to Collaboratively Participate at the interface of Computation and Social Science**

*Richard Alterman, & Johann Larusson, Brandeis University*

How do we develop students who can participate critically at the interface of computation and social science? The narrowness of traditional departments, the culture of Computer Science Departments in particular, and a teaching standard that emphasizes high baud rates of information flow are amongst the general reasons why educating students to a more reflective orientation is difficult. This paper explores the use of technology to organize the collaboration within a class so as to produce Computer Science students who learn to develop technology within a critical framework. A case study is presented that shows how technology can be used to produce objects of reflection and analysis for the multi-disciplinary theoretical analysis of online activity.

#### **MUVES as a Powerful Means to Study Situated, Collaborative Learning**

*Jody Clarke & Chris Dede, Harvard University*

In this paper we describe how multi-user virtual environments (MUVES) can simulate immersive, collaborative learning environments intermediate in complexity between recipe-like laboratory exercises and complex real world inquiry situations. We offer the River City MUVE as a case study. River City is a middle school science curriculum designed around theories of situated learning to teach biology, ecology, and scientific inquiry. We ran a quasi-experimental design with students randomly assigned at classroom level to our River City MUVE treatment. Students in our treatment performed better on our content post-test and saw higher gains in self efficacy in general science inquiry than the control group (n=358). We conclude with observations on how MUVES are a powerful vehicle for studying situated and collaborative learning.

#### **"You're Either In, or You're Out": Reality Television and Participation in Online Communities of Practice**

*Erica Halverson, University O Wisconsin – Madison*

In this paper, I describe participation in reality television online communities as a new media extension of the complex constellation of literacy practices that comprise fan fiction (Jenkins, 1992, 2002; Lewis, 1992). The ways in which reality TV fans engage as media producers parallels the ways in which researchers who study other new media such as video games describe the rich discourse and enduring community required to participate in these settings (Steinkuehler, 2006). I argue here that the characterization of these worlds as communities of practice (Lave & Wenger, 1991) does not fully capture the way learning (and therefore becoming) happens in realty TV online communities and suggest ways to reframe this model. Finally, I propose

directions for future research focused on understanding reality TV online fan communities as informal learning environments that require participants to engage in rich cognitive and sociocultural media literacy activities.

### **Animation as Antagonism: Possible Pitfalls of Computer Supported Science Education**

*Göran Karlsson, IT University, Göteborg  
Jonas Ivarsson, Göteborg University, Department of Education*

The specific field of investigation for this study concerns secondary school science education and the aim is to analyze the reasoning students perform when working with animations, or more specifically, with animated sequences of the carbon cycle. The overall aim is to explore some of the pedagogical potentials, as well as limitations, of animations displaying complex biochemical processes. Three salient themes are discernible in material of the students reasoning in connection with observing the animations and solving a given task. These three themes all point to problematic issues that need more attention and further scrutiny in relation to the development of specific educational materials based on animations.

### **Learning from Digital Video: An Exploration of How Interactions Affect Outcomes**

*Robb Lindgren, Roy Pea, Sarah Lewis, & Joe Rosen, Stanford University*

The sinking costs of producing digital video and its growing presence on the Internet suggest that it has potential for use in web-based learning technologies. However, there have been few investigations into how the kind of interaction one has with video impacts subsequent learning. In this in-progress study participants are asked to watch video of an expert taking apart a toaster and describing how it works. The recorded event is the same for all participants, but the event is presented in one of three different modalities: (1) digital video shot from a free-standing camera (2) digital video shot from a free-standing camera that has been annotated in a video mark-up application called DIVER and (3) digital video shot from a head-mounted camera. A number of different assessment tasks are used to characterize the quantity and type of learning that is supported by a particular mode of video interaction.

#### **6.00 – 7.30 p.m. POSTER SESSION A**

### **Fostering Students' Participation in Face-to-Face Interactions and Deepening Their Understanding by Integrating Personal and Shared Spaces**

*Etsuji Yamaguchi, Faculty of Education and Culture, University of Miyazaki*

*Shigenori Inagaki, Faculty of Human Development, Kobe University*

*Masanori Sugimoto Department of Frontier Informatics, Graduate School of Frontier Sciences, ,  
University of Tokyo*

*Fusako Kusunoki Department of Information Design, Faculty of Art and Design, Tama Art University*

*Akiko Deguchi Graduate School of Cultural Studies and Human Science, Kobe University*

*Yuichiro Takeuchi, Department of Frontier Informatics, Graduate School of Frontier Sciences,  
University of Tokyo*

*Takao Seki ,Fukui Prefectural School for the Deaf*

*Sanae Tachibana ,Midorigaoka Junior High School*

*Tomokazu Yamamoto, Sumiyoshi Elementary School Attached to Faculty of Human Development, Kobe University*

In this research, we introduced CarettaKids into the social context of a classroom environment to evaluate whether integration of personal and shared spaces can help promote students' participation in synchronous/co-located interactions in the classroom and deepen their understanding of subject matter. Analysis of videotaped interactions and pre- and posttests clarified the following three points. (1) Students who used CarettaKids presented the simulation results and rules for object arrangement they worked out individually in their respective personal space, by using CarettaKids' function of projecting object arrangements and simulation results from a personal digital assistant onto a sensing board. (2) Many of the students who used CarettaKids examined individually generated ideas collaboratively in the shared space. The patterns of collaborative examination are: (a) Induce a rule for object arrangement from object arrangements devised in personal spaces; (b) Deduce a new object arrangement from the rules discovered in the personal spaces; and (c) Refine the rules discovered in the personal spaces through group discussion. (3) Students who used CarettaKids not only considered all of the three factors, i.e. residential area, industrial area and forest area, but also understood relations between these factors, thereby deepening their understanding of

city planning that takes environmental and financial aspects into consideration. We suggest that the degree to which students deepen their understanding is affected by the presence or absence of collaborative examination of individually generated ideas in the shared space.

### **About the Complexity of CSCL Systems**

Jacques Lonchamp, LORIA, University of Nancy

CSCL systems must deal with both the general complexity of supporting people doing things collaboratively through computers and the specific complexity of constructing artificial situations in which collaborative learning processes are expected to occur. This paper emphasizes three high level requirements for designing-in-the-large rich and malleable CSCL systems dealing with that multiform complexity. For each requirement the paper describes solutions taken from the Omega+ effort for providing a generic and flexible synchronous CSCL framework.

### **Argumentation Vee Diagrams (AVDs) Enrich Online Discussions**

E. Michael Nussbaum, Denise L. Winsor, Yvette M. Aqi, Anne M. Poliquin, University of Nevada, Las Vegas

With online Argumentation Vee Diagrams (AVDs), students compose arguments on both sides of a controversial issue and then develop an integrated conclusion. In this study, students used AVDs prior to composing discussion note and--at the end of each discussion--jointly created a group AVD. AVDs significantly enhanced the number of arguments/counterarguments and compromises in students' discussion notes, and promoted opinion change. However, for AVDs to be effective, students also needed instruction on evaluating argument strength.

### **Complex Network Theory Approach to the Assessment on Collective Knowledge Advancement through Scientific Discourse in CSCL**

Jun Oshima, Ritsuko Oshima, Shizuoka University

This study discusses the possibility of the integrated analytic approach to discourse in CSCL by the combination of macro network analysis and micro analysis of argument on students' written discourse. Although studies have established fine-grained analytic approaches to discourse or argumentation in CSCL environments, we still have difficulty with evaluating collective knowledge advancement. The Complex Network Theory would be a promising approach to challenging this difficulty. We can visualize a variety of network structures with identifying ideas as nodes, and co-presence of words as links. Several indices numerically inform us how a target network is structured. In this paper, we report our attempt to describe how the network of ideas represented in discourse is structured in CSCL environments and its relation to the network structure analysis.

### **Supporting Collaborative Learning in Online Higher Education through Activity Awareness**

Chris Amelung, Yale University  
James Laffey & Paul Turner, University of Missouri-Columbia

Improving activity awareness, the ability to know what is going on around you in ways that are meaningful to your learning objectives and activities, in online learning has the potential to enhance the effectiveness of online learning for students and instructors. This paper introduces readers to the Context-aware Activity Notification System being developed for use within course management systems.

### **Exploring Embedded Guidance and Self-efficacy in Educational Multi-user Virtual Environments**

Brian Nelson, Arizona State University  
Diane Ketelhut, Temple University

In this paper, we present the results of an exploratory study into the relationship between student self-efficacy and guidance use in a Multi-User Virtual Environment (MUVE) science curriculum project. We examine findings from a group of middle school

science students on the combined effects on learning of student self-efficacy in science and use of individualized guidance messages. In addition, we report on findings that demonstrate the interplay between levels of self efficacy in science and use of an embedded guidance system in an educational MUVE.

### **Examining the Dual Function of Computational Technology on the Conception of Mathematical Proof**

Diler Oner, Bogazici University

In this paper, I examine how the availability of a certain technology and new ideas about the nature of learning operate as a factor to suggest a novel understanding about a crucial mathematical concept: mathematical proof. I characterize the resulting conception for ideal mathematical proof activity combining two fundamentally different ways of knowing: a posteriori (or experimental/empirical) and a priori (or deductive/propositional). Obviously, such conception of proving is/will be central in designing proof tasks, thus shaping the mathematical discourse around proof within classrooms. Whether one considers participation within such discourse is simply an aid or tantamount to thinking, identifying the character of this discourse appears to be essential in order to examine the interrelationships between what is social and what is individual.

### **Fostering Collaborative Problem Solving for Pupils with Cognitive Disabilities**

Andreas Lingnau, Peter Zentel, Urlike Cress, Knowledge Media Research Center, Tuebingen, Germany

Verbal communication, particularly the ability to give directions and understand them, is a key not only for learning but also for every day life. Since one main objective of schools for pupils with cognitive disability is to prepare them to manage their every day life on their own as much as possible, we expect that teaching pupils to learn and work collaboratively by sharing tasks and give directions to each other will support this process and provide them in becoming more independent. In this paper we will present a short study and approaches we have elaborated to increase quality and quantity of users' contributions and foster verbal communication between pupils in collaborative problem solving tasks.

### **Enabling Organizational Learning through Event Reporting: A Case Study in a Health Care Context**

Pei-Ju Liu, James Laffey, Karen Cox, University of Missouri-Columbia

Applying the organizational learning framework, we argue event reporting is an enabler for organizational learning in healthcare contexts in order to reach the optimal patient safety and care quality. The findings in this case study describe how the four different learning activities (intuiting, interpreting, integration, and institutionalizing) occurred in event reporting and suggest several challenges that need to be overcome before a health care organization can transform to a learning organization

### **Interaction Rules: Their Place in Collaboration Software**

Robert Kildare, Ray Williams, Jacky Hartnett, University of Tasmania  
Peter Reimann, University of Sydney

One major form of social capital that is central to the development of communities is the set of structures devoted to norms of interaction, making these norms overt and regulating interaction. The creation of these structures is deeply linked to notions of trust, which have been identified as a major factor in the behaviour of successful virtual teams. Because (virtual) teams are complex, the types of interactions that suit a particular team may or may not be predictable. The first author has created Phreda, software that permits group members to create interaction rules in the form of production rules. These rules are then given to an expert system shell that matches these rules against resource use parameters in the group's online collaboration environment. This software as well as results from a first pilot study are described.

## **The Organization of Collaborative Math Problem Solving Activities across Dual Interaction Spaces**

Murat Cakir, Alan Zemel, Gerry Stahl, Drexel University

In this paper we focus on the organization of activities that produce shared graphical representations on the whiteboard of a CSCL system with dual interaction spaces called VMT Chat, and the ways these representations are used in conjunction with chat postings as semiotic resources by interactants as they jointly make sense of and build upon each other's mathematical statements.

### **Visualizations for team Learning: Small Teams Working on Long-Term Projects**

Judy Kay & Kalina Yacef, School of Information Technologies ,University of Sydney  
Peter Reimann, Research Centre on Computer-supported Learning and Cognition (CoCo), University of Sydney

We have developed a set of visualizations mirroring the activity of small teams engaged in a task. These provide a bird's-eye view of what is happening in a small team, giving insights into the way that each individual is contributing to the group and the ways that team members interact with each other. We report on our first experience of using these visualizations for a semester-long software development project course. The study revealed that students, especially those with leadership roles, found the visualizations informative and helpful and that over a third of students modified their behavior accordingly.

### **The Fourth Man – Supporting Self-Organizing Group Formation in Learning Communities**

Malzhn Nils, Harrer Andreas, Zeini Sam, University of Duisburg-Essen

In this paper we propose an approach based on social network analysis facilitated by ontologies for the support of learning group formation in computer supported collaborative and blended learning scenarios. This approach allows us to generate new ties between learners who are interested in similar topics. The identification of similar topics is elaborated dynamically by using a shared workspace environment which supports visual editing and modeling of topic relationships.

### **Using Social Network Analysis to Explore the Dynamics of Tele-mentors' Meta-support in Practice**

Fei-Ching Chen, Huo-Ming Jiang, National Central University, NCU

Little research has been conducted on human support in CSCL situations. Extensive investigations on human meta-support are, in fact, rare. In this study, we have developed a set of mechanisms to facilitate human meta-support in a CSCL environment. Thirteen cognitive-affective pairs of mentors who facilitate a total of 82 forum groups share and discuss their mentoring practice in an exclusive Mentoring Forum. Using Social Network Analysis, we have explored the dynamics within and among pairs of mentors to reveal how they engaged in this environment and how they co-constructed their knowledge on how best to support a group of learners.

### **Process Gain: A Task on Which Real Groups Outperformed Individuals Modeled Under Perfect-Knowledge-Sharing Assumptions**

David Sears, Purdue University

An experiment with university students examined effects of two versions of a statistics task on individual versus group learning. Using a novel measure of transfer, groups were found to outperform, on average, individuals modeled as groups under perfect-knowledge-sharing assumptions. To my knowledge, this is the first result of its kind, and it suggests a characterization of naturally productive collaborative tasks.

## **Boda Blocks: A Collaborative Tool for Exploring Tangible Three-Dimensional Cellular Automata**

Leah Buechley, Michael Eisenberg, University of Colorado at Boulder

Construction kits like traditional building blocks provide excellent media for face-to-face collaborative interaction. The complexity and expressive power of these kits are increasingly being augmented with computational elements like controllable lights, motors and sounds. This paper introduces a computationally enhanced set of building blocks, Boda Blocks, which allows for collaborative interaction through the construction and programming of tangible three-dimensional cellular automata. We provide a brief introduction to computationally enhanced construction kits, describe the Boda Blocks system and report on the results of a preliminary user study.

## **Online Video Repository and Supportive Community for Beginning Teachers**

Greg Wientjies, Jawed Karim, Stanford University

Nearly half of public school teachers leave in their first five years of teaching, and the inadequacy of their preparation is a significant challenge to their success. Teacher attrition results in part from frustration caused by inadequate preparation and lack of a professional development support system. Beginning teachers lack access to exemplars of effective teaching practices. This paper proposes a design framework addressing these problems via a free Internet-based resource for teachers to share videos of their teaching practices and exchange ideas through a supportive online community. This resource would present easily accessible videos of model practices, problem representations, problem solutions. The website would provide a supportive community for beginning teachers; enable them to: form groups centered on common interests, exchange messages, and offer one another feedback on teaching practices; facilitate sharing of classroom materials and best practices; and allow teachers to post profiles of professional and personal information.

## **Learning About Transfer in an Online Problem-Based Course**

Alan Bitterman, Natalie Hatrak, Cindy Hmelo-Silver, Rutgers University

Abstract: Problem-based learning (PBL) is an instructional method in which students collaboratively learn through problem-solving. Students solve a complex problem, direct their own learning, and reflect on their learning. In a STELLAR course, PBL was adapted for an online CSCL environment for preservice teachers. The study demonstrates that students who participated in a STELLAR course learned more about transfer than students in a traditional course.

## **Scaffolding Preservice Teachers Online: The Roles of Interest and Mathematical Beliefs**

Lilian Ray, K. Ann Renninger, Swarthmore College

Discourse analysis and grounded theory were used to study the responses of 12 preservice teachers (PTs) to scaffolding: 6 received content-informed scaffolding and 6 received performance feedback. PTs receiving content-informed scaffolding varied in the content and form of their scaffolding from PTs receiving performance feedback. Readiness to learn from scaffolding appears to be influenced by interest for mathematics and problem-oriented mathematical beliefs.

## **Sharing Visual Context to Facilitate Late Overhearer's Understanding of the Handheld-Based Learning Activity**

Kibum Kim, Deborah Tatar, Steve Harrison, Virginia Tech

Peripheral participation is fundamental to collaborative learning. In the classroom, we see two situations in which peripheral participation is essential: "formative assessment," during which a teacher attempts to assess the utility of an ongoing activity and intervenes if necessary; and "peer-monitoring," during which a student attempts to learn what other students are doing. When augmenting the classroom with handheld, wireless computing devices, handling peripheral participation becomes more difficult. The proposed new handheld network service "Look" allows a late overhearer, who has not witnessed the creation of common ground, to monitor the interaction between group members already engaged in a collaborative situated learning without

interrupting. Laboratory experiences with our prototypes indicate that "Look" balances lightweight implementation, ease of use, and utility in a way that could enhance classroom communication and learning.

### **The Impact of 3-D Based Group Interactions in an On-Line Problem-Based Learning Environment**

Nicholas Omale, Wei-Chen Hung, Lara Luetkehans, Jessamine Cooke-Plagwitz  
Northern Illinois University

The purpose of this article is to present the results of a study conducted to investigate how the attributes of 3-D technology influence the group interactions toward problem solutions and how it impacts the instructional practice in on-line PBL. Results suggested that the attributes of 3-D technology, if used properly, would promote students' social presence and their metacognitive awareness.

### **Professional Visions in the Liminal Worlds of Graphs**

Ken Wright, Vanderbilt University

A pair of comparable but contrasting episodes wherein biostatisticians narrate within the Cartesian space of regression graphs produced by software, illustrates how close analysis of narrations can reveal distinctive professional visions that correspond to differing views of work in biostatistical consulting or lecturing. Graphs serve as material anchors for conceptual blends that form the basis for narratives that merge Cartesian space with the space of artifacts from the setting from which the data came.

### **The Socio-Technical Process of Newcomer Participation: Lessons from a Field Study**

Aditya Johri, Stanford University

Newcomer participation is fundamental to most organizations yet we have limited understanding of how this process unfolds in real world organizations. In this paper I present preliminary findings from a field study of five newcomers in a research and development laboratory. The findings show that to move from peripheral to full participation newcomers make use of both interpersonal and technological resources available within the organization. In addition to these resources, newcomers' participation trajectories depend on experiences that they bring with when they enter the organization. These experiences provide templates that influence and shape consequent participation. The findings also suggest that as newcomers participate in a community they influence oldtimers as well as established practices in that community, suggesting that a community of practice undergoes changes as a result of newcomer participation.

**THURSDAY JULY 19<sup>TH</sup>**

9.00 -10.00 a.m. KEYNOTE ADDRESS: DIANE LAURILLARD

### **The Pedagogical Challenges to Mobile Collaborative Technologies**

Mobile collaborative technologies offer a range of new ways of supporting learning by enabling learners to share rich media across different contexts, and to synchronize information and communication with location-specific experience. The presentation will approach the issue of how best to exploit these opportunities from the perspective of learners' needs. It will use a pedagogical framework to challenge these technologies to deliver a genuinely enhanced learning experience, embracing both the cognitive and the socio-emotional aspects of learning.

10.15 – 11.45 a.m.

**PAPER SESSION # 3: METHODOLOGICAL TOOLS**

**A Learnable Content & Participation Analysis Toolkit for Assessing CSCL Learning Outcomes and Processes**

Nancy Law & Johnny Yuen, University of Hong Kong  
Ronghuai Huang & Yanyan Li, Beijing Normal University  
Nicol Pan, University of Hong Kong

In this paper, the authors first review the different kinds of analysis methods used by researchers to assess students' learning outcomes and processes to propose a categorization framework that can be applicable for assessment methods of CSCL discourse irrespective of the theoretical underpinning of the assessment method. A conceptual design for the construction of a suite of learnable content and participation analysis tools is proposed to provide intelligent support to analysis of online discourse. It is argued in this paper that the implementation of such a toolkit will facilitate collaboration and critical co-construction of knowledge about CSCL outcomes and processes among researchers. An example is also provided for the use of VINCA, a prototype for the toolkit, in comparing the cognitive engagement of two groups of students through text analysis.

**Time is Precious: Why Process Analysis is Essential for CSCL (and Can Also Help To Bridge Between Experimental and Descriptive Methods)**

Peter Reimann, University of Sydney

Although process is a key characteristic of the core concepts of CSCL—interaction, communication, learning, knowledge building, technology use—, and although CSCL researchers have privileged access to process data, the theoretical constructs and methods employed in research practice frequently neglect to make full use of information relating to time and order. This is particularly problematic when collaboration and learning processes are studied in groups that work together over weeks, and months, as is increasingly the case. The quantitative method dominant in the social and learning sciences—variable-centered variance theory—is of limited value, so we argue, for studying change on longer time scales. We introduce event-centered process analysis as a more generally applicable approach, not only for quantitative analysis, but also for providing closer links between qualitative and quantitative research methods. We conclude with suggestions on how nomothetic, idiographic, and design-oriented research interests can become better integrated in CSCL.

**Research on FCA and Its Application on Content Analysis of Online Learning**

Jing Leng, Jian Liao, & Ronghuai Huang  
Institute of Knowledge Science & Engineering  
Beijing Normal University

For the past ten years, computer-mediated communication has been a revolutionary tool to support instruction. Thus content analysis of computer-mediated communication needed to be employed to qualitatively analyze the electronic discourse. The paper describes a system that analyzes discussion content by combining word frequency counts with a key word in context analysis. In terms of the calculation of concept similarity, a formal concept lattice is implemented based on HowNet through mapping the concept, sememe and the relationship in HowNet into formal context. The application shows that it provides good foundation for the research of concept similarity based on the knowledge in HowNet.

## PAPER SESSION # 4: KNOWLEDGE BUILDING

### CSCL Interaction Analysis for Assessing Knowledge Building Outcomes: Method and Tool

Yanyan Li, Jian Liao, Jing Wang, & Ronghuai Huang, Beijing Normal University

Interaction analysis plays an important role in computer-supported collaborative learning. This paper proposes a multidimensional analysis framework to study the interaction and makes use of the quantitative analysis method to assess the collaborative knowledge building (CKB) outcomes at individual and group levels. A tool is developed that can support interaction analysis, text analysis, social network analysis and a combination of the above to show the differences of cognitive content and constructive level in terms of collaborative knowledge building. A case study of the interaction analysis via using the tool is presented.

### A Theoretical Framework of Collaborative Knowledge Building with Wikis – a Systemic and Cognitive Perspective

Ulrike Cress, & Joachim Kimmerle, Knowledge Media Research Center

Wikis provide new possibilities for collaborative knowledge building with artifacts. This paper presents a theoretical framework for describing and understanding the processes which lead to collaborative knowledge building. The model borrows from the systemic approach of Luhmann as well as from Piaget's theory of equilibration. It describes people's learning activities as processes of externalization and internalization. Individual learning happens through internal processes of assimilation and accommodation, whereas changes in a wiki's information space are due to activities of external assimilation and external accommodation. All these equilibration activities are caused by subjectively perceived differences between an individuals' knowledge space and the wiki's information space. Differences of medium level are considered to cause cognitive conflicts which activate the described processes of equilibration.

### Fostering Knowledge Building Using Concurrent, Embedded and Transformative Assessment for High- and Low-Achieving Students

Carol K. K. Chan, Eddy Y. C. Lee, The University of Hong Kong

We describe the design of a knowledge-building environment using concurrent, embedded and transformative assessment and examine the roles of knowledge-building principles and portfolios in fostering collaboration for students of different achievement levels. Students assessed their contribution in Knowledge Forum using rubrics, portfolios and group reviews to assess both individual and community progress. We used a 2 x 2 design (knowledge-building principles x achievement) with four classes of 9th grade students (n = 141) working on Knowledge Forum. We obtained the following results: (1) Students scaffolded with knowledge-building principles showed more participation and conceptual understanding than students working on Knowledge Forum with no principles; the effects were more pronounced for low-achievers compared to high-achievers, (2) Students' portfolio scores significantly predicted domain understanding over and above the effects of academic achievement, and (3) Analyses of knowledge-building discourse and portfolios showed how students made progress in their collective knowledge advances.

## PAPER SESSION # 5: INFORMAL LEARNING

### When Cheating and Collaboration Collide: Applying a Theory of Dialogism to Classroom Culture

Sarita Yardi, Georgia Institute of Technology  
Dan Perkel, University of California, Berkeley

We apply Mikhail Bakhtin's theory of dialogism to describe the factors that contribute to students' perception of a classroom activity as one that does or does not foster a culture of collaboration. We propose that when students perceive a classroom activity to be dialogic in nature they will also perceive it to be collaborative in nature. In our analysis, we compare students' collaborative cultures using new technologies in their informal learning environments with their collaborative activities in school, focusing on their cultural practices in computer science classes in particular. Students are using, reusing, and appropriating

media in creative ways outside of their school settings. At the same time, teachers are increasingly incorporating related emerging technologies, such as wikis, blogs, and chat rooms, into their classrooms. By understanding the factors that contribute to dialogism and how to design learning environments based on these factors, educators will be better equipped to create classroom cultures to encourage collaboration among students.

### **Emergence of Learning in Computer-Supported, Large-Scale Collective Dynamics: A Research Agenda**

Manu Kapur, David Hung, & Michael Jacobson  
National Institute of Education, Singapore  
John Voiklis, & Charles Kinzer, Teachers College, Columbia University  
Victor Chen Der-Thang, National Institute of Education, Singapore

Seen through the lens of complexity theory, past CSCL research may largely be characterized as small-scale (i.e., small-group) collective dynamics. While this research tradition is substantive and meaningful in its own right, we propose a line of inquiry that seeks to understand computer-supported, large-scale collective dynamics: how large groups of interacting people leverage technology to create emergent organizations (knowledge, structures, norms, values, etc.) at the collective level that are not reducible to any individual, e.g., Wikipedia, online communities etc. How does learning emerge in such large-scale collectives? Understanding the interactional dynamics of large-scale collectives is a critical and an open research question especially in an increasingly participatory, inter-connected, media-convergent culture of today. Recent CSCL research has alluded to this; we, however, develop the case further in terms of what it means for how one conceives learning, as well as methodologies for seeking understandings of how learning emerges in these large-scale networks. In the final analysis, we leverage complexity theory to advance computational agent-based models (ABMs) as part of an integrated, iteratively-validated phenomenological-ABM inquiry cycle to understand emergent phenomenon from the "bottom up".

### **Turning on Minds with Computers in the Kitchen: Supporting Group Reflection in the Midst of Engaging in Hands-on Activities**

Christina Gardner, & Janet Kolodner  
Georgia Institute of Technology

How can we promote the kinds of reflection needed for deep and lasting learning and the development of disposition in the context of an informal learning community? It is hard for middle-school learners to disengage from engaging activities long enough for that. We've discovered that when we give learners the goal of helping others outside their community appreciate what they are learning, they are more than willing to jot down notes during activities and write articles for an on-line cooking "magazine" later. Our context is a cooking club; we run the club to promote disposition towards scientific reasoning in the context of kitchen science. Members of the learning community aim to perfect recipes together and help each other learn the science needed to use what they are learning to develop and perfect other recipes. The on-line cooking magazine has the potential to support learning and development of disposition toward scientific reasoning in several ways: authoring tools provide a place to hang scaffolding that promotes recognizing what's been learned, what led to successes, and how science contributed to those successes; articles provide context for knowledge building and concrete artifacts learners can share outside of the Kitchen Science Investigators community; and the want to write articles seems to promote better observation, noticing, and sharing during cooking activities. We found that with computers in the kitchen and an on-line magazine to contribute to, participants were stopping and reflecting in ways that we had only seen previously while a facilitator was prompting them.

## **INTERACTIVE SESSION # 2: VISUALIZATIONS AND REPRESENTATIONAL TOOLS**

### **Influence Of Group Member Familiarity On Online Collaborative Learning**

Jeroen Janssen, Gijsbert Erkens, Paul Kirschner, Gellof Kanselaar, Utrecht University

This study investigated the effects of group member familiarity during computer-supported collaborative learning. Familiarity may have an impact on online collaboration, because it may help group members to progress more quickly through the stages of group development, and may lead to higher group cohesion. It was therefore hypothesized that increased familiarity would lead to (a) more critical and exploratory group norms, (b) more positive perceptions of online communication and collaboration, (c)

more efficient and positive collaboration, and (d) better group performance. To investigate these hypotheses, 105 secondary education students collaborated in groups of three. The results of this study indicate that familiarity led to more critical and exploratory group norm perceptions, and more positive perceptions of online communication and collaboration. Furthermore, in familiar groups students needed to devote less time regulating their task-related activities. On the other hand, no effect of familiarity on group performance was found.

### **Towards a Flexible Model for Computer-based Analysis and Visualization of Collaborative Learning Activities**

Andreas Harrer, Sam Zeini, University of Duisburg-Essen  
Georgios Kahrmanis, Nikolaos Avouris, University of Patras  
Jose Antonio Marcos, Alejandra Martinez-Mones, University of Valladolid  
Anne Meier, Nikol Rummel, Hans Spada, University of Freiburg

The definition of appropriate interaction analysis methods is a major research topic in Computer Supported Collaborative Learning. Analysis methods can be totally or partially supported by computer-based tools that provide for better and more efficient analysis processes. The current research in this field shows that most interaction analysis tools have been based on unstable prototypes, and are highly dependant on the learning environments and research goals for which they were defined. As a consequence, it is not possible to use them in authentic CSCL settings with real users. The goal of this European Research Team therefore is to utilize the synergies of experience in manual interaction analysis with computer-based analytical methods. In this article we present an approach that embeds standardized computer-supported techniques into a semi-formal analysis process model which can be utilized and adapted in a flexible way according to the cases and environments to be analyzed

### **Catalysts to Creating Representational Tools and the Benefits for Learning**

Lee Martin, Daniel Schwartz, Stanford University

Thirty-two undergraduates and six graduate students participated in a medical diagnosis task. They received a set of reference cases and diagnosed new patient cases by ordering and considering the results of medical tests. Half of the participants faced a memory burden as they worked on an initial set of ten new patient diagnoses. Participants then taught a confederate how to perform diagnoses. Finally, two new diseases were introduced, and participants diagnosed five new patients. Participants were allowed to take notes throughout the study. Both the memory burden and the teaching demand led participants to create external representations. Representations used for initial diagnosis, but not for teaching, carried over into the final diagnosis set. Results show that creating a representation was initially inefficient, but led to better performance and learning when participants were asked to adapt to new diseases. Also, a much greater proportion of graduate students than undergraduates created representations.

### **Boundary Conditions for Applying Argumentative Diagrams**

Marije Van Amelsvoort, Seger Breugelmans, Tilburg University

In this paper, we examine two factors that may influence the use of diagrams in computer-supported collaborative argumentation-based learning: students' preference for and ability to construct and read argumentative diagrams as opposed to argumentative texts, and the complexity level of presented information. Fifty-two high school students and 74 undergraduates completed a questionnaire on preference for argumentative texts or diagrams with different levels of difficulty. The high school students were also asked to construct texts and diagrams. Results show that preference for textual or diagrammatic representation depends on the level of difficulty of the represented information. The results suggest that learning with argumentative diagrams is only perceived to be beneficial with a medium level of information complexity. Sub optimal diagram construction in our previous studies on computer-supported collaborative learning may have been due to the complexity of the information

## **Exploring the Potential of a Handheld Participatory Simulation and Social Network Application for Revealing Decision-Making Processes for Information Seeking Amongst Middle School Students**

Susan Yoon, The Pennsylvania State University

In this study a participatory simulation called the Discussion Game combined with TeCFlow, a temporal social networks visualization program is used to identify socially and cognitively-oriented rules for selecting discussion partners. Whereas, the majority of rules for previous interactions are based on social or random factors, after studying social network graphs, students cite more cognitive or informational factors as reasons for who to talk to.

## **The Use of "Knowledge Types" as Scripting Tool to Enhance Critical Thinking in Online Discussions**

Hilde Van Keer, Tammy Schellens, Bram De Wever, Martin Valcke, Ghent University

The present study focuses on a particular scripting tool, namely the use of "knowledge types" as a way to structure university students' discourse in asynchronous discussion groups and consequently promote their learning. More specifically, the aim of the study is to determine how requiring students to label their contributions by means of the stages of the progressive inquiry model affects the ongoing critical thinking processes reflected in the discussion. Preliminary results indicate that using this scripting tool can, under certain circumstances, enhance critical thinking in online discussions

### **11.45 – 1.30 p.m. POSTER SESSION B**

## **Video Traces: Creating Common Space between University and Public Schools for Preparing New Teachers**

Amita Saxena, Reed Stevens, University of Washington, Seattle

The preparation of new teachers has been an enduring issue of the field of education (Handbook on Research on Teaching, 1963; 1973; 1986; 2001). The objectives of this paper are to describe the interaction among different stakeholders in teacher education facilitated by a novel technology-based approach, Video Traces. The analysis suggests that this is a potentially effective approach for making mutual learning across public school and university-based teacher educators more concrete, visible and compelling. In our paper, we (a) present an overview of the pedagogical philosophy that guided the design of the Video Traces medium, (b) describe the enduring problem in teacher education we are using Video Traces to address, and (c) present data and analysis from our approach in the context of the North American educational system.

## **From The Individual To The Group: Tracing Preservice Teachers' Conceptions Of Transformational Technologies**

Elvira Katic, Ramapo College of New Jersey

This study describes the conceptions of technology held by two preservice teachers and how they may have influenced group talk and work within a collaborative technology infusion project. Analyses establish that preservice teachers saw technology as a utilitarian tool rather than a transformational one. These conceptions were influenced by their personal experiences and were not altered greatly by peer contributions. They could also be seen to influence group talk and the ultimate creation of the infusion project.

## **ProBoPortable: Does the Cellular Phone Software Promote Emergent Division of Labor in Project-Based Learning**

Toshio Mochizuki, The University Of Tokyo  
Hiroshi Kato, National Institute Of Multimedia Education  
Kazaru Yaegashi, Ritsumeikan University  
Toshihisa Nishimori, The University Of Tokyo  
Yusuke Nagamori, University Of Tsukuba  
Shinobu Fujita, Spiceworks Corporation

This paper describes the design and evaluation of a cellular phone application called "ProBoPortable", which displays information regarding the task status and division of labor in a project-based learning (PBL). The authors have developed a cellular phone application that cooperates with a Web-based groupware to enhance the learners' reorganization of learning activity in PBL. The research conducted in an undergraduate course revealed that ProBoPortable can enhance awareness regarding the status of learners' collaborations in PBL.

## **Wiki Design for Teacher Interventions in Collaborative Productions**

Ingvill Rasmussen, Andreas Lund, Ole Smoerdal, Intermedia, University of Oslo

In this poster we report on a process of re-designing a wiki. From previous research we have found that while this type of software is conducive to collective knowledge advancement, it needs to be further developed. Socially we develop a teacher mode where the teacher can trace and directly support learners' activities. Technologically we develop prompts, reminders and guides for subject specific development. We aim to contribute to developing CSCL related classroom practices by developing the XWiki application for such purposes.

## **The Relation between Schoolteachers' Perceptions about Collaborative Learning and Their Employment of Online Instruction**

Tamar Inbal-Shamir, Yael Kali, Israel Institute of Technology

The gap between known benefits of socio-constructivist pedagogies to online instruction, and schoolteacher practices has been widely documented. To better understand the gap this research characterizes the range of schoolteachers' online practices and the relation between their pedagogical perceptions and these practices. Two groups of teachers were studied: Novices and leaders in online instruction. Data-sources included interviews, researcher's journal and online activities developed by teachers. Findings indicate that leading teachers develop activities that better utilize the technology, require higher levels of thinking, better connect contents to student lives, and scaffold for rich artifacts. However, both groups scarcely utilize collaborative learning in their activities. We claim that this teacher-centered approach plays a critical role in preventing "ordinary" teachers from regular employment of online instruction. Only teachers who considered themselves "online freaks" were able to withstand the demands of this approach to online instruction.

## **Studying the Effects of Scripts and Technology on Cooperative Learning**

Guan-Yu Lin, James M. Laffey, University of Missouri-Columbia  
Kristen A. Buss, The Pennsylvania State University

The experimental study investigated the effects of a cooperation script with technology and face-to-face forms of group learning. The results revealed that the use of scripted cooperation and the scripted-unscripted sequence for instructions had a positive effect on group-efficacy. When face-to-face groups used scripted instructions they felt more satisfied with discussion process than when using unscripted instructions. In contrast, computer mediated groups felt equally satisfied when using both forms of instruction.

## Using Learning Management Systems to Support Students' Collaborative Learning in Higher Education

Stephanie D. Teasley, Steven Lonn, University of Michigan

Learning Management Systems (LMS) are web-based systems for the distribution, management and retrieval of course materials, and to support communication between students and instructors. A LMS can also support peer collaboration by providing students with the capacity to create their own project sites. In this paper we present data from system logs, surveys, and interviews to investigate how one such system, CTools, is used by students at a large public university to facilitate peer learning.

### Effects of Previous Messages' Evaluations, Knowledge Content, Social Cues and Personal Information on the Current Message During Online Discussion

Gaowei Chen, Ming Ming Chiu, Department of Educational Psychology  
The Chinese University of Hong Kong

This study of the flow of online discussions examined how previous messages affected the current message along five dimensions: (1) evaluations (agreement, disagreement, or unresponsive actions); (2) knowledge content (contribution, repetition, or null content); (3) social cues (positive, negative, or none); (4) personal information (number of visits); and (5) elicitation (eliciting response or not). Using dynamic multilevel analysis (DMA) and a structural equation model (SEM), this study analyzed 131 messages of 47 participants across seven topics in the mathematics forum of a university Bulletin Board System (BBS) Website. Results showed that a disagreement or contribution in the previous message yielded more disagreements and social cue displays in the current message. Unlike face-to-face discussions, online discussion messages that disagreed with a previous message elicited more responses. Together, these results suggest that teachers can use and manage online discussions to promote critical thinking, facilitate discussion of controversial topics, and reduce status effects.

### Helping Teachers in Designing CSCL Scenarios: a Methodology Based on the LDL Language

Christine Ferraris, Christian Martel, Laurence Vignollet  
Equipe scénarios - Université de Savoie

When teachers prepare learning activities to be carried out by learners within web learning environments, they encounter two main problems: the modeling and the technical ones. The modeling one is nowadays regarded as being the most important, both in CSCL and Learning Design. We have defined a methodology to help the teachers to model. It is briefly presented here. It is subordinated to the educational modeling language used to produce the models: LDL.

### Let's Read Together: An Evaluation of a Computer Assisted Reciprocal Early English Reading System

Yu-Ju Lan, Yao-Ting Sung, Kuo-En Chang, National Taiwan Normal University

The purposes of this study were to evaluate the effect of a computer assisted reciprocal early English reading (CAREER) system. The results showed that these components were unable to guarantee the students to collaborate well when they lacked for the abilities to accomplish the assigned tasks. Nevertheless, with the support of the proposed mobile reading system the students were benefited by collaborating with each other.

### Learning Writing By Reviewing in Science

Kwangsue Cho, University of Missouri, Columbia  
Christian Schunn, University of Pittsburgh  
Kyungbin Kwon, University of Missouri, Columbia

We examined a theoretical perspective on reciprocal peer reviewing of writing. As an alternative to the traditional approach, Learning Writing by Writing, focusing on increasing writing opportunities, we proposed and tested a new hypothesis, Learning

Writing by Reviewing. Reviewing is defined as a problem solving activity of practicing problem detection, diagnosis, and solution generation in peer writing. The results supported the hypothesis in that peer reviewers improve their own writing by reviewing peer writing.

### **Information as a Social Achievement: Collaborative Information Behavior in CSCL**

Nan Zhou, Alan Zemel, Gerry Stahl, Drexel University  
In computer-supported collaborative learning (CSCL) environments, learners in problem solving contexts constantly engage in information seeking, information sharing, and information use. However, these activities have not been well investigated in CSCL research. We have studied information behavior of small groups of middle school students engaged in online math problem solving. More specifically, we examined how participants negotiate and co-construct their information needs, how they seek information, and how they make sense of discovered information. We argue that for learners in a CSCL environment, information is essentially a social achievement that emerges through the interactions of the group. Information only becomes information for participants when it is interactionally constructed to be meaningful and intelligible in their local situation. Analyzing learners' information behavior from such an interactional perspective can help us understand their practices of doing collaboration and learning. This has significant implications for designing CSCL environments and information resources to support small groups' information behavior and collaborative learning.

### **Student Competition in Computer-Mediated Conferencing Courses**

Vanessa Peters, Jim Hewitt, University of Toronto

The current study explores student perspectives on competition in asynchronous computer conferencing courses. A survey was distributed to 57 students enrolled in graduate-level distance education programs. Nine of these students participated in extensive interviews. The findings indicate that students experience subtle forms of competition while participating in their online courses. Most manifestations of competition appear to have few educational benefits. It is posited that marking schemes that focus on individual accomplishments may increase feelings of competition and undermine efforts to foster collaborative practices. To reduce the negative effects of competition, course instructors may need to develop assessment strategies that reward group, rather than individual, accomplishments.

### **Interaction Analysis In Asynchronous Discussions: Lessons Learned On The Learners' Perspective, Using The DIAS System**

Tharrenos Bratitsis, Angelique Dimitracopoulou, LTEE, University of the Aegean. Greece

DIAS is an Asynchronous Discussion Forum Software, developed in order to offer extended monitoring and interaction analysis support, by providing a wide range of Interaction Analysis (IA) indicators jointly used in various situations, to all possible users (individual students, groups, teachers/moderators, researchers/observers), appropriate for their various roles in different activities. In this paper we present a brief overview of the research and results regarding the students as IA tool users, deriving from four conducted studies, in educational contexts.

### **Designing Collaborative Mathematics Activities for Classroom Device Networks**

Tobin White, Kevin Lai, Garrett Kenehan, UC Davis

This paper explores the potential of networked devices to support classroom problem solving in small groups. We articulate two principles for designing networked collaborative activities: that they should 1) balance the group's collective engagement of shared objects with opportunities for individual student manipulation of those objects and 2) coordinate networked interactions among student-controlled objects with mathematically meaningful relationships. To illustrate these principles, we present a scenario for small-group collaboration involving classroom device networks.

## **The Disembodied Act: Copresence and Indexical Symmetry in Computer-Mediated Communication**

Alan Zemel, Wesley Shumar, Murat Cakir, Drexel University

CSCL has recently begun to consider how shared understanding is achieved in computer-mediated interactional environments. In this paper, we explore how actors produce and maintain indexical symmetry and reciprocity of perspectives in online chat by establishing reciprocal fields of copresence. We use ethnomethodologically informed analysis to describe the interactional methods by which actors establish indexical symmetry and reciprocal fields of copresence.

## **A Qualitative Study of Students' Cognitive Elaboration in CSCL**

Ning Ding, Groningen Education Research Institute

The poster concerns a qualitative study of student's knowledge elaboration in computer-supported collaborative problem solving. The aim of the study is to investigate whether we can use elaboration value as a measurement to insight into student's communicative artifacts in CSCL and diagnose the crux of mixed-gender collaboration.

## **Appropriation of a Graphical Shared Workspace: The Learner-Tool Connection**

Maarten Overdijk, Wouter Van Diggelen, Utrecht University

The influence that a CSCL tool has on a group of learners depends on how the tool is appropriated. Different ways of appropriating a tool may lead to different effects on the way learners interact and carry out their task. To study the process of tool appropriation we apply an analytical distinction between interaction with the tool and interaction via the tool.

## **Exploring Self-Regulation in Group Contexts**

Toni Kempler, Rutgers, The State University of New Jersey  
Lisa Linnenbrink-Garcia, Duke University

Research on group processes that advances student learning has the potential to support current efforts aimed at introducing technological innovations into classrooms that encourage student collaboration. The current study focuses specifically on group processes that emerge during collaborative learning by exploring how groups use behavioral and cognitive regulation when working on collaborative tasks. Within our analyses, we examined evidence for group self-regulation among two 4-person groups of sixth grade students while they worked on three different group activities as part of a mathematics unit on statistics and graphing. Results suggest that groups made consistent efforts at regulating their learning and engagement, but that the overall quality of group regulation varied. In addition, our findings support the application of the general categories of behavioral and cognitive regulation to regulatory processes in groups, but suggest that specific aspects of self-regulation may be especially important in group contexts.

## **Using Computer-Based Math Games as an Anchor for Cooperative Learning**

Fengfeng Ke, University of New Mexico

This paper reports an empirical experiment that examined the effects of cooperative computer-based math game playing, in comparison to cooperative paper-and-pencil drilling, on cognitive, metacognitive, and motivational math learning outcomes. 141 5th graders were randomly assigned to the two experimental groups and undertook the treatment activities for eight 45-minute sessions during four weeks. The results indicated that game-based cooperative learning context was more effective in promoting positive attitudes toward math.

## Why Technology Isn't Making a Difference: Coming to Terms with Ubiquitous Learning in High School Classrooms

Erica Boling, Rutgers, The State University of New Jersey

This qualitative study investigated teachers' and students' participation in a 1-to-1 laptop initiative. The study explored how high school teachers' beliefs about technology and education impacted classroom instruction. Findings revealed how teachers' conceptions of English education and their predominantly logocentric view of language reinforced individualized instruction and a transmissive model of education. Findings alert educators to the views and beliefs of technology integration that can undermine collaborative and transformational uses of technology.

### A Tale of Two Formats

Angela M. O'Donnell, Nicole DiDonato, The State University of New Jersey

The study examined one teacher's perspective on teaching the same material in an online format and in a face-to-face format. The instructor's reactions varied in part as a function of the topic being taught. Some topics were seemed to be suitable in either format whereas others were better in one format or the other. The instructor noted that the class who had face-to-face interaction changed dramatically when they began these modules.

### Making Thinking Visible: Growth in Graphical Literacy, Grades 3 to 4

Yongcheng Gan, Marlene Scardamalia, Huang-Yao Hong, Jianwei Zhang,  
Ontario Institute for Studies in Education, University of Toronto

This study provides a new coding scheme to analyze growth in seven components of graphical literacy for 22 students who used an online multimedia environment--Knowledge Forum®--across two years (grades 3 and 4) to advance their theories in science and history. Students received no instruction in graphical literacy and were free to express their ideas in text or graphics. Results show increases in all components of graphical literacy over this time span.

1.30 -3.00 p.m.

## PLENARY SYMPOSIUM: METHODOLOGIES FOR ANALYZING GROUP INTERACTIONS: THEORY, MODELS, METHODS AND CHALLENGES

### *Chair and Organizer:*

Roger Azevedo, *University of Memphis, USA*

### *Participants:*

Ricki Goldman, *New York University, USA*  
Arthur Graesser, *University of Memphis, USA*  
Sten Ludvigsen, *University of Oslo, Norway*  
Philip Winne, *Simon Fraser University, Canada*

### *Discussant:*

Kristiina Kumpulainen, *University of Helsinki, Finland*

### Abstract

Researchers from several fields have used several theories, models, and methods to analyze group interactions. Such models have been used to examine the cognitive, metacognitive, social, and contextual interactions in several school and professional contexts. For example, constructivist theorists have examined the role of human and artificial tutors on students' emerging understanding of challenging science topics. Other researchers have used the cognitive apprenticeship model to study the development of medical expertise based on extended analyses of medical teaching rounds while others have used situated

cognition to examine teacher-student interactions in classroom settings. The *purpose of this session* is to bring in some of the world's renowned scholars to: (a) provide an overview of the context which they use to analyze group interactions; (b) provide an overview of their theoretical/conceptual framework and the underlying assumptions, and an explanation of how the particular theory/model addresses group interactions; (c) briefly review and summarize the findings from their own studies using quantitative, qualitative, and mixed methods; and, (e) discuss and assess the implications and challenges of their theory or model for advancing the field of CSCL.

## **SYMPOSIUM # 2: Evaluating the Quality of Dialogical Argumentation in CSCL: Moving Beyond an Analysis of Formal Structure**

Douglas Clark Arizona & Victor Sampson  
Arizona State University  
Armin Weinberger  
Ludwig-Maximilians-Universität  
Gijsbert Erkens  
Research Centre Learning in Interaction

Over the last decade, researchers have developed sophisticated online learning environments to promote argumentative discourse between students. This symposium examines some of the diverse ways researchers have attempted to examine how students engage in argumentation and to assess the effectiveness of CSCL environments in fostering productive argumentation. The papers presented as part of this symposium will focus on four different categories of analytic frameworks: (1) nature and function of contributions within the dialog, (2) nature of reasoning, (3) conceptual quality, and (4) patterns and trajectories of participant interaction. Example analytic frameworks from each category are presented in detail rich enough to illustrate their nature and structure. Synthetic discussions of each category consider the frameworks in light of the underlying theoretical perspectives on argumentation, pedagogical goals, and online environmental structures.

## **PAPER SESSION # 6: COGNITIVE PROCESSES IN GROUPS**

### **Meaning Making in CSCL: Conditions and Preconditions for Cognitive Processes by Groups**

Gerry Stahl  
Drexel University

Meaning making is central to the interactions that take place in CSCL settings. The collaborative construction of shared meaning is a complex process that has not previously been analyzed in detail despite the fact that it is often acknowledged as being the distinguishing element in CSCL. Here, a three-minute excerpt from a discussion among three students is considered in some detail. The students are reflecting on their analysis of mathematical patterns in a synchronous online environment with text chat and a shared whiteboard. Several interaction methods and group cognitive processes are identified. The analysis suggests a number of conditions and preconditions of such interaction. These are necessary for achieving the potential of CSCL as the accomplishment of high-order cognitive tasks by small groups of learners. An understanding of the conditions and preconditions of the small-group meaning-making process may aid in the design and analysis of CSCL activities, as well as in the development of a theory of group cognition.

### **Effects of Technology-based Support for Explanation Construction on Learners' Discourse during Design-based Learning in Science**

Swaroop Vattam, Christopher Kramer, Hyungsin Kim, & Janet Kolodner, Georgia Institute of Technology

We examine the effects of a software-based approach to scaffolding explanation construction on learners' discussion in a design-based learning environment. The approach consists of having learners collaboratively work around a software-based explanation construction tool in the context of addressing their design needs during design investigations. We conducted a study where three sets of participants completed a one-week hovercraft unit with the same teacher. We have analyzed the data collected from two sets of participants where one set was facilitated by only the teacher in their explanation efforts and the other set was facilitated by both the teacher and our software called SHADE. Results indicate that participants who used the software

engaged in higher quality explanatory discourse by the end of the unit. This research supports the usefulness of a contextualized, explanation construction tool in promoting explanation discourse.

### **The Role of Problematizing Moves in Online Knowledge Building Activities**

Ming Lai, The University of Hong Kong

This paper employed the method of problematizing moves (Koschmann et al., 2005) to study the online discussion of two groups of fifth grade students with one group more experienced in knowledge building (Bereiter, 2002; Scardamalia, 2002) than the other. Productive discussions could be resulted even without the assistance of teachers, through the problematizing moves made by the students themselves. Students having more experience in knowledge building seemed to be better at initiating the problematizing moves. However, the initiation also requires the uptakes of other learners so that the inquiry could be sustained. There was evidence that the novice group learned to ask more questions in the discussions, but their questions could still not be qualified as problematizing moves, suggesting further guidance might be needed. Relevant issues such as culture, gender, and the concept of "group" in a CSCL context were also discussed in this paper.

### **PAPER SESSION # 7: DESIGN PRINCIPLES**

#### **Promoting Collaborative Learning in Higher Education: Design Principles for Hybrid Courses**

Rachel Levin-Peled, Yael Kali, & Judy Dori, Technion - Israel Institute of Technology

This research explores the learning that took place in three hybrid university-level courses in education, which were designed according to three main design-principles: (a) engage learners in peer instruction, (b) involve learners in assessment processes, and (c) reuse student artifacts as resource for further learning. These principles were employed in the courses in different manners according to the goals, contents, and target audience in each of the courses. About 40 graduate, and 260 undergraduate students participated in the study. Data-sources included collaborative and personal artifacts in the courses' sites (wikis, forums, and documents created by teams or individuals), researchers' reflective journal, surveys and interviews. We focus on the first design-principle, and show how learning was promoted by features designed according to this principle in each of the courses. We recommend course-designers and instructors in higher-education to use the design-principles identified and developed in this research to foster meaningful learning in other web-based courses.

#### **Principles and Grand Challenges for the Future: A Prospectus for the CSCL Community**

Eric Hamilton, U.S. Air Force Academy

Four principles of future learning environments have emerged from work by CSCL researchers. Such environments will furnish greater "sightlines" into learner, teacher and peer cognition; models and modeling will occupy an increasingly salient role; and connectivity between people will increase at the same time that there is a greater sense of individualization or "one-to-oneness" between instructional resources and the learner. Four grand challenges – large, worthy, and difficult tasks should occupy the attention of the CSCL community. Each challenge is a frontier: a more visible and vibrant role for the tools and metaphors of the CSCL community in a troubled era of globalization; means for extending collaboration beyond conceptual and cognitive models to a broader range of human experience; vitality in learning and collaboration throughout the life cycle; and unlocking group "flow" in the science of collaboration

#### **Classroom Model, Model Classroom: Computer-Supported Methodology for Investigating Collaborative-Learning Pedagogy**

Dor Abrahamson, University of California, Berkeley  
Paulo Blikstein, & Uri Wilensky Northwestern University

We have been exploring the potential of agent-based modeling methodology for social-science research and, specifically, for illuminating theoretical complementarities of cognitive and socio-constructivist conceptualizations of learning (e.g., Abrahamson & Wilensky, 2005a). The current study advances our research by applying our methodology to pedagogy research: we

investigate individual and social factors underlying outcomes of implementing collaborative-inquiry classroom practice. Using bifocal modeling (Blikstein & Wilensky, 2006b), we juxtapose agent-based simulations of collaborative problem solving with real-classroom data of students' collaboration in a demographically diverse middle-school mathematics classroom (Abrahamson & Wilensky, 2005b). We validate the computer model by comparing outcomes from running the simulation with outcomes of the real intervention. Findings are that collaboration pedagogy emphasizing group performance may forsake individual learning, because stable division-of-labor patterns emerge due to utilitarian preference of short-term production over long-term learning (Axelrod, 1997). The study may inform professional development and pedagogical policy (see interactive applet at <http://ccl.northwestern.edu/research/conferences/CSCL2007/CSCL2007.html>).

## DEMO SESSION A

### Engaging Students in Science Controversy Through an Augmented Reality Role-Playing Game

Eric Rosenbaum, Eric Klopfer, Britton Boughner, MIT  
Louisa Rosenheck, Harvard University

POSIT (developing Public Opinions on Science using Information Technology) is an augmented reality role-playing game for networked handheld computers. It is designed to improve engagement in science controversies and develop skills in evaluating evidence and forming arguments. Groups of high school or college students investigate a scenario based on a fictionalized science controversy. They gather evidence from virtual characters and items situated in real locations and compete to develop the most persuasive arguments. Preliminary results suggest that this is a promising approach and further design experiments are needed.

### Coordination Dynamics in CSCL based Chat Logs

Miriam Weinel, Peter Reinman, The University of Sydney

This paper describes coordination dynamics in computer supported collaborative learning (CSCL) based chat logs. We developed a coding scheme for coordination processes containing 25 different coding categories, and used it to analyze chat data gathered in a semester-long education course. In general, we found a high level of coordination throughout the chat logs. The level of goal-related coordination (goal-related vs. not goal-related) varied extensively, depending on the specific task type. Based on an initial process analysis, a time pattern with regard to coordination levels was identified. We surmised that the amount of goal-related coordination and the point in time in which it occurs might play a role in coordination behavior. However, strong intra- and interindividual differences prevented us from detecting a distinct coordination pattern by numerical means over time. We conclude by proposing an extension of our analysis across media type and task type to detect coordination patterns relevant for collaborative learning.

### Conceptual and Computational Issues in the Formalization of Collaboration Scripts

Andreas Harrer, University of Duisburg-Essen  
Lars Kobbe, Knowledge Media Research Center, Tübingen  
Nils Malzahn, University of Duisburg-Essen

Collaboration scripts aim at facilitating social and cognitive processes of collaborative learning by shaping the way learners interact with each other. Computer-supported collaboration scripts generally suffer from the problem of being restrained to a specific learning platform and learning context. Researchers are therefore aiming for a formalization of collaboration scripts on both a conceptual and a computational level. A recently developed framework allows to describe collaboration scripts using a small number of components (participants, activities, roles, resources and groups) and mechanisms (task distribution, group formation and sequencing). Based on these, a formal, graphical modeling tool has been developed and tested with several example scripts.

## **Demonstration of a Discussion Terminal for Knowledge Acquisition and Opinion Formation in Science Museums**

Kristin Knipfer, University of Tuebingen  
Carmen Zahn, Friedrich W. Hesse, Knowledge Media Research Center

There is a trend for active visitor engagement at science museums: Visitors' opinions about science topics are often integrated into exhibitions, today. Modern discussion-based installations are described in this paper. In particular, we present a computer-mediated discussion terminal which was designed to mediate and encourage elaboration on and opinion exchange about the topic nanotechnology as one of the most explosive science topics nowadays. It is supposed to foster critical thinking, knowledge acquisition, and opinion formation at science museums. The rationale behind and assumptions about the impact of this discussion terminal are explicated.

### **Computer Supported Moderation of E-Discussions: the ARGUNAUT Approach**

Reuma De Groot, Raul Drachman, Rakheli (Rachel) Hever, Baruch B. Schwarz,  
The Hebrew University of Jerusalem (HUJI)  
Ulrich Hoppe, Andreas Harrer, University of Duisburg-Essen (UDE)  
Maarten De Laat, Rupert Wegerif, University of Exeter  
Bruce M. McLaren, Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI)  
Benoit Baurens, Silogic

Despite their potential value for learning purposes, e-discussions do not necessarily lead to desirable results, even when moderated. The study of the moderator's role, especially in synchronous, graphical e-discussions, and the development of appropriate tools to assist moderators are the objectives of the ARGUNAUT project. This project aims at unifying awareness and feedback mechanisms in e-discussion environments, presently implemented on two existing platforms. This system is primarily directed to a human moderator and facilitating moderation, but might also help the students monitor their own interactions. At the heart of system are the inter-relations between an off-line AI analysis mechanism and an online monitoring module. This is done through a collaboration of technological and pedagogical teams, showing promising preliminary results.

### **Tools for Concurrent, Embedded, and Transformative Assessment of Knowledge Building Processes and Progress**

Chris Teplov, Zoe Donoahue, Marlene Scardamalia, Donald Philip, OISE/UT

In this paper we introduce a suite of analytic tools to enable users of Knowledge Forum to monitor various participation and collaboration patterns, with almost instantaneous feedback to ongoing processes. Tools for semantic analysis of content similarly provide just-in-time assessment (e.g., vocabulary overlap for different documents or Knowledge Forum database segments). Early results suggest a number of ways in which concurrent and embedded assessment enhances knowledge building in classrooms.

### **Mentored Professional Development to Support Successful Integration of Technology-enhanced Science Curriculum**

Stephanie Corliss, Michele Spitulnik, Tara Higgins, Doug Kirkpatrick, University of California, Berkeley

MODELS (Mentored and Online Development of Educational Leaders for Science) is a 5-year NSF grant funded to support teacher professional development and learning to enable schools to implement technology-enhanced inquiry instruction. In this paper we discuss professional development activities, classroom enactment of technology-enhanced projects, and the trends emerging in changes in teachers' beliefs and practices during the first two years of the project. We present a case study of one teacher's learning progression and discuss plans for further data collection and analysis.

## Wearable Tag Clouds: Visualizations to Facilitate New Collaborations

Daniel Steinbock, Roy Pea, Byron Reeves, Stanford University

We describe the development and pilot testing by university faculty of Wearable Tag Clouds as a CSCL technology. Tag Clouds are 'at-a-glance' information visualizations that, in the wearable form developed here, repurpose social web technologies to support face-to-face interactions. Exploration of collaborative prospects is facilitated by visualizing the substantive emphases of researchers' written works. Pilot test results suggest wearable information visualizations can positively impact face-to-face interactions in collaborative communities.

### Transcendent Communities

Sam Joseph, Viil Lid, Dan Suthers, University of Hawaii

Online communities are potential arenas for informal and lifelong learning. Even though technology fosters internal sharing and collaboration in online communities, it also presents excessively strong external boundaries. These silo-like structures lead to fragmentation, counteracting cross-community collaboration and interdisciplinary learning. We are revising our own online community software to support a particular sociotechnical pattern: the emergence of "transcendent communities"-networks of participation that transcend collections of related but distinct communities. In order to understand such inter-community activity we have developed a theoretical analysis of the basis for individual action and how this action can lead to value for the larger community. Investigating the relationships between individual action, social affordances of the technology and group identities will help us to design for functionality and for meaning.

## Friday 20<sup>th</sup> July

9.00 – 10.00 a.m. KEYNOTE ADDRESS: JEREMY ROSCHELLE

### Can CSCL Make a Global Contribution

Our previous gathering, CSCL 2005 in Taipei, opened with reflections on increasing international participation in computer-supported collaborative learning research and later celebrated the launch of *ijCSCL*, an international journal representing our field. Coincidentally, 2005 was also the year of publication of "The World is Flat," a book which highlighted the growing challenges of globalization for a worldwide audience and argued that improving education is one of the few viable responses. In this keynote, I'll juxtapose these two independent events and ask: Can international collaboration among CSCL researchers address challenges of a globalizing world? International collaboration among CSCL researchers is on the increase in part because we find our distant colleagues striving to address similar problems and because we find complementary talents and research opportunities across locales. I'll argue that we are beginning, in our own small ways, to rise above narrow technical research issues to ones with broader conceptualization and impact. To make the case, I'll reflect on several International efforts I've been involved with, such as:

\* G1on1.org -- A social network of researchers concerned with leveraging the potential of wireless mobile devices, which responded to the One Laptop Per Child initiative, envisioned future scenarios for CSCL, and summarized the state of the art in a journal article.

\* mCSCL -- A network of projects between the UK, Chile, and the United States which is studying how carefully designed mobile CSCL activities can increase teamwork among students while increasing individual learning outcomes

\* Connected SimCalc - An expansion of SimCalc's successful application of multiple representational software to the challenge of democratizing mathematics learning into a classroom-network-based version that addresses student alienation from mathematics as well as concept learning and is being simultaneously tested in the United States and Singapore

\* GroupScribbles - A simple, flexible classroom coordination tool that enables teachers and students to improvise a wide range of distributed and collaborative learning activities and is being studied simultaneously in Spain, Taiwan, Singapore and the United States.

10.15 – 11.45 a.m.

### **SYMPOSIUM # 3: ORCHESTRATING LEARNING ACTIVITIES ON THE SOCIAL AND THE COGNITIVE LEVEL TO FOSTER CSCL**

Armin Weinberger - University of Munich  
Douglas Clark - Arizona State University  
Pierre Dillenbourg - Ecole Polytechnique Fédérale de Lausanne  
Dejana Diziol - University of Freiburg  
Victor Sampson - Arizona State University  
Karsten Stegmann - University of Munich  
Nikol Rummel - University of Freiburg  
Fabrice Hong - Ecole Polytechnique Fédérale de Lausanne  
Hans Spada - University of Freiburg  
Bruce McLaren - Carnegie Mellon University

CSCL includes a wide range of scenarios that integrate individual and collaborative learning. Scripts have repeatedly proven useful for guiding learners to engage in specific roles and activities in CSCL environments. The effective mechanisms of scripts in stimulating cognitive and collaborative processes, however, are not yet well understood. Moreover, scripts have been shown to be somewhat inflexible to variations in needs across individual learners, specific groups, and classroom constellations. In this symposium, we present research on how scripts impact cognitive and collaborative processes. The symposium additionally focuses on how CSCL environments can be orchestrated through flexible scripts that adapt to meet the special requirements at the classroom, small group, and individual levels.

### **PAPER SESSION # 8: METHODS OF SCAFFOLDING**

#### **Instructional Support for Individual And Collaborative Demands In Two Net-Based Communication Settings**

Miriam Hansen & Hans Spada, Department of Psychology, University of Freiburg

In this paper, we present a study conducted to evaluate instructional support measures for a net-based collaborative picture-sorting task. A combination of a model collaboration presented as an on-screen video to the collaborators prior to collaboration and a collaboration script was developed to support individual cognitive as well as collaborative demands. In a 2x3 factorial design we varied the amount of support as well as the mode of communication in order to test the impact of the support on the collaboration process and performance in net-based interactive and non-interactive communication settings. The results showed an improved collaboration process in conditions with support but no significant effect on the performance measures. The support measures fostered the collaboration process even in the particularly difficult conditions with non-interactive communication.

#### **Fading Scripts in CSCL: The Role of Distributed Monitoring**

Christof Wecker & Frank Fischer, University of Munich

Computer-based collaboration scripts constitute a form of distributed control and disburden the learners from the regulation of their performance, which they must internalize in order to acquire cognitive skills such as argumentation. Accordingly, without further support, e. g. by distributed monitoring by a learning partner, fading may be ineffective. Therefore we examined whether fading fosters skill acquisition only in combination with collaborative support. In an experimental study with the factors fading and distributed monitoring, learners were supported in an online discussion forum by a collaboration script for the production of counterarguments. Results show that fading fostered the acquisition of declarative knowledge on argumentation only in combination with distributed monitoring, whereas with regard to procedural knowledge on argumentation there were no

differences. These results indicate that fading supported by aspects of computer-supported collaboration can increase the effectiveness of fading for skill acquisition even in early stages of skill acquisition.

### **Evaluating Collaboration in Design Courses: Team Interactions Affect Technology Adoption, Artifact Creation, and Course Performance**

Heidy Maldonado, Brian Lee, Scott Klemmer, Roy Pea Stanford University

In a collaborative task, group dynamics have been shown to affect students' grades, motivation to pursue a topic or subject, documentation of the experience, learning, enjoyment of a project and course, as well as relationships with their classmates. The results presented in this paper clarify the effect that group dynamics also have upon technology adoption, through an innovative combination of data-collection strategies and the use of the iDeas learning ecology. We briefly describe the system, before considering students' design notebooks, questionnaire and interview responses, class observations, and course performance. We find that students' use of collaborative tools increases when they believe their teammates to be equally engaged and involved in the project. Students in a successful collaboration or in a team with friends are likely to take less notes than those involved in conflict-filled collaborations, and students with considerable experience working in groups may bypass critical steps in creating joint-problem solving spaces with each new group.

### **PAPER SESSION # 9: COORDINATION**

#### **The Integration of Synchronous Communication Across Dual Interaction Spaces**

Martin Mühlpfordt Fraunhofer IPSI  
Gerry Stahl Drexel University

Dual interaction spaces—that combine text chat with a shared graphical work area—have been developed in recent years as CSCL applications to support the synchronous construction and discussion of shared artifacts by distributed small groups of students. However, the simple juxtaposition of the two spaces raises numerous issues for users: How can objects in the shared workspace be referenced from within the chat? How can users track and comprehend all the various simultaneous activities? How can participants coordinate their multifaceted actions? We present three steps toward integration of activities across separate interaction spaces: support for deictic references, implementation of a history feature and display of social awareness information.

#### **Combining Social Network Analysis with Semantic Relations to Support the Evolution of a Scientific Community**

Andreas Harrer, Nils Malzahn, Sam Zeini, & Ulrich Hoppe, University of Duisburg-Essen

This paper presents an analytical approach to support organisational learning in terms of the evolution of a scientific community based on a combination of social network analysis and semantic relations. The primary and direct target of the method is to infer hidden or desirable links between subgroups in a networked community. The data source for these inferences comprises memberships in teams and thematic subgroups. The approach has been applied in a case study to a large scientific network on technology enhanced learning.

#### **Small-group Face-to-Face Discussions in the Classroom: A New Direction of CSCL Research**

Wouter van Diggelen & Maarten Overdijk, Utrecht University

In this paper we discuss the use of collaborative technology in the classroom. The focus is on small groups of students who are co-located and discuss a problem. These students communicate face-to-face and may also use a networked-computer application to solve the problem. We use the distinction between task-related and social-emotional interactions as criteria for computer support. It is assumed that task-related interaction is necessary condition small group learning. It means that the computer tool should be configured in such a way that it facilitates task-related interactions and stimulates knowledge elaboration. We used two design principles that would facilitate the occurrence of these two processes. Results show that all computer-mediated interactions were task-oriented and facilitated knowledge elaboration.

## **INTERACTIVE SESSION # 3: COLLABORATION AND SOCIAL PROCESSES**

### **An Innovative Approach for Fostering Computer-Supported Collaboration**

Tanja Engelmann, Sigmar-Olaf Tergan, Knowledge Media Research Center

Computer-supported collaboration is still problematic with regard to the interaction between spatially distributed group members. In this paper, an innovative approach to tackling this problem is presented. This approach is based on fostering "knowledge and information awareness" that is defined as awareness of a group member with regard to task-relevant knowledge and information underlying this knowledge of his/her collaborators. An experimental study described in this paper confirmed the efficiency of knowledge and information awareness on computer-supported collaborative problem solving.

### **Online but Off-Topic: Establishing Common Ground in Small Learning Groups**

Trena Paulus, University of Tennessee

There is not yet a great deal of research in formal online learning environments focusing on the "off task" conversations that small groups engage in. This study explores how participants establish common ground in distance learning environments. The e-mail, discussion forum, and chat transcripts of ten small online groups were investigated using computer-mediated discourse analysis. Participants established common ground by focusing mostly on logistics, followed by social and then technical moves. The types of functional moves exchanged revealed that groups were actively engaged with each other to establish common ground, balancing individual focus with a group focus.

### **Information Sharing is Incongruous with Collaborative Convergence: The Case for Interaction**

Daniel Suthers, Richard Medina, Ravi Vatrapu, Nathan Dwyer, University of Hawaii

Various authors have placed information sharing at the core of successful collaborative problem solving and learning. In this paper we report analyses of an experimental study that bring the sufficiency of an information sharing account of collaboration into question. One treatment group achieved greater convergence and integration of information in their handling of a complex problem, yet this same group shared less information in a hidden profile design. The pattern of convergence is more closely mirrored by interactivity quantified as the number of "round trips" addressing the same information items

### **Illegitimate Practices as Legitimate Participation: Game Cheat Sites in a Teen Virtual World**

Deborah Fields, Yasmin Kafai, University of California, Los Angeles

Much research has described the various practices of gaining access and participation in multi-user game communities. Cheat websites that are a prominent part of the game culture and industry have been debated because of their illegitimate nature but received little attention in terms of their educational value. In this paper we analyze the cheat sites created by players for a teen virtual world called Whyville.net, which encourages youth ages 8-16 to participate in a range of social activities and play casual science games. Analysis of a sample of 257 cheat sites resulted in typologies for both the cheats and sites in terms of quality and quantity of science content. A case study of an especially active cheat site and analysis of player-written articles in Whyville's newspaper illuminate the illegitimate and legitimate aspects of cheating in this virtual world. Implications of these findings as cultural artifacts of the game community and as guides for designing informal online learning activities are discussed.

## From Socially-Mediated To Technology-Mediated Coordination: A Study of Design Tensions Using Group Scribbles

Yannis Dimitriadis, Juan Ignacio Asensio-Perez, Davinia Hernandez-Leo, University of Valladolid  
Jeremy Roschelle, John Brecht, SRI International  
Deborah Tatar, Virginia Tech  
Raj Chaudhury, Christopher Newport University  
Chris DiGiano, Charles Patton, SRI International

It is well known that scripts based on good practices can enhance the collaboration effectiveness and efficiency in CSCL environments. Yet, to achieve rich, interactive, and creative collaborative learning settings CSCL tools need new flexible, dynamic and lightweight metaphors. This design tension between social and technology-mediated coordination is difficult to resolve and worthy of close analysis. In this paper, we study such a tension through the use of the Group Scribbles (GS) CSCL tool, developed at SRI International, a GUI-based approach that enables the creation and enactment of lightweight CSCL scenarios. The potential of GS, as well as its limitations and possible extensions are studied in relation to design scripts based on Collaborative Learning Flow Patterns. Preliminary experiences in an authentic environment illustrate several facets of the design tension, such as the participants' workload and awareness, or the adaptation to emergent situations. On the other hand, this study points out the need for a new flexible architecture that complements Group Scribbles.

### Drawing on Practices for Modeling Socio-Technical Systems

Heidrun Allert, Christoph Richter, Upper Austrian University Of Applied Sciences, Research Group Knowledge Media

The formal description of pedagogical scenarios and learning processes has attracted a lot of attention among researchers and developers in recent years. Nevertheless current modeling approaches resemble the notion of workflows and hence fall short in describing the situated and socially mediated nature of practice. Against this background the paper describes an alternative modeling approach as well as its theoretical foundation and practical implications.

## PAPER SESSION # 10: KNOWLEDGE CONSTRUCTION

### Conceptual Representations Enhance Knowledge Construction in Asynchronous Collaboration

Daniel Suthers, Ravi Vatrapu, Richard Medina, & Sam Joseph, University of Hawaii

An experimental study of asynchronously communicating dyads tested the claim that conceptual representations could more effectively support collaborative knowledge construction in online learning than threaded discussions. Results showed that users of conceptual representations created more hypotheses earlier in the experimental sessions and elaborated on hypotheses more than users of threaded discussions. Participants using conceptual representations were more likely to converge on the same conclusion and scored higher on post-test questions that required integration of information distributed across dyads in a hidden profile design. However, the essay contents and post-test offered no evidence for differences in information sharing in itself. These results were most consistent when a knowledge map with embedded notes was the primary means of interaction rather than when it augmented a threaded discussion.

### Learning from Virtual Interaction: A Review of Research on Online Synchronous Groups

*Anindito Aditomo, & Peter Reimann*  
*CoCo Research Centre, Faculty of Education and Social Work*  
*University of Sydney, Australia*

Although in general collaborative learning is effective, it is clear that this is not always the case. To explain this, researchers have been suggested to investigate the interaction process occurring in the course of collaboration. Research on face-to-face (FTF) groups have provided clues as to what types of interaction are productive for learning, both at the individual and group level. However, the extent to which these findings apply to online groups is not yet clear. This paper reports a qualitative metaanalysis of recent studies of online synchronous learning groups. There is little evidence that the types of online interaction deemed

favorable are actually associated with individual conceptual learning. At the group level, the kinds of interaction deemed favorable are related more to measures of problem representation (e.g. concept maps) than of problem solutions. These findings challenge the implicit assumption held by many educational technology designers. Implications for future research are discussed.

### **Analyzing Collaborative Processes and Learning from Hypertext Through Hierarchical Linear Modelling**

Agni Stylianou & Elena Papanastasiou, Intercollege  
Sadhana Puntambekar, University of Wisconsin

The purpose of this study was to investigate whether supporting sixth grade students to monitor and regulate their group navigation behavior while reading from hypertext would lead to a rich understanding of domain knowledge. Metanavigation support in the form of prompts was provided to groups of students who collaboratively used a hypertext system called CoMPASS to complete a design challenge. Multilevel analysis techniques were used to understand how the provision of metanavigation support to groups interact with group navigation behavior and learner's metacognitive awareness of reading strategies to affect individual learning. The findings of this study revealed that providing metanavigation support to the groups contributed positively in enabling students to gain a rich understanding of domain knowledge. Our findings also indicate that there was a significant negative interaction of students' metacognitive awareness and perceived use of reading strategies and the presence of metanavigation support while interacting with hypertext.

### **PAPER SESSION # 11: SHARED KNOWLEDGE**

#### **Partner Modeling Is Mutual**

Mirweis Sangin, Nicolas Nova, Gaëlle Molinari, & Pierre Dillenbourg  
Ecole Polytechnique Fédérale de Lausanne (EPFL)  
School of Computer and Communication Sciences, CRAFT

Collaborative learning has been hypothesized to be related to the cognitive effort engaged by co-learners to build a shared understanding. The process of constructing this shared understanding requires each team member to build some kind of representation of the behavior, beliefs, knowledge or intentions of other group members. This contribution reports interesting findings regarding the process of modeling each other. In two empirical studies, we measured the accuracy of the mutual model, i.e. the difference between what A believes B knows, has done or intends to do and what B actually knows, has done or intends to do. In both studies, we found a significant correlation between the accuracy of A's model of B and the accuracy of B's model of A. This leads us to think that the process of modeling one's partners does not simply reflect individual attitudes or skills but emerges as a property of group interactions. We describe on-going studies that explore these preliminary results.

#### **Supporting Controversial CSCL Discussions with Augmented Group Awareness Tools**

Juergen Buder & Daniel Bodemer, University of Tuebingen

An experimental study investigated the influence of an augmented group awareness tool on controversial online discussions and decisions made by 4-person learner groups. The study employed an informed minority paradigm where one group member holds a correct viewpoint, but is faced with a 3-person majority holding an incorrect viewpoint. Within this paradigm, groups using an augmented group awareness tool based on learner ratings of agreement and novelty of contributions were compared to groups using a standard online discussion tool. It was shown that majority influence occurred in unsupported groups, whereas augmented group awareness tools strengthened minority influence, as indicated by group decisions and individual correctness of decisions.

## Talking about Text – Wikis as Support for Instruction and Collaborative Learning

Gustav Lymer & Johan Lundin, Department of Applied IT, Göteborg University  
Barry Brown, Glasgow University  
Mattias Rost & Lars Erik Holmquist, Department of Applied IT, Göteborg University

This study describes the ways in which a wiki platform worked as a resource for teachers and students in a university course on applied ethnographic research method. The wiki was used by students primarily for uploading field notes from their ethnographic work, thereby functioning as a collaborative tool. Interviews, video recordings, and participant observation was used to document the activities in the course. We found that the wiki supported orientations among students towards relevant competencies involved in fieldwork, and that it was also used by supervisors during supervision sessions as a way of gaining access to students' work. We discuss these functionalities in relation to ethnomethodological work on learning-and-instruction, showing how wiki entries were used as references in students' and teachers talk. Distributed activities were thereby made available for instructive practices, and the competencies involved in note taking and observation could be collaboratively oriented to.

### PAPER SESSION # 12: CSCL AND SCIENCE LEARNING

#### Sensitivities to Early Exchange in Synchronous Computer-supported Collaborative Learning (CSCL) Groups

Manu Kapur , National Institute of Education, Singapore  
John Voiklis & Charles Kinzer , Teachers College, Columbia University

This study reports the impact of high sensitivity to early exchange in 11th-grade, CSCL triads solving well- and ill-structured problems in Newtonian Kinematics. Analysis of the evolution of participation inequity (PI) in group discussions suggested that participation levels tended to get locked-in relatively early on in the discussion. Similarly, high (low) quality member contributions made earlier in a discussion did more good (harm) than those made later on. Both PI and differential impact of member contributions suggest a high sensitivity to early exchange; both significantly predicting the eventual group performance, as measured by solution quality. Consequently, eventual group performance could be predicted based on what happened in the first 30-40% of a discussion. In addition to theoretical and methodological implications, implications for scaffolding CSCL groups are drawn.

#### Computer-supported Collaborative Learning and Conceptual Change

Lei Liu & Cindy Hmelo-Silver, Rutgers, The State University of New Jersey

Students often have difficulties achieving conceptual change in both individual learning and collaborative learning environments. Although research in the fields of both conceptual change and collaborative learning are well documented, few studies examine the relations between computer support and collaborative conceptual change. This review addresses this issue and considers the potential of CSCL for promoting conceptual change. We first review the major findings in the fields of conceptual change and collaborative learning. We then review literature on CSCL and discuss why CSCL environments may help in overcoming barriers to collaborative conceptual change. Finally, implications are provided for future CSCL design.

#### Thinking Hard Together: the Long and Short of Collaborative Idea Generation in Scientific Inquiry

Hao-Chuan Wang, Language Technologies Institute, Carnegie Mellon University  
Carolyn Rose, Language Technologies Institute & Human-Computer Interaction Institute, CMU,  
Yue Cui, Language Technologies Institute, Carnegie Mellon University  
Chun-Yen Chang, National Taiwan Normal University  
Chun-Chieh Huang & Tsai-Yen Li, National Chengchi University, Taiwan

Idea generation is a cognitive process that plays a central role in inquiry learning tasks. This paper presents results from a controlled experiment in which we investigate the affect on productivity and learning of doing idea generation tasks individually versus in pairs, with versus without automatic support from a virtual brainstorming agent called VIBRANT. Our finding is that individuals brainstorming with VIBRANT produced more ideas than individuals who brainstormed with a human peer. However,

an additional finding is that while brainstorming in pairs lead to short term process losses in terms of idea generation, with a corresponding reduction in learning in terms of pre to post test gain, it produced a productivity gain for a subsequent distinct individual inquiry task. Furthermore, automatically generated feedback from VIBRANT improved learning during idea generation but did not mitigate the process losses that were associated with reduced learning in the pairs conditions.

## DEMO B

### **Collaborative Lesson Analysis in Virtual Groups: The Impact of Video on Student Teachers' Analysis and Reflection Processes**

Jan Henning, University of Education, Freiburg  
Ute Massler, University of Education, Weingarten  
Rolf Ploetzner, Peter Huppertz, University of Education, Freiburg

Reflection on teaching experiences is considered to be an important element of teacher training. Given the increase of virtual or partly virtual seminars and related constraints, video is gaining relevance because it facilitates an analysis and reflection on teaching experiences, which is independent of time and place. Research indicates that the use of video-recorded lessons for collaborative analysis in virtual groups has a positive effect on student teachers' reflection processes regarding teaching situations. Following a field study by Ploetzner et al. (2005) on different applications of the learning environment "v-share", we conducted an experimental study to investigate the impact of video on student teachers' analysis and reflection processes in a more controlled way. At the conference the learning environment and our research findings will be presented.

### **Combining Structural, Process-oriented and Textual Elements to Generate Awareness Indicators for Graphical E-Discussions**

Rakheli (Rachel) Hever, Reuma De Groot, The Hebrew University of Jerusalem (HUJI)  
Maarten De Laat, The University of Exeter  
Andreas Harrer, Ulrich Hoppe, University of Duisburg-Essen (UDE)  
Bruce M. McLaren, Oliver Scheuer, Deutsches Forschungszentrum für Künstliche Intelligenz (DFKI)

Moderation of e-discussions can be facilitated by online feedback promoting awareness and understanding of the ongoing discussion. Such feedback may be based on indicators, which combine structural and process-oriented elements (e.g., types of connectors, user actions) with textual elements (discussion content). In the ARGUNAUT project (IST-2005027728, partially funded by the EC, started 12/2005) we explore two main directions for generating such indicators, in the context of a synchronous tool for graphical e-discussion. One direction is the training of machine-learning classifiers to classify discussion units (shapes and paired-shapes) into pre-defined theoretical categories, using structural and process-oriented attributes. The classifiers are trained with examples categorized by humans, based on content and some contextual cues. A second direction is the use of a pattern matching tool in conjunction with e-discussion XML log files to generate "rules" that find "patterns" combining user actions (e.g., create shape, delete link) and structural elements with content keywords.

### **Using Social Network Analysis to Highlight an Emerging Online Community of Practice**

Anthony Cocciolo, Hui Soo Chae, Gary Natriello, Teachers College, Columbia University

In this exploratory study, Cocciolo, Chae and Natriello investigate the extent to which the communicative processes exhibited within a large digital repository illustrate the emergence of an online community of practice (CoP). In order to make this claim, we present a method for identifying the emergence of an online CoP using Social Network Analysis (SNA) on communication data (i.e., uploads and downloads) and institutional role (i.e., expert/faculty vs. novice/student). The analysis reveals that the online repository provides opportunities for novices to perform the role of the expert knowledge facilitator. We posit that these conditions constitute a necessary element for the emergence of an online CoP.

## **Implementation of the Scrabble Game on the Mobile Devices to Increase English Vocabulary Acquisition**

Chiu-Pin Lin, e-Learning Technology  
Shelley S.-C. Young, Hui-Chung Hung, information systems and applications  
Yi-Chen Lin, e-Learning Technology

The Scrabble Game redesigned on the mobile devices has been implemented. through this game to facilitate English vocabulary acquisition of the elementary school students with group collaborative and competitive learning activities. We reviewed literature related to collaborative, competition and language learning. Moreover, the concept of game design and its system architecture have been presented. It is expected that research findings in actual English learning contexts will further share in the near future.

## **Virtual Communities of Care: Online Peer Networks with Post-Organ Transplant Youth**

Marina Bers, Clement Chau, Keiko Satoh, Laura Beals, Tufts University

This paper discusses the Virtual Communities of Care Project that uses a 3D virtual environment, Zora, to support a psycho-educational intervention for pediatric post-organ transplant patients. These patients have difficulties in developing a peer network due to chronic illness, and as a result they are often incontinent to medical and other requirements. Our goals are to examine the extent to which we can leverage youth interest in technologies to develop an intervention to support peer network building and medical adherence. During an eight-week intervention, participants engage in weekly

## **Computational Literacy and Mathematics Learning in a Virtual World: Identity, Embodiment, and Empowered Media Engagement**

Sneha Veeragoudar Harrell, Dor Abrahamson, University of California, Berkeley

We are engaged in the on-going development of a computer-supported collaborative learning environment within a virtual world and use it as a setting for studies exploring relationships between student mathematical cognition, computational literacy, and identity. Our design research is informed by the work of Gee (video games), diSessa (computational literacy), Cole (mediated collaboration), Abrahamson (embodied design for mathematics learning), and Lee (cultural modeling). Within the constructed virtual ecology, we are conducting an ethnographic study of a technologically enabled learning environment with real students bearing virtual identities. The participants are physically remote but embody characters and personae of their own making in playful activities that foster intrinsic motivation and bear mathematical and computational integrity that transcends the medium. Collecting both real and virtual data of a group of urban high-school students working in Teen Second Life, we examine for changes in participants' cognitive-affective dispositions toward mathematical practice and identity.

## **Just a Cog In The Machine: Participatory Robotics As A Tool For Understanding Collaborative Learning And Decision-Making**

Paulo Blikstein, William Rand, Uri Wilensky, Northwestern University

We will demonstrate the integration of a software-based multi-agent modeling platform with a participatory simulation environment and a real-time control system for a physical robotic agent. Both real and virtual participants will be able to act collaboratively in a simulation that will control a physical agent. The backbone of this demonstration is a widely used, freely available, mature modeling platform (NetLogo). We posit that this technological platform can be of use for researchers interested in investigating collaborative learning and decision-making, as well as to design collaborative learning activities. We will present preliminary findings from pilot studies with the tool.

## **SYMPOSIUM # 4: FOSTERING PEER COLLABORATION WITH TECHNOLOGY**

Janice Gobert -The Concord Consortium  
James Slotta - University of Toronto  
Jody Clarke & Chris Dede -Harvard University  
Hannie Gijlers - University of Twente  
Nadira Saab - University of Amsterdam  
Wouter van Joolingen & Ton de Jong -University of Twente  
Ken Koedinger - Carnegie-Mellon University

We address recent developments in learning environments, including logging, authoring, and collaboration tools that have opened new doors for instructional practices and research. These systems have enhanced our ability to support students in collaboration and well as track students' collaboration in a fine-grained way. Collectively, these projects represent advances to this area of research offering the following affordances: (1) data collection — we can accurately capture students' and teachers' actions; (2) authoring and customization – we enable researchers to develop, and teachers to tailor curriculum materials that target research questions or student populations; (3) tracking –allows materials and assessments to be accurately managed, versioned, etc.; (4) integration –enables materials to be seamlessly incorporated into instruction; (5) reach –enables researchers to conduct studies anywhere, collect data automatically, and easily make updates to materials for any school worldwide; and 6) open source – technologies are interoperable and open-source, allowing dynamic development and rapid evolution.

### **PAPER SESSION # 13: COLLABORATIVE WORK**

#### **How Does Net-Based Interdisciplinary Collaboration Change with Growing Domain Expertise?**

Nikol Rummel, Sabine Hauser, & Hans Spada, University of Freiburg, Germany

This study examined how growing domain expertise influences net-based interdisciplinary collaboration of persons with medical and psychological background. We compared the quality of the collaborative process and the joint solution of interdisciplinary dyads of different expertise levels (advanced students, trainees, and experts) working on a patient case. To assess the quality of the collaborative process, a rating scheme developed by Meier et al. (in press) was used. Additionally, process log files measuring individual and joint time and number of work phases were gathered, and joint solutions were analyzed. As had been assumed, the experts scored lower than the less experienced dyads in most measures of collaborative process. Looking in more detail at the less experienced dyads revealed that the trainee dyads outperformed the student dyads in most of the process variables. Analyses of process logfiles revealed the same pattern regarding the number of phases used. The predictions for the quality of the joint solution were more difficult and the results for these variables more mixed.

#### **Interdisciplinarity in the CSCL Community – an Empirical Study**

Martin Wessner, Ludwig-Maximilians-Universität Munich  
Andrea Kienle, Fraunhofer IPSI

**Abstract.** In previous work the CSCL community was analysed with respect to its scope, development, continuity and connectivity (Hoadley 2005, Kienle & Wessner 2005, Kienle & Wessner 2006). Main insights included a relatively low but stable continuity of individuals in the community, increasing international participation and increasing connectivity across different countries. Concerning the disciplines involved in CSCL and the disciplinary backgrounds of CSCL community members it was found that a variety of disciplines are represented in the community. A detailed analysis of the way these disciplines contribute to the progress of CSCL, the way members with different disciplinary backgrounds collaborate is still missing. In this paper we report an analysis of the CSCL community with respect to the disciplinary background of its members and the interrelation of various disciplines in CSCL. The analysis is based on a survey among members of the CSCL community actively involved in the CSCL 2007 conference (reviewers and authors of accepted contributions). The paper reports and discusses main results of this analysis with respect to disciplinary background of CSCL community members as well as links between the disciplines. In addition it provides insights into motives for interdisciplinary collaboration, beneficial and hindering factors. The results should help to sharpen our view of the CSCL community, contribute to a shared understanding about what CSCL (currently) is (and what is it not) and point out perspectives for future development of the CSCL community.

## Creativity, Collaboration and Competence: Agency in Online Synchronous Chat Environment

Elizabeth Charles, Dawson College  
Wesley Shumar, Drexel University

Agency is potentially an important concept for CSCL as researchers think about the effectiveness of online learning environments and the ways they encourage groups to take active control of their learning activities. This paper reports on several sessions of mathematics problem solving in the VMT Chat environment. The VMT Chat is a synchronous chat and whiteboard space for students to collaboratively define and work on problems that are open-ended and that encourage students to define the questions themselves. We draw on the anthropological, psychological and sociological traditions and their concept of agency in order to produce a robust analysis of several segments of student work in the VMT Chat. Our analysis suggests that there are structural features to the VMT Chat environment that encourage "agentic behavior" on the part of students. This has important implications for learning and the structure of pedagogic activities.

### PAPER SESSION # 14: SOCIAL PROCESSES IN CSCL INTERACTION

#### Do Internal Factors of Cooperation Influence Computer-Mediated Distance Activity?

*Kristine Lund, Céline Rossetti, & Stéphanie Metz, University of Lyon*

On the one hand, researchers have studied factors that influence collaboration and on the other, researchers have proposed models of collaborative problem solving. However, we have not found research on the relation between these factors and the dimensions used in order to describe the collaborative activity within the models. This article's goal is to propose such relations for a situation of collaborative design, mediated by computer and carried out at a distance. We will show two main relations that emerged from our corpus. Firstly, dialogue utterances between partners that have a dominant social aspect are positively related to the symmetry of the entire dyadic interaction in terms of partners' contributions. Secondly, dialogue utterances that predominantly deal with expressing what partners are doing is negatively related to the extent to which partners are aligned. This research also extends the field of applicability of the cooperative activity model proposed in Baker (2002).

#### Group Awareness and Self-Presentation in the Information-Exchange Dilemma: An Interactional Approach

Joachim Kimmerle & Ulrike Cress, Knowledge Media Research Center

A common challenge in many situations of computer-supported collaborative learning is increasing the willingness of those involved to share their knowledge with other group members. As a prototypical situation of computer-supported information exchange, a shared-database setting was chosen for the current study. This information-exchange situation represented a social dilemma: while the contribution of information to a shared database induced costs and provided no benefit for the individual, the entire group suffered when all members decided to withhold information. In order to alleviate the information-exchange dilemma, a group-awareness tool was employed. It was hypothesized that participants would use group awareness for self-presentational purposes. For the examination of this assumption, the personality trait 'protective self-presentation' (PSP) was measured. An interaction effect of group awareness and PSP was found: when an awareness tool provided information concerning the contribution behavior of each individual, this tool was used as a self-presentation opportunity. In order to understand this effect in more detail, single items of the PSP-scale were analyzed and the findings discussed.

#### Influence of Group Member Familiarity On Online Collaborative Learning

Jeroen Janssen, Gijsbert Erkens, Paul Kirschner, & Gellouf Kanselaar, Utrecht University

This study investigated the effects of group member familiarity during computer-supported collaborative learning. Familiarity may have an impact on online collaboration, because it may help group members to progress more quickly through the stages of group development, and may lead to higher group cohesion. It was therefore hypothesized that increased familiarity would lead to (a) more critical and exploratory group norms, (b) more positive perceptions of online communication and collaboration, (c) more efficient and positive collaboration, and (d) better group performance. To investigate these hypotheses, 105 secondary

education students collaborated in groups of three. The results of this study indicate that familiarity led to more critical and exploratory group norm perceptions, and more positive perceptions of online communication and collaboration. Furthermore, in familiar groups students needed to devote less time regulating their task-related activities. On the other hand, no effect of familiarity on group performance was found.

#### **INTERACTIVE SESSION # 4: KNOWLEDGE BUILDING AND LEARNING**

##### **Constructing New Knowledge In Collaboration: Instructional Support For Improving Information Pooling And Processing In Groups**

Hans Spada, Anne Meier, University of Freiburg

Groups can build valuable new knowledge by drawing inferences from their members' complementary knowledge. Unfortunately, groups tend to focus on information known to all members from the start ("shared") and neglect members' unique ("unshared") knowledge. The present study investigated whether a similar bias could also be found at the level of inferences drawn from shared and unshared information. In an experiment, 27 student dyads solved a murder mystery task over a videoconferencing system. A control condition was compared to two instructed conditions which were informed about typical task difficulties, and either received external guidance from a collaboration script (script condition), or planned their own collaboration (planning condition). Dialog analyses revealed the expected biases towards shared information in both the pooling of text information and the drawing of inferences. Instructional support helped dyads to produce more correct solutions, but did not improve the drawing of inferences.

##### **Improving Young Learners' Scientific Understanding in CSCL Environments**

Hyo-Jeong So, National Institute of Education, Nanyang Technological University

The purpose of the present study was to improve young learners' scientific understanding in CSCL environments. The study consisted of two phases: Phase I for fostering a collaborative learning culture, and Phase II for using Knowledge Forum as a CSCL tool. Primary 3 students in one Singapore school participated in this study. Findings suggested that while students were motivated to learn in CSCL environments, they had difficulties monitoring and sharing knowledge for their own understanding. Additionally, a great deal of teacher guidance was needed to encourage student participation in collaborative knowledge building processes. Overall, this study may imply that students at this early stage of schooling need more structured guidance to improve their understanding in CSCL environments.

##### **Toward Collaborative Technologies Supporting Cognitive Skills for Mutual Regard**

Tom Murray, Perspgrity Technology

In this paper I elaborate on a promising link between ethics, thinking skills, and online collaborative tools. Cognitive tools used for communication and collaboration can be designed to support and scaffold ethically-relevant skills such as: cognitive empathy, the ability to take multiple perspectives, the ability to reflect on one's biases and emotional state, a tolerance for uncertainty, ambiguity, and change, and the ability to reflect upon the quality of a communication that one is involved in. These thinking skills contribute to the quality of knowledge building and decision making. I argue that an opportunity now exists to source this large body of related work to create a coherent R&D focus.

##### **From Theory of Mind to a Theory of Distributed Shared Sense-Making**

Barbara Ladewski, Annemarie Palincsar, Joseph Krajcik. University of Michigan

The current study proposes conceptualizing human intellectual activity in terms of mutually constitutive interactions among a distributed network of sense-making systems, rather than as individual cognition/learning situated in sociocultural context or as individual participation/apprenticeship in collective social practice. The model of distributed shared sense-making incorporates mutually constitutive interactions among sense-making systems, among mental models of sense-making systems, and between sense-making systems and their mental models. The model provides an integrated theoretical framework to support empirical

examination of interactions among humans, and among humans and their cultural tools--in particular, their technological tools. The study uses the proposed theoretical framework to interpret teacher-student developing interactions in a technology-rich middle-school science classroom over the course of a year of scaffolded introduction to inquiry-based science instruction.

### **Epistemological Perturbations: Using Material Artifacts to Cultivate A Knowledge Building Culture In Classrooms**

John Ow, Townsville Primary School, Singapore  
Katerine Bielaczyc, National Institute of Education, Singapore

The realization of the pedagogic affordances of many CSCL tools require a social infrastructure quite different from that found in traditional classrooms using "instructionist" teaching and learning practices. We are interested in ways to support teachers and students in making the necessary shift in cultural beliefs and classroom practices in order to integrate such CSCL tools --- a change trajectory that we term the "implementation path" (Bielaczyc & Collins, 2006). In the present paper we discuss a research project focused on integrating Knowledge Forum (Scardamalia, 2004) into the science curriculum of nine Primary 3 and 4 classrooms in a Singaporean school. We investigate the use of material artifacts and offline practices in providing a transition mechanism from traditional classrooms toward creating a knowledge building culture. We are particularly interested in how such artifacts and practices lead to "epistemological perturbations" in teacher's conceptions of teaching and learning.

### **Collaboration, Computation, and Creativity: Media Arts Practices in Urban Youth Culture**

Kylie Pepler, Yasmin Kafai, University Of California, Los Angeles

The focus of this paper is to turn our attention to the arts as an understudied area within the computer-supported collaborative learning community and examine how studying the learning of arts and programming can open new avenues of research. We analyze urban youths' media arts practices within the context of the design studio, particularly by focusing on how collaboration, computation, and creativity play out within this context. We utilize a mixed methods design that draws upon three approaches: (1) participant observations; (2) media arts object analyses; and (3) comparative in-depth case studies. Aspects of new literacy studies, social theories of literacy, and situated learning guide the methodology and interpretation in this study. Media arts projects like these are not well understood in the research literature but have the potential to teach us about learning and literacy in the age of multimedia.

**SATURDAY, 21<sup>ST</sup> JULY**

**9.00 – 10.30 a.m.**

### **PLENARY SYMPOSIUM: GAMES IN SCHOOLS, CLUBS, HOMES AND FANDOM COMMUNITIES: OPPORTUNITIES AND CHALLENGES IN UNDERSTANDING LEARNING AND COLLABORATION**

Chris Dede & Jody Clarke, Harvard University  
Erica Halverson, University of Wisconsin, Madison  
Yasmin Kafai & Deborah A. Fields, UCLA  
Tom Satwicz, University of Georgia

The last two years have witnessed a marked rise in interest across various academies in leveraging game technologies toward educational ends: the Woodrow Wilson Foundation's Serious Games Initiative, the MacArthur Foundation Digital Media and Learning Program, and the Federation of American Scientists Summit, to name a few. In this symposium, the participants will examine learning and collaboration in different gaming contexts with the goal to broaden the discussion about opportunities and challenges ahead of us.

11.00 – 12.30 p.m.

**INVITED SYMPOSIUM: MAKING USE OF PRODUCTIVE TENSIONS IN CSCL**

PARTICIPANTS: Friedrich W. Hesse, Gerry Stahl, Tim Koschmann, Dan Suthers, Peter Reinmann, Jurgen Buder, Ulricke Cress.

**PAPER SESSION # 15: ARGUMENTATION**

**Fostering Argumentation with Script and Content Scheme in Videoconferencing**

Birgitta Kopp & Heinz Mandl  
University of Munich

This study examines the support of argumentation in collaborative task solving in videoconferencing. In particular, it investigates the effects of a script (which supported the collaboration) and a content scheme (which fostered the focusing on the content) on transactivity in argumentation and on justifications of single arguments in the learning discourse and task solutions. Learners were asked to learn a theory individually before working on a task cooperatively. Altogether, 52 triads were randomly assigned to one of four conditions in a 2 (with/without script) x 2 (with/without content scheme)-factorial design. To measure the effects of the intervention, the argumentation in the learning discourse and in the task solutions was analyzed. Results show no effects of the script on transactive reactions, but small effects of the content scheme. The content scheme also influenced the construction of arguments with justifications positively. Justifications in task solutions were supported by script and content scheme.

**Effects of Synchronous and Asynchronous CMC on Interactive Argumentation**

Lisette Munneke, Jerry Andriessen, Paul Kirschner, & Gellouf Kanselaar  
Research Centre Learning in Interaction

This study examined the influence of different types of computer-mediated communication (CMC) on the way pre-university students argue about genetically modified organisms. A total of 39 dyads discussed the topic using either synchronous (chat) or asynchronous (discussion board) CMC, after which they collaboratively wrote an argumentative text in a synchronous groupware environment. It was hypothesized that synchronous CMC would stimulate deep argumentation because of its immediacy of feedback, while asynchronous CMC would stimulate gathering arguments because of its allowing increased reflection time. Finally it was studied whether students who argue well during a discussion also wrote better argumentative texts. The results obtained partly confirmed the expectations. Students using synchronous CMC argue in a more elaborated way than students using asynchronous CMC. However, in contrast with the hypothesis students using asynchronous CMC produced more accurate argumentative texts. This study sheds light on how synchronous and asynchronous CMC will be suitable for specific collaborative learning processes.

**Collaborative Argumentation and Cognitive Processing - An Empirical Study in a Computer-Supported Collaborative Learning Environment**

Karsten Stegmann, Christof Wecker, Armin Weinberger, & Frank Fischer  
University of Munich

It has been assumed that deep cognitive processing is associated with better understanding. Better understanding of the content is supposed to improve the quality of argumentation in discussions. Although plausible, empirical tests of these assumptions are sparse. Therefore, the goals of this study are to examine these assumptions and to provide analyses of cognitive processes during collaboration. A one-factorial design with forty-eight (48) participants was used to investigate the relation between the formal quality of single arguments (low vs. high) during online discussions of groups of three, cognitive processes, and knowledge acquisition. The formal quality of single arguments was fostered by means of a computer-supported collaboration script. Empirical evidence was found that the quality of argumentative knowledge construction during discussion is positively related to deep cognitive processing and that the scripted construction of single arguments had a positive effect on the individual acquisition of knowledge on argumentation.

## PAPER SESSION # 16: CSCL AND TEACHER PRACTICES

### **The Relation between Schoolteachers' Perceptions about Collaborative Learning and Their Employment of Online Instruction**

Tamar Inbal-Shamir & Yael Kali  
Technion - Israel Institute of Technology

The gap between known benefits of socio-constructivist pedagogies to online instruction, and schoolteacher practices has been widely documented. To better understand the gap this research characterizes the range of schoolteachers' online practices and the relation between their pedagogical perceptions and these practices. Two groups of teachers were studied: Novices and leaders in online instruction. Data-sources included interviews, researcher's journal and online activities developed by teachers. Findings indicate that leading teachers develop activities that better utilize the technology, require higher levels of thinking, better connect contents to student lives, and scaffold for rich artifacts. However, both groups scarcely utilize collaborative learning in their activities. We claim that this teacher-centered approach plays a critical role in preventing "ordinary" teachers from regular employment of online instruction. Only teachers who considered themselves as "online freaks" were able to withstand the demands of this approach to online instruction.

### **Intuitive Moderation Styles and Beliefs of Teachers in CSCL-Based Argumentation**

Julia Gil, Baruch B. Schwarz, & Christa S. C. Asterhan  
The Hebrew University of Jerusalem

CSCL learning environments provide new contexts for discussions and are thought to provide new opportunities for learning. At the same time, such environments often do not provide guidance on how to act during the discussion. The purpose of this paper is to initiate research on moderation in synchronous discussions in a CSCL environment. The first study contrasts teachers' beliefs on good discussions and good moderation pertaining to face-to-face discussions with those pertaining to synchronous, CSCL-mediated discussions. The second study focuses on the strategies teachers intuitively enact in synchronous discussions.

### **A Reflective Analysis of Facilitation in an Online Problem-Based Learning Activity**

Sharon Derry, University of Wisconsin-Madison  
Matt DeMarcelle, Humana Corp

Abstract: The first author collaborated with the second to analyze his facilitation of online problem-based learning (PBL). A framework for analyzing reflective collaboration in science instruction developed by Radinsky (2000) was adapted to analyze threaded discourse in an online teacher education course. In the spirit of Schön (1983), we proffer this method as a tool for analyzing and improving one's teaching and for developing scientific hypotheses about connections between facilitation and learning.

## INTERACTIVE SESSION # 5: INTERACTION PROCESSES

### **Knowledge Mirroring: Fostering Audience Design of Computer-Mediated Knowledge Communication**

Jessica Dehler, Daniel Bodemer, Juergen Buder, University of Tübingen

Higher education is increasingly realized by net-based scenarios often incorporating collaborative activities. This is accompanied with specific benefits but also constraints. In computer-mediated peer-tutoring for example it is more difficult to construct mutual models, thus impairing collaborators' grounding, audience design and coordination. In this paper 'Knowledge Mirroring', that is providing information about the partner's knowledge, is introduced as technological support developed to compensate for these problems. Effects of Knowledge Mirroring on audience design and knowledge acquisition are studied in a simulated peer-tutoring scenario with explaining as basic activity. Analysis of explanations revealed audience design with respect to length of explanations, usage of elaborations and references. Results regarding knowledge acquisition show that learners provided with Knowledge Mirroring were able to draw more inferences on information distributed across the learning material.

## **The Effects of Conversations with Regulars and Administrators on the Participation of New Users in a Virtual Learning Community**

Yevgeniy Medynskiy, Amy Bruckman, Georgia Institute of Technology

We analyze new users' participation rates on MOOSE Crossing, a collaborative educational environment. New MOOSE Crossing users who conversed with regulars or administrators soon after joining are found to exhibit more social activity and stay involved with MOOSE Crossing longer than new users who did not. We find regulars to be better at eliciting participation than administrators, but also note a synergistic interaction between the groups.

## **The Student Becomes the Master: Integrating Peer Tutoring with Cognitive Tutoring**

Erin Walker, Carnegie Mellon University (CMU)  
Nikol Rummel, University of Freiburg  
Bruce McLaren, Kenneth Koedinger, Carnegie Mellon University (CMU)

Combining peer tutoring with an intelligent tutoring system (ITS) holds the promise of augmenting the current benefits of the ITS. We designed and implemented a peer tutoring approach as an addition to the Cognitive Tutor Algebra (CTA), an ITS for high school algebra. We then used 30 students to evaluate the potential of the peer tutoring addition to increase learning. Although students learned and interacted positively, peer tutors lacked the necessary expertise to adequately help their tutees.

## **Source Memorization in Chat Interactions**

Gaëlle Molinari, Patrick Jermann, Pierre Dillenbourg, Ecole Polytechnique Fédérale de Lausanne (EPFL)

This paper reports a study about memorization of online chat interaction. Results show that subjects are very good at recognizing who produced a given utterance, especially if they produced the utterance themselves. Performance was much weaker when subjects recalled who produced the utterance immediately following the given utterance. We investigated several variables in order to predict which utterances are easier to remember.

## **The relationship between student interaction and message readability in asynchronous online discussions**

Jim Hewitt, Vanessa Peters, OISE University of Toronto

The current study explores the relationship between the readability of computer conferencing messages and the level of student interaction in asynchronous online discussions. Large-scale quantitative analyses were performed on the activity logs of 37 graduate-level distance education courses at the University of Toronto. The mean Reading Ease and Grade Level scores of student messages were found to be significantly correlated with the mean number of messages that students write, the percentage of student messages that reply to other messages, and mean message size. A correlation was also found between the readability of instructor messages and student messages. Consequently, the data suggest that a positive relationship exists between readability and the level of student online interactivity. Possible explanations for these results are discussed.

## **Impact of Anonymity of Input in Next-Generation Classroom Networks**

Sarah Davis, National Institute of Education

**Abstract:** This project looked at anonymity of input across a series of classroom activities seeking to answer three research questions. First, did activity type influence students' use of anonymity? Second, did activity type influence students' perception of the utility of anonymity? Finally, did student statements about the use and utility of anonymity match their actions? Analysis of the digital artifacts revealed no significant differences for use of names by activity or gender. Females more frequently made comments about wanting to be confident of their answers before they would attach their names. Males much more frequently expressed that anonymity was not important to them. Yet the use of names by the two groups across activities was virtually identical. Both groups had a use of names across all activities of approximately 60%.

## Understanding Pair-Programming from a Socio-cultural Perspective

Weiqin Chen, Marius Nordbø, University of Bergen

Pair-programming has been used more and more often in educational settings. Although some studies have been conducted and pair-programming was found in these studies more effective for students to learn programming, very few studies have focused on the interactions between the paired students during the pair-programming process. The study reported in this paper seeks to understand the learner's activities by taking a closer look at the interactions between the pair from a socio-cultural perspective