CSCL 2005

The Next 10 Years!

Proceedings of the International Conference on Computer Supported Collaborative Learning 2005 (Abstracts)

May 30 - June 4, 2005 TAIPEI, TAIWAN

Edited by Timothy Koschmann, Daniel D. Suthers, Tak-Wai Chan

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Edited by

Timothy Koschmann
Southern Illinois University

Daniel D. Suthers
University of Hawaii

Tak-Wai Chan
National Central University

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Preface

This conference (and its associated proceedings) is auspicious in two regards—first, it marks the tenth anniversary of the first CSCL conference held at Indiana University in 1995 and, second, it represents the first CSCL conference to be held in the Asia/Pacific region. The latter is, of course, important because of the opportunity it affords for expanding both the CSCL community itself and the base of ideas upon which it operates. The former is even more important, however, because it provides an occasion for reflection on how the field has changed in the intervening decade and where it needs to move in the one to come.

The collection of papers comprising this volume is impressive! They range from theoretical proposals to meta-analytic reviews to methodologically diverse empirical pieces. They draw upon a variety of disciplines including communication studies, computer science, education, psychology, and sociology. Among the authors are many leaders of their respective fields, and as a group they represent all regions of the world in which relevant research is being conducted. In total, 252 papers were submitted for this conference, of which exactly 100 were accepted for presentation at the meeting and publication in this volume. Papers were accepted in two publication formats: full or short. Of the 166 full paper submissions, 31% were accepted in that category. Many papers received nominations for either the Best Paper award or the Best Student Paper award. Those papers receiving two or more nominations are marked with BPN (Best Paper Nomination) or BSPN (Best Student Paper Nomination) in the Table of Contents.

Two years of hard work went into planning this conference. Space does not allow us to individually credit all the people who contributed in one way or another to this elaborate undertaking. We would, however, like to extend our heartfelt appreciation to the members of the steering committee and the staff at our respective universities for their assistance, and especially to Ben Chang of National Central University, who contributed tremendously to all aspects of the planning of the conference and the compilation of this volume.

Also deserving of special commendation are the many colleagues who reviewed proposals for this conference. Our approach to paper selection was the most ambitious of all CSCL conferences convened to date. Recognizing the growing and international community we serve, an effort was made to treat the reviewing process as an opportunity for community building and collaboration. We solicited approximately 1200 reviews from researchers around the world, both those currently active in the CSCL community and those with special disciplinary expertise relevant to the submitted papers. Wherever consistent with reviewer expertise and availability,

we assigned reviewers from the Americas, the Asia/Pacific region, and Europe to each and every paper. Reviewers were encouraged to read and discuss each other's commentaries, especially in cases where reviews were discrepant, and were given the opportunity to revise their own reviews. The program co-chairs wrote meta-reviews for every submission. The ultimate credit for the quality of the technical program, therefore, rests with those who contributed to this process. The fruits of their efforts can be seen in the pages of this volume, both in its selectivity and through the valuable feedback provided to the paper authors. We dedicate this collection to their diligence and commitment to the field.

Tak-Wai Chan
Timothy Koschmann
Daniel Suthers

Action Context and Target Context Representations: A Case Study on Collaborative Design Learning

Henrik Artman
Dept. for Numerical Analysis
and Computer Science
The Royal Institute of Technology, Sweden
artman@nada.kth.se

Robert Ramberg, Hillevi Sundholm,
Teresa Cerratto-Pargman
Dept. of Computer- and Systems Sciences
Stockholm University, Sweden
{robban, hillevi, tessy}@dsv.su.se

Abstract. This paper focuses on the concept of representations produced in the context of collaborative design. More specifically, on the interplay between collaborative creation of sketches (design proposals), and argumentation and negotiation processes taking place in the design activity. The question raised in this paper is how sketches produced during a design session reflect and mediate dialogues and argumentation in the design activity and how the sketches feed into an envisioned use context or vice versa. The concepts of *action context*- and *target context representations* are introduced and used to illustrate shifts of focus during a design session. We have studied a group of students working on a design task in an interactive space for two weeks. The purpose of the study was to investigate how an environment meant to support collaborative work and learning support collaborative and creative learning of interaction design. The results indicate that students attending a course on interaction design did not pay enough attention to target representations. Furthermore the results suggest that "action context representations" to a large extent occupy student activities as a result of either complex technology or as a result of the students thrust to do something instrumental. We suggest that pedagogical programs for collaborative learning of design may relieve some of the mapping, or interplay, of design proposals and the target context representation.

Keywords: Design, Communication, Interactive Spaces, Learning, Representation

Coercing Knowledge Construction in Collaborative Learning Environments

Pieter J. Beers, Paul A. Kirschner, Henny P.A. Boshuizen
Educational Technology Expertise Center
Open University of the Netherlands
pieter.beers@ou.nl

Wim H. Gijselaers
Department of Educational Development and Educational Research
Maastricht University

Abstract. Multidisciplinary teams are often employed to solve complex problems, but research has shown that using such teams does not guarantee arriving at good solutions. Good team-solutions require team members possessing a good degree of common ground. In this contribution an ICT-tool based upon making individual perspectives explicit to other team members is studied. Two versions of the tool that differed in the extent to which users were coerced to adhere to embedded support principles were used, in both a laboratory and a secondary professional education setting. Coercion, as expected, increased negotiation of common ground in both settings. However, results were contradictory with regard the amount of common ground achieved. Overall, it can be concluded that NTool and its underlying framework affect negotiation of common ground, and that adding some coercion increases this effect. However, one should be careful with the specific task and audience before implementing NTool.

Keywords: Negotiation of meaning, common ground, ICT-tools, knowledge construction, coercion

Improving the Coordination of Collaborative Learning with Process Models

Angela Carell[1], Thomas Herrmann[1], Andrea Kienle[2], Natalja Menold[1]

[1]Management of Information and Technology
Ruhr-University of Bochum, Germany
firstname.lastname@rub.de

[2]Informatics and Society
University of Dortmund, Germany
andrea.kienle@uni-dortmund.de

Abstract. CSCL is seen as a socio-technical process which has to be carefully planned by both students and teachers. These processes can be presented as graphical models which serve as maps to guide the students through their collaboration. In an experimental field study, the participatory development of these models was compared to a condition without models. The data shows the advantages of graphical models for the students' planning coordination. Most of the five hypotheses are confirmed in this study. These findings show just how important a technical concept is which helps to integrate the developed models as a means of coordination and navigation into CSCL-systems.

Keywords: Coordination, graphical process models, maps, representational guidance

AGQ: A Model of Student Question Generation Supported by One-on-One Educational Computing

Sung-Bin Chang
Department of Computer Science and Information Engineering
National Central University, Taiwan
legend@cl.ncu.edu.tw

Kuan-Jung Tung
Department of Computer Science and Information Engineering
National Central University, Taiwan
tgz0819@lst.ncu.edu.tw

Hsien-Ming Huang
Degree Program of E-Learning
National Chiao Tung University, Taiwan
mozart@mail.clhs.tyc.edu.tw

Tak-Wai Chan
Graduate Institute of Network Learning Technology
National Central University, Taiwan
chan@cl.ncu.edu.tw

Abstract. One-on-one educational computing refers to 1 student 1 computing device, which means every student in a group uses a digital learning device. In this paper, we present a model of student question generation called AGQ, which stands for "asking a good question," supported by one-on-one educational computing in the classroom settings. AGQ is designed for engaging students in a challenging learning activity that potentially involves higher-level cognitive processing operations. We shall describe the general design of AGQ, called Product Evolution, and that the current version is a variation of it.

Keywords: One-on-one educational computing, peer question generation, question posing

Effective Discussions, Social Talks and Learning —A Paradox on Learning in Discussion Forums

F.C. Chen, Y.W. Lee, H.J. Chu, H.R. Wang[1], H.M. Jiang[2]

Institute of Learning & Instruction, National Central University
[1]Department of Information & Communications, Shih Hsin University
[2]Institute of Atmospheric Physics, National Central University
fcc@cc.ncu.edu.tw

Abstract. It is generally accepted that social talks have nothing to do with on-task discussion, or even that they are to be discouraged in the interests of effective learning. However, from a community-building perspective, social interaction is key to the sustainability of a learning community. An apparent paradox seems to exist in that, while social interaction is critical for community cohesion, social postings do not contribute to effective discussion. The authors argue that previous research using postings as the unit of analysis has failed to discover the context in which effective learning took place. Using threads as the unit of analysis, this study is able to explore empirically the relationship between effective discussion and social talks in CSCL environment. Based on an analysis of 321 longer threads (consisting of 10490 postings) in which the structure of the threads, the components of the threads, and the order of different categories of postings in some of these threads were defined, this study reveals that genuine effective discussions and social talks cannot be viewed in isolation nor does there exist a wall between them. The roles of social talks in CSCL are rediscovered and discussed.

Keywords: social talks, “off-task” interaction, effective discussions, thread

Animal Companions as Motivators for Teammates Helping Each Other Learn

Zhi-Hong Chen
Department of Computer Science & Information Engineering, National Central University, Taiwan
hon@lst.ncu.edu.tw

Yi-Chan Deng
Department of Computer Science & Information Engineering, National Central University, Taiwan
ycdeng@lst.ncu.edu.tw

Chih-Yueh Chou
Department of Computer Science and Engineering, Yuan Ze University, Taiwan
cychou@saturn.yzu.edu.tw

Tak-Wai Chan
Center for Science and Technology of Learning, National Central University, Taiwan
chan@cl.ncu.edu.tw

Abstract. This paper describes and discusses the design rationales of a system called My-Pet-Our-Pet that intends to realize an approach to using simulated animal companions to encourage students to help each other learn. A class of students is divided into several teams. Every student keeps her own *individual animal companion*, called My-Pet. An important component of animal companion is the student model of its master that supports self-reflection in different perspectives. Also, every team has a *team animal companion*, called Our-Pet, being kept by all the members of the team collaboratively. Our-Pet has a collective student model composed by all the student models of the team members. The design of Our-Pet help set a team goal through participating a competition game among Our-Pets of different teams, support collective reflections among team members, and shed light for the team how to help each other. We are currently conducting an experimental trail of the system in an elementary school where every student in the class has a Tablet PC.

Keywords: Learning companion, team animal companion, student model, active student model, open student model

MatrixDesks: Interactive Computing Desks toward One-on-Two Educational Computing Environments

Hercy N.H. Cheng
Department of Computer Science and Information Engineering
National Central University, Taiwan
hercy@cl.ncu.edu.tw

Ben Chang
Research Center for Science and Technology of Learning
National Central University, Taiwan
ben@cl.ncu.edu.tw

Yi-Chan Deng
Department of Computer Science and Information Engineering
National Central University, Taiwan
ycdeng@cl.ncu.edu.tw

Tak-Wai Chan
Graduate Institute of Network Learning Technology
National Central University, Taiwan
chan@cl.ncu.edu.tw

Abstract. The era of 1:1 educational computing environment where each student has one mobile computing device is not far away. When such technology designed for individuals is applied to group learning, several student grouping problems could be encountered. In this paper, three issues are identified to illustrate the vision of the 1:2 educational computing environments. In a 1:2 classroom, besides the mobile devices, students also have their own computing desks, i.e. MatrixDesks, to solve the potential student grouping problems. By putting MatrixDesks together, a small group can form a shared working space with the combined desktops immediately and they can use their own digital pens as the input devices to work on and talk over it. Meanwhile, the students use their mobile devices to handle the related individual tasks. MatrixDesks is a coordination of applying the mobile computing and invisible computing to collaborative learning, which will lead to the accomplishment of 1:2 educational computing environments.

Keywords: student grouping, interactive computing desks, ubiquitous computing, invisible computing, 1:1 educational computing, 1:2 educational computing

Problem-based Learning Online: Multiple Perspectives on Collaborative Knowledge Construction

Ellina Chernobilsky, Anandi Nagarajan and Cindy E. Hmelo-Silver
Rutgers University, 10 Seminary Place, New Brunswick, NJ 08901-1183
ellinac@eden.rutgers.edu, annagara@eden.rutgers.edu, chmelo@rci.rutgers.edu

Abstract. Online problem-based learning (PBL) environments afford many opportunities to engage in collaborative knowledge construction. Activity theory is a suitable framework to study such environments and the processes learners go through when using these environments. Two complementary perspectives are blended in this paper in an attempt to create a comprehensive picture of learning using an online PBL system. One perspective is the detailed analysis of tool use and discourse students and facilitator engage in. The second perspective is facilitator reflections about the evolution of the group's collaborative practices and norms.

Keywords: Problem-based learning, online learning, collaboration

A Pilot Study of Computer Supported Learning by Constructing Instruction Notes and Peer Expository Instruction

Emily Ching[1], Chih-Ti Chen[2], Chih-Yueh Chou[3], Yi-Chan Deng[2], Tak-Wai Chan[1]
Graduate Institute of Network Learning Technology[1], Department of Computer Science & Information Engineering[2], National Central University, Taiwan
Department of Computer Science and Engineering, Yuan Ze University, Taiwan[3]
smileming@lst.ncu.edu.tw, chihtichen@lst.ncu.edu.tw, cychou@saturn.yzu.edu.tw, ycdeng@cl.ncu.edu.tw, chan@lst.ncu.edu.tw

Abstract. Learning by teaching has been extensively studied in education and psychology research. However, there has been relatively less effort in this research avenue in CSCL research. Computer supported learning by teaching, as a genus of CSCL activities, is expected to draw more attention in the future. In this pilot study, we propose a model of computer supported learning by teaching that involves peer tutors in preparing their instruction notes and teaching their peer tutees verbally. Collaborative learning is incorporated in our pedagogical design. As an initial investigation and for future improvement of our design, we conducted two experimental trials in a graduate-level course. This paper discusses the design of this model and reports our findings from the experimental trials.

Keywords: computer supported learning by teaching, computer supported peer tutoring, peer teaching, reciprocal peer tutoring, learning by teaching

Measuring Motivation in Collaborative Inquiry-based Learning Contexts

Angela Chow
The University of Hong Kong, Pokfulam
ychow@hkucc.hku.hk

Nancy Law
The University of Hong Kong, Pokfulam
nlaw@hkusua.hku.hk

Abstract. This paper argues that for understanding motivation in collaborative inquiry-based learning settings, there is an urgent need to develop new instruments that can capture the impact of the changes from the learning of well-defined content to open-ended inquiry and from individual learning to group-based learning on learning motivation. It reports on the development of such an instrument, the Collaborative Inquiry-based Project Questionnaire (CIPQ). Confirmatory factor analysis of the CIPQ data on six independent groups (n=269, 235, 173, 192, 300 and 254) of students who participated computer-supported collaborative learning (CSCL) projects has consistently yielded a five-factor model of motivation (Project Work, Social Learning, Task, Reinforcement and Social Pressure factors). The validity of CIPQ was indicated by the empirical relationship found between the five factor scores and independent measures of the levels of project engagement of the students.

Keywords: Motivation, collaborative inquiry-based project work, scale development

Analyzing the Quality of Argumentation Supported by Personally-Seeded Discussions

Douglas B. Clark **Victor D. Sampson**
College of Education
Division of Curriculum and Instruction
Arizona State University
Payne Hall, PO Box 870911
Tempe, Arizona, 85287-0911
Tel: (480) 491-7921, Email: dbc@asu.edu

Abstract. Several researchers have shown that student participation in discourse paralleling that of scientific communities is critical to successful science education. This study focuses on supporting scientific argumentation in the classroom through a personally-seeded online discussion system. Students use an online interface to build principles to describe data they have collected. These principles become the seed comments for the online discussions. The software sorts students into discussion groups with students who have built different principles so that each discussion group can consider and critique multiple perspectives. We outline a methodology for (a) coding the individual comments in terms of epistemic operation, grounds, and content normativity and (b) parsing and assessing overall argumentation structure of the oppositional episodes. This study therefore contributes to the research literature both in terms of scaffolding and assessing student argumentation in online asynchronous forums.

Keywords: Education, Conversation Analysis, Argumentation, Discussions, Secondary School

Why Member Portraits Can Undermine Participation

Ulrike Cress
University of Tuebingen; Germany, Department of Applied Cognitive Psychology and Media Psychology
u.cress@iwm-kmrc.de

Abstract. One possible way to support social awareness in virtual collaborative environments is to provide member portraits. Based on the SIDE-Model (Social Identity Model of Deindividuation Effect) it is argued that these portraits can have ambivalent effects for people who act according to the mode of personal identity and for people who act according to the mode of social identity. An experiment providing an information-exchange dilemma task confirmed these expectations.

Keywords: Group-awareness tools; information-exchange dilemma; participation; member portraits; anonymity; SIDE-Model

ICT Can Recover Collaborative Tutorial Conversation and Position It within Undergraduate Curricula

Charles Crook
School of Education & Learning Sciences Research Institute
Nottingham University
charles.crook@nottingham.ac.uk

Abstract. A procedure is described for mobilizing ICT resources in order to implement collaborative tutorial conversations with large undergraduate classes. The method allows intense, intimate and regular face-to-face conversations the consequences of which are used as grounding for traditional lecture presentations. Data from focus group discussion, system logs, and measures of student contribution indicate the intervention ran smoothly, was popular, economical and effective.

Keywords: University, tutorial conversation, interact ional practices

Researching “Collaborative Knowledge Building” in Formal Distance Learning Environments

Vanessa Paz Dennen
Educational Psychology & Learning Systems
Florida State University
vdennen@fsu.edu

Trena M. Paulus
Educational Psychology and Counseling
University of Tennessee
tpaulus@utk.edu

Abstract. Distance learning environments provide a rich opportunity for collaborative knowledge building, particularly through peer-to-peer dialogue. Much of the discussion in distance learning environments occurs in asynchronous forums, and it is content analysis of these discussions that constitutes the majority of research in online learning. However few studies in this area provide enough information about the context to know what works and what doesn’t. Most studies do not go beyond downloading and analyzing the transcripts after the course is completed. Studies also lack a solid epistemological stance, attempting to capture evidence of individual learning of knowledge rather than examining the process of group learning through knowledge construction. An ongoing lack of attention to a coherent theoretical foundation, examining transcripts without attending to their situated contexts, and relying primarily on reductionist content analysis methods, will continue to limit our understanding of the potentiality and actuality of online collaborative learning environments. In this paper we explore how Stahl’s social theory of CSCL can be applied to formal online learning environments to address these limitations.

Keywords: Online discourse, collaborative knowledge building, discourse analysis methods

Making a Mesh of It: A STELLAR Approach to Teacher Professional Development

Sharon J. Derry
University of Wisconsin-Madison
derry@education.wisc.edu

Cindy E. Hmelo-Silver
Anandi Nagarajan
Ellina Chernobilsky
Rutgers University
chmelo@rci.rutgers.edu
annagara@eden.rutgers.edu
ellinac@eden.rutgers.edu

Joan Feltovich
Institute for Human & Machine Cognition
jfeltovich@ihmc.us

Brad Halfpap
University of Wisconsin-Madison
halfpap@wiscmail.wisc.edu

Abstract. We propose a model for Internet learning grounded in a theoretical analysis of transfer and embodied within a general tool called STELLAR (Socio-Technical Environment for Learning and Learning-Activity Research). STELLAR supports creation and management of online courses that systematically integrate collaborative design with study of text and video. The objective of STELLAR is to help learners develop "meshed" cognitive representations that support transfer of course knowledge to professional practice. Using STELLAR, we created experimental online courses in the learning sciences for pre-service teachers. Our research produced substantial evidence supporting our approach and a body of empirically tested online materials and collaborative activities for teacher education.

Keywords: Teacher education, transfer, online learning, instructional design, problem-based learning, design-based learning, video cases

Designing Collaborative Learning Systems: Current Trends & Future Research Agenda

Angelique Dimitracopoulou
Learning Technology & Educational Engineering Laboratory
University of the Aegean, Greece
adimitr@rhodes.aegean.gr

Abstract. The research community, in order to support learning as well as collaboration, has designed systems, which, distinctive from common web-based ones (simply enabling collaborative activities), constitute new cognitive and meta-cognitive tools. The paper proceeds with a categorization of the main tools and functions that characterise collaborative learning systems (designed for primary/ secondary/ higher/ education) in order to discuss the current trade-offs. It proposes a design framework for collaborative learning systems that are addressed to primary & secondary education. This framework is derived from considerations of cognitive psychology, science education, and CSCL community research results. The paper concludes by presenting the main themes of the actual research agenda, which is intended to help design systems that can be integrated into primary and secondary education contexts.

Keywords: Collaborative learning systems, primary / secondary education, trade-offs, framework

Supporting CSCL with Automatic Corpus Analysis Technology

Pinar Dönmez, Carolyn Rosé
Language Technologies Institute
Carnegie Mellon University
pinard,cprose@cs.cmu.edu

Karsten Stegmann
Department for Applied Cognitive Psychology and Media Psychology,
University of Tuebingen
k.stegmann @iwm-kmrc.de

Armin Weinberger, Frank Fischer
Knowledge Media Research Center Tuebingen
a.weinberger, f.fischer@iwm-kmrc.de

Abstract. Process analyses are becoming more and more standard in research on computer-supported collaborative learning. This paper presents the rational as well as results of an evaluation of a tool called TagHelper, designed for streamlining the process of multi-dimensional analysis of the collaborative learning process. In comparison with a hand-coded corpus coded with a 7 dimensional coding scheme, TagHelper is able to achieve an acceptable level of agreement (Cohen's Kappa of .7 or more) along 6 out of 7 of the dimensions when we commit only to the portion of the corpus where the predictor has the highest certainty. In 5 of those cases, the percentage of the corpus where the predictor is confident enough to commit a code is at least 88% of the corpus. Consequences for theory-building with respect to automatic corpus analysis are formulated. Potential applications as a support tool for process analyses, as real-time support for facilitators of on-line discussions, and for the development of more adaptive instructional support for computer-supported collaboration are discussed.

Keywords: Corpus analysis, automatic text processing techniques, argumentation

A Study of the Foundations of Artifact-Mediated Collaboration

Nathan Dwyer, Daniel D. Suthers
Laboratory for Interactive Learning Technologies
Department of Information and Computer Sciences
University of Hawai`i
ndwyer@hawaii.edu, suthers@hawaii.edu

Abstract. The premise of this work is that, like language, the meanings of written representations are contextual and their affordances are appropriated in sometimes-unexpected ways. This situation presents a dilemma for designers of collaborative learning technologies: there is a need for representational and interactional tools that guide and support learning through cognitive and social activities, but predefined mappings between interface elements and functionalities may be too rigid. The study reported in this paper attempts to address this dilemma by identifying the strategies that people communicating via flexible written representations use to manage their interaction, and how they appropriate the affordances of media to carry out these strategies. We analyzed how people appropriated paper-based tools for collaboration under conditions approximating online interaction. Regularities were observed in the use of limited but polymorphic repertoires for communication and expression of attitude, functional and coordinative use of space, the presence of simultaneous threads, and strategies for interruption and context setting. The results suggest a new generation of collaborative technologies that include support for multi-faceted and parallel interactions, lightweight tools for expressing attitude, context representations, and scaffolding for automatically detecting and supporting emerging conventions.

Keywords: Descriptive Studies, Video Analysis, Interactional Practices, Representational Affordances, Shared Workspaces

Effects of an Individual's Prior Knowledge on Collaborative Knowledge Construction and Individual Learning Outcomes in Videoconferencing

Bernhard Ertl, Birgitta Kopp & Heinz Mandl
Department of Psychology
Ludwig Maximilian University, Munich
{ertl|koppb|mandl}@emp.paed.uni-muenchen.de

Abstract. This paper deals with collaborative knowledge construction in videoconferencing. The main topic for investigation is how to predict individual learning outcomes, and in particular the degree to which an individual's prior knowledge and collaborative knowledge construction can influence individual learning outcomes. In this context, the influence of prior knowledge and two measures of instructional support, a collaboration script and a content scheme, were analyzed with respect to collaborative knowledge construction. An empirical study was conducted using 159 university students. Students worked collaboratively in groups of three within a case-based videoconferencing learning environment and were supported by instructional support measures. Results indicated that collaborative knowledge construction had a greater impact on individual learning outcomes than an individual's prior knowledge.

Keywords: prior knowledge, factual knowledge, applicable knowledge, cooperative/collaborative learning, teaching/learning strategies, videoconferencing, collaboration script, content scheme, collaborative knowledge construction, shared application

The SENSE Project: a Context-inclusive Approach to Studying Environmental Science within and across Schools

Danaë Stanton Fraser[1], Hilary Smith[3], Ella Tallyn[2], Dave Kirk[2], Steve Benford[2], Duncan Rowland[2], Mark Paxton[2], Sara Price[3] and Geraldine Fitzpatrick[3]

[1] Department of Psychology, University of Bath
[2] Mixed Reality Laboratory, School of Computer Science & I.T., University of Nottingham
[3] Interact Lab, Department of Informatics, University of Sussex

Abstract. This paper describes a project designed to provide children with a context-inclusive approach to collecting scientific data. The term context-inclusive refers to the collection of data which records the process of scientific data collection itself. We outline the design process carried out within two partner schools with the aim of engaging children in taking part in, and reflecting upon, the scientific process involved in collecting and analysing scientific data. We provided children with the ability to share and compare their data with children at their own and other schools. Our context-inclusive approach involved the design of tailored sensors and a bespoke interface displaying video data synchronised with environmental pollution data. Through evaluation of the data collection, analysis and sharing sessions, we describe how the context-inclusive approach impacts on children's understanding of the scientific process. We focus on children's discussion and reflection around understanding the constraints of measuring. We argue that the collection and presentation of contextual data engenders reflection on constraints, and may enable improved understanding of that process.

Keywords. Context, collaboration, eLearning, children, evaluation, sensors, pollution, visualisation

No Need to Read Messages Right Now: Helping Mediators to Steer Educational Forums Using Statistical and Visual Information

Marco Aurélio Gerosa, Mariano Gomes Pimentel, Hugo Fuks & Carlos J.P. Lucena
Computer Science Department, Catholic University of Rio de Janeiro (PUC-Rio)
R. M. S. Vicente, 225, Rio de Janeiro, Brazil - 22453-900
{gerosa, mariano, hugo, lucena}@inf.puc-rio.br

Abstract. In an education environment, a forum provides a valuable tool that can be used to foster reflection and a deeper analysis of subjects being discussed. However, as an asynchronous communication tool, participation can occur at any time, demanding a constant attention of the teacher to satisfactorily mediate the group and the discussion. In addition, a reasonable number of messages can be posted in a short period of time, making it hard to follow up and coordinate the discussion. This paper proposes an approach based on statistical and visual analysis of messages characteristics to alert the teacher about potential problems.

Keywords: Forum, Coordination, Message Inspection, Collaboration

The Role of Floor Control and of Ontology in Argumentative Activities with Discussion-based Tools

Amnon Glassner

Ben-Gurion University of the Negev, Beer-Sheva, Israel

aglazner@bgumail.bgu.ac.il

Baruch B. Schwarz

Hebrew University of Jerusalem, Israel

msschwar@mscc.huji.ac.il

Abstract. Argumentative activity has been found beneficial for knowledge building and evaluation of information in some conditions. Many CSCL theorists have suggested that graphical representations may help in this endeavor. In the present study we examine effects of a graphical representation of synchronous discussions. 54 Grade 7 students from 2 classes participated. The study tested the effects of: (a) the use of shapes representing some argumentative functions in discussions and the use of arrows representing support/challenge between utterances; (b) the use of floor control to monitor turn taking during discussion. It appears that the combination of use of shapes and arrows and of the control over turn taking invites students to express more relevant claims and arguments, and less chat expressions.

Keywords: Argumentation, Knowledge Building, (a)synchronous e-discussions

ACT: A Web-based Adaptive Communication Tool

Agoritsa Gogoulou, Evangelia Gouli, Maria Grigoriadou
Department of Informatics & Telecommunications,
University of Athens
{rgog, lilag, gregor}@di.uoa.gr

Maria Samarakou
Department of Energy
Technology, Technological
Education Institute of Athens
marsam@teiath.gr

Abstract. This paper presents a web-based adaptive communication tool, called ACT. ACT supports and guides the learners' communication/collaboration by implementing the structured dialogue either through sentence openers or communication acts. The scaffolding sentence templates are adapted according to the cognitive skills addressed by the learning activity, the model of collaboration followed and the educational tool used. The learners have the possibility to personalize the communication/ collaboration process by enriching the provided set of the scaffolding sentence templates with the desired ones and to monitor their debate in a visual graphical representation form through the Dialogue Tree. The first empirical results are encouraging regarding the predetermined set of the scaffolding sentence templates and their proper use, the adaptation framework supported, the provided facilities and the coherence of the dialogue.

Keywords: Communication, structured dialogue, sentence openers, communication acts, scaffolding sentence templates, adaptation, Dialogue Tree

The Effects of Electronic Communication Support on Presence Learning Scenarios

Andreas Harrer, Sam Zeini and Niels Pinkwart
Collide Research Group,Universität Duisburg-Essen
{harrer, zeini, pinkwart}@collide.info

Abstract. This paper investigates in the effects of using electronic communication forms in web-based environments. Following the idea of triangulation, we used qualitative methods, statistical analysis and Social Network Analyses to explore the patterns of communication within one selected case of a mixed presence/web-based university course. The results show that while an isolated perspective does not suffice to explain the complex processes, taking more perspectives into account in a combined and integrated way provides a better understanding of technology enabled communication and interaction.

From Parallel Play to Meshed Interaction: The Evolution of the eSTEP System

Cindy E. Hmelo-Silver
Rutgers University
chmelo@rci.rutgers.edu

Sharon J. Derry, David Woods, Matt DelMarcelle
University of Wisconsin-Madison
derry@education.wisc.edu
dwoods@wcer.wisc.edu
mdelmarcel@aol.com

Ellina Chernobilsky
Rutgers University
ellinac@eden.rutgers.edu

Abstract. In this paper, we describe the evolution of the eSTEP system. The eSTEP system is an integrated online learning environment for teacher education that provides videocases of classroom practice, an online learning sciences hypertext, and a collaborative problem-based learning environment. The central tool in the problem-based learning environment is the group whiteboard. In face-to-face PBL activities, a whiteboard serves to focus negotiation and represent current understanding. Seeking to offer the same functionality online, we adapted the structure and functionality of a basic whiteboard to easily allow students to exchange and develop ideas online, and effectively represent current understanding. This tool serves as the focus of negotiation in face-to-face PBL but required considerable adaptation to serve this function in an online environment. This paper describes the refinement of the whiteboard and the concomitant refinement of our theory of how students learn through meshing the conceptual ideas of the learning sciences with perceptual information from the problems of practice.

Keywords: problem-based learning, scaffolding, design principles

The Shape of the Elephant: Scope and Membership of the CSCL Community

Christopher M. Hoadley
College of Education, and School of Information Sciences and Technology
Penn State University
cscl05-elephant@tophe.net

Abstract. This paper discusses the character of the CSCL research community. While members of the community often feel they have authoritative perceptions of the nature of the community, these perceptions often differ. This paper is an attempt to look empirically at the CSCL community as constituted by leadership in the CSCL conferences. Data are included about who, historically, has published in the CSCL conferences and how those people are distributed across academic disciplines and regions of the world. In addition, the relationship between CSCL and the learning sciences is explored.

Keywords: Citation analysis, bibliometrics, sociology of science, computer-supported collaborative learning, learning sciences, communities of practice.

Building Bridges within Learning Communities through Ontologies and "Thematic Objects"

Ulrich Hoppe, Niels Pinkwart, Maria Oelinger, Sam Zeini
University of Duisburg-Essen
{hoppe,pinkwart,oelinger,zeini}@collide.info

Felisa Verdejo, Beatriz Barros, Jose Ignacio Mayorga
Spanish Open University
{felisa,bbarros,nmayorga}@lsi.uned.es

Abstract. Communication through artefacts, in the sense of objects (co-)constructed by learners, is a well known mechanism in synchronous shared workspace environments. In this article, we explore the potential of extending this principle to heterogeneous, anonymous and asynchronous learner communities by drawing on existing work, e.g. in the areas of "social navigation" and recommender systems. A new ingredient is the description and provision of "thematic objects" embedded in a task/activity context. Design principles and available technologies are discussed and an example implementation in a European project is presented from the perspective of technology design and development.

Keywords: Artefact-centred community support, social navigation, content-awareness

A New Role for Computer-Mediated Communication in Engaging Teacher Learning within Informal Professional Communities

Diane Hui
Department of Education
Washington University in St Louis
diane.hui@wustl.edu

Abstract. Computer-mediated communication (CMC) implementations, in particular among teachers, have not lived up to public expectations. This study examines some reasons for this and outlines a conceptual and methodological framework for characterizing the engagement of experienced and novice teachers in informal network-based professional learning communities. I postulate sustainability to positively correlate with what I term "CMC engagement." This study addresses three key research questions: (1) What properties constitute CMC engagement in professional learning e-communities? (2) Why do some CMC groups sustain themselves, whereas others do not? (3) How might the communicative structures of network-based CMC enhance or constrain the development of their e-communities, and in turn, pertain to CMC engagement? I argue that both the dialogicality of utterances (Bakhtin, 1986) and the use of texts as “thinking device[s]" for generating new meanings (Lotman, 1990; Wertsch, 1991) are essential for engaging practitioners' professional life. Using both qualitative and quantitative methods, longitudinal discursive data from public teacher email lists are subject to microgenetic, discourse, and ethnographic analyses, resulting in a novel taxonomy of e-communities and a characterization of CMC engagement. The findings provide a new formulation for sustainable learning in CMC-based professional teaching and learning environments, in both informal and formal settings.

Keywords: Computer-Mediated Communication (CMC), Engagement, Teacher Learning, Informal Professional Communities

Preserving Authenticity in CoLs and CoPs: Proposing an Agenda for CSCL

David Hung
National Institute of Education
Der Thanq Chen
University of Canterbury
wldhung@nie.edu.sg

Abstract. This paper reviews the issues of authenticity in learning and educational technologies. Instead of undermining the authenticity of schools or communities of learners (CoLs), we acknowledge schools as having equally legitimate authenticities compared with communities of practice (CoPs). Founded on such an argument, we propose the role of scaffolding learners from CoLs and CoPs. A critical review of approaches to authenticity forms a major part of this paper, and a recommendation of a framework to scaffold learners from CoLs to CoPs with augmentation supports is recommended. We argue that such a process leads to innovation. We recommend an agenda for the field of CSCL to consider.

Keywords: Authenticity, Communities of Learners, Communities of Practice, Scaffolding, Augmentation

V-Share - Video-based Analysis and Reflection of Teaching Experiences in (Virtual) Groups

Peter Huppertz
University of Education, Freiburg
peter.huppertz@ph-freiburg.de

Ute Massler
University of Education, Freiburg
ute.massler@ph-freiburg.de

Rolf Ploetzner
University of Education, Freiburg
rolf.ploetzner@ph-freiburg.de

Abstract. Successful teacher education links methodological theory and teaching practice. Research further indicates that student teachers' development of pedagogical content knowledge can be fostered if they are supported in reflecting on teaching experiences individually and cooperatively. Time and place independent pre- and in-service teacher training is gaining importance. Due to long distances between individual student teachers and the limited amount of time for reflection during face-to-face sessions, analysis and reflection processes cannot be realized in blended learning arrangements with the same means available in traditional face-to-face teacher education. The project "v-share" therefore develops the methodological concept and technical support for video-based analysis and reflection on teaching experiences in (virtual) groups. The internet-based tool allows student teachers in blended learning arrangements to share videos of their own and their fellow student teachers' teaching lessons and to select sequences for joint online analysis, annotation and reflection.

Keywords: video-analysis and -annotation, teacher training, blended learning, reflective teaching

CSCL - The Next Ten Years – a View from Europe

Chris Jones
Department of Educational Research
Lancaster University,
United Kingdom
c.r.jones@lancaster.ac.uk

Lone Dirckinck-Holmfeld
Department of Communication,
Aalborg University,
Denmark
lone@hum.aau.dk

Berner Lindtröm
Department of Education,
Göteborg University,
Sweden
berner.lindstrom@ped.gu.se

Abstract. This paper reviews some foundational issues that affect the progress of CSCL. In particular we examine the terms technology, affordance and infrastructure and propose a relational approach to their use in CSCL. Following a consideration of networks, space and trust we propose an indirect approach to design in CSCL. The paper is based on the outcomes of two European networks, E-QUEL a network on e-quality in e-learning and Kaleidoscope, a European Union Framework 6 Network of Excellence and the 'Conditions of productive learning in networked learning environments' project in particular. This paper does not aim to be comprehensive or summative rather it provides a view of current issues and perspectives from a European point of view.

Keywords: CSCL, networked learning, ethics , affordance, design

Design Principles for Online Peer-evaluation: Fostering Objectivity

Yael Kali
Technion – Israel Institute of Technology
Israel
yaelk@tx.technion.ac.il

Miky Ronen
Holon Academic Institute of Technology
Israel
ronen@hait.ac.il

Abstract. Peer-evaluation is a powerful method for fostering learning in a variety of contexts. Yet challenges of application in contexts involving personal values received little attention. This study used a design-based research approach to explore such challenges in an undergraduate educational-philosophy course. The study was organized in three design-and-implementation iterations of a peer evaluation activity. Discrepancies between student and instructor scores were explained by bias due to non-objective student personal stands. Refinements to the design, based on emerging design principles a) assisted students to better differentiate between objective criteria and personal opinions, b) increased learning gains, and c) decreased tensions between different cultural groups.

Keywords: Online peer-evaluation, Design, Undergraduate Education, Educational Philosophy

Problem Solving as a Complex, Evolutionary Activity: a Methodological Framework for Analyzing Problem-solving Processes in a Computer-supported Collaborative Environment

Manu Kapur[1], John Voiklis[2], Charles K. Kinzer[3]
Communication, Computing, and Technology in Education
Teachers College, Columbia University
[1]manu_kapur@hotmail.com, [2]jv37@columbia.edu, [3]kinzer@tc.columbia.edu

Abstract. Viewed through the lens of complex systems science, one may conceptualize problem-solving interactions among multiple actors, artifacts, tools, and environmental structures as goal-seeking adaptations, and problem-solving itself, as a complex adaptive activity. Theories of biological evolution point to an analogical equivalence between problem solving and evolutionary processes and, thus, introduce innovative methodological tools to the analysis of computer-supported, collaborative, problem-solving processes. In this paper, we present a methodological framework for characterizing and analyzing these processes. We describe four measures that characterize genetic evolution - *number*, *function*, *fitness*, and *persistence* - to characterize the process of collaborative problem solving, and instantiate them in a study of problem-solving interactions of collaborative groups in an online, synchronous environment. Issues relating to reliability, validity, usefulness, and limitations of the proposed methodology are discussed.

Keywords: Problem solving, complex adaptive activity, convergence, fitness, persistence

Our Way to Taipei -
An Analysis of the First Ten Years of the CSCL Community

Andrea Kienle
Informatics & Society
University of Dortmund, Germany
andrea.kienle@udo.edu

Martin Wessner
Fraunhofer IPSI
Darmstadt, Germany
martin.wessner@ipsi.fraunhofer.de

Abstract. Ten years of international CSCL conferences give proper reason to reflect on the development of the CSCL community. Based on an analysis of conference proceedings, lists of participants and lists of program committee members, this paper provides insights about the development of the CSCL community in its first decade. A focus is set on the continuity of active and passive membership, the geographical distribution and the international connectivity of the community.
Contrary to our expectations, only a relatively small number of people participate continuously in the community. Concerning the geographical distribution we found that the community is increasingly international in conference participation, authors, and program committees. The international connectivity of the community is also increasing which can be seen in a growing number of citations and co-authorships across different countries. These results can serve as a basis for further cultivation of the CSCL community.

Keywords: CSCL community, community analysis, citation analysis, social network analysis.

Anonymity Options and Professional Participation in an Online Community of Practice

Peter G. Kilner
Instructional Systems Program,
Penn State University, and
U.S. Military Academy
pgk111@psu.edu

Christopher M. Hoadley
College of Education, and School of
Information Science & Technology
Penn State University
cscl05-anon@tophe.net

Abstract. In this paper, we analyze a natural experiment regarding anonymity options and participation in a large, successful online community of practice (CoP) for U.S. soldiers. We study the impacts of changes of anonymity options on comment quality for productive discussion and professionalism. Four levels of personal attribution or anonymity of comments are significantly correlated with comment quality under some, but not all, circumstances. Eliminating anonymity options produced significantly fewer antisocial comments and fewer comments overall, although it did not affect overall peripheral participation as measured by logins and page views. Online identity or reputation appears to be more of a factor than external culpability in shaping user behaviors. Attitudes of participants and the evolution of norms over time are presented, and implications for the design of online learning communities are discussed.

Keywords: Community of practice, anonymity, norms, flaming, facilitation, moderation, participation, online discussion, asynchronous discussion

The Evolution of the Intellectual Partnership with a Cognitive Tool in Inquiry-Based Astronomy Laboratory

Beaumie Kim
NASA-Sponsored Classroom of the Future
Wheeling Jesuit University
bkim@cet.edu

Kenneth E. Hay
Learning and Performance Support Lab
The University of Georgia
khay@coe.uga.edu

Abstract. This paper describes a study focused on the longitudinal application of a cognitive tool by observing a pair of learners' interaction with it over a semester. This study intended to develop a deeper understanding of the process whereby learners become more capable of engaging in scientific inquiry with the tool in order to advance technology-enhanced, inquiry-based approaches to instruction. In an effort to understand how learners move toward coherent knowledge structure, eccentricity of planet's orbit emerged as one of the main themes. The findings are discussed focused on how the pair used, understood, and elaborated the concept of eccentricity.

Keywords: Distributed cognition, expertise, cognitive tool, inquiry-based learning, modeling

Review of Computer-Mediated Collaborative Concept Mapping: Implication for Future Research

Bosung Kim, Chia-chi Yang, I-Chun Tsai

School of Information Science & Learning Technologies
University of Missouri-Columbia

bkq22@mizzou.edu; cymp8@mizzou.edu; itch9@mizzou.edu

Abstract. In this paper we critically review and analyze previous research on collaborative concept mapping in both face-to-face and networked environments. Although research has shown the positive effects of collaborative concept mapping on learning in face-to-face learning environments, there is a dearth of research which specifically focuses on the potential value of adopting collaborative concept mapping in online learning environments. Newly developed concept mapping software which operates via the Internet makes it possible for distance learners to implement concept mapping as a learning tool for co-constructing knowledge. Using our analysis of current research we provide some directions for future research in the use of concept mapping for online learning.

Keywords: concept mapping, collaborative learning, computer-mediated learning, literature review, assessment

Weak Guidance with "Look" Functionality in Handheld-Based Classroom Activities

Kibum Kim and Deborah G. Tatar
Center for Human-Computer Interaction
Department of Computer Science
Virginia Tech
kikim@vt.edu, tatar@vt.edu

Abstract. Wireless handheld technologies can be used to move technology into the classroom framework rather than to move classrooms into the technology framework. To make such technologies effective, we support activities and teaching practices crucial to children's creativity and competence. However, because of the small screen size and distributed nature of some of the activities, it can be hard for teachers to engage in *formative assessment*, that is, finding out what students know and can do. The current work reports an idea about how to solve this problem and the first assays of this idea in the classroom. We try to enable what we call *weak guidance* during collaborative activities, by implementing a system feature called "Look."

Keywords: Mobile Computing, Constructivist Pedagogy

The Effects of Remote Gesturing on Distance Instruction

David S. Kirk
Computer Science & IT
University of Nottingham
dsk@cs.nott.ac.uk

Danaë Stanton Fraser
Department of Psychology
University of Bath
D.StantonFraser@bath.ac.uk

Abstract. In this paper, we describe an experimental research study, investigating the impact of varying communication media on the quality of learning. Our study investigates remote instruction using an object assembly task. The between-subjects independent-measures study compared instruction via audio only, with instruction via a remote gesturing system. Measures included assembly speed and assembly accuracy and were recorded during instruction and post-instruction at 10min and 24hr intervals. Perceived Instructor presence and other interpersonal variables were assessed via questionnaire. Results showed that remote gesturing during instruction led to significantly faster self-assembly 24hrs post instruction ($t(13) = 1.73$, $p \leq 0.05$). Whilst the use of gesture reportedly reduces communicative rapport, we conclude that gesture-based remote instruction improves the overall efficiency of remote collaboration.

Keywords: expert, novice, remote gesturing, remote instruction, collaborative physical tasks

Collaborative Learning through Augmented Reality Role Playing

Eric Klopfer
Judy Perry
Teacher Education Program
Massachusetts Institute of Technology
klopfer@mit.edu, jperry@mit.edu

Kurt Squire
Ming-Fong Jan
School of Education
University of Wisconsin, Madison
kdsquire@education.wisc.edu,
mingfongjan@wisc.edu

Abstract. This research investigates the potential of Augmented Reality (AR) technologies, specifically handheld computers, to create an emotionally compelling, rich context for collaborative learning. Building on work in collaborative learning, we sought to design games requiring positive interdependence, promotive interaction, individual accountability, interpersonal and small group skills, and group processing. While the collaboration within groups was strong and successful in the first generation AR games, the collaboration between groups was limited or non-existent. Several new game play elements added to a new engine created a more dynamic game play experience. These features included time dependence, cascading events and distinct player roles. In subsequent iterations of AR games, we have found these new features to be effective at fostering collaboration, which in turn scaffolds a more authentic investigation process

Keywords: Handhelds, games, simulations, role play, PDA

Mystery at the Museum – A Collaborative Game for Museum Education

Eric Klopfer
Judy Perry
Teacher Education Program
Massachusetts Institute of Technology
klopfer@mit.edu
jperry@mit.edu

Kurt Squire
Ming-Fong Jan
Constance Steinkuehler
School of Education
University of Wisconsin, Madison
kdsquire@education.wisc.edu
mingfongjan@wisc.edu
steinkuehler@wisc.edu

Abstract. Through an iterative design process involving museum educators, learning scientists and technologists, and drawing upon our previous experiences in handheld game design and a growing body of knowledge on learning through gaming, we designed an interactive mystery game called Mystery at the Museum (the High Tech Whodunnit), which was designed for synchronous play of groups of parents and children over a two to three hour period. The primary design goals were to engage visitors more deeply in the museum, engage visitors more broadly across museum exhibits, and encourage collaboration between visitors. The feedback from the participants suggested that the combination of depth and breadth was engaging and effective in encouraging them to think about the museum's exhibits. The roles that were an integral part of the game turned out to be extremely effective in engaging pairs of participants with one another. Feedback from parents was quite positive in terms of how they felt it engaged them and their children. These results suggest that further explorations of technology-based museum experiences of this type are wholly appropriate.

Keywords: Handhelds, games, simulations, role play, PDA, museum, wireless

Progressive Refinement of a CSCL-Based Lesson Plan for Improving Student Learning as Knowledge Building in the Period for the Integrated Study

Knowledge Forum® Japan Research Group
Jun Oshima, Information Processing Center
Shizuoka Univ.
joshima@kai.ipc.shizuoka.ac.jp

Abstract. Although constructivism has been prevailed across schools in Japan, what they call constructivism is a "shallow" one (Scardamalia, & Bereiter, 2002). In collaboration with teachers at a laboratory school, we have been conducting design studies on a lesson for knowledge building from the perspective of "deep" constructivism. For embodying such a new lesson, a CSCL technology called Knowledge Forum® has been introduced. Through the progressive refinement of lesson plans, we have been involved in creating pedagogical design principles (Linn, Davis, & Bell (Eds.), 2004) by referring to the metaprinciples on knowledge building (Scardamalia, 2002). In this report, we describe our refinement process of a fifth-grade lesson on genetically modified foods through two years, and discuss how the pedagogical design principles can be transformed into design elements.

Keywords: knowledge building, design principles, design studies, the period for the integrated study

Internal and External Collaboration Scripts in Web-based Science Learning at Schools

Ingo Kollar
Virtual Ph.D. Program "Knowledge Acquisition and Knowledge Exchange with New Media", Tübingen (Germany)
i.kollar@iwm-kmrc.de

Frank Fischer
Knowledge Media Research Center, Tübingen (Germany)
f.fischer@iwm-kmrc.de

James D. Slotta
Graduate School of Education
University of California at Berkeley (U.S.A.)
slotta@tels.socrates.edu

Abstract. Collaboration scripts can help learners to engage in argumentation and knowledge acquisition. However, they might have differential effects for learners holding differently structured knowledge (internal scripts) on argumentation. We investigated how external scripts interact with learners' internal scripts concerning collaborative argumentation. 98 students from two secondary schools participated. Two versions of an external collaboration script (high vs. low structured) supporting argumentation were embedded within a web-based collaborative inquiry curriculum. Students' internal scripts were classified as either high or low structured, establishing a 2x2-factorial design. Results suggest that the high structured external script supported all learners, regardless of their internal scripts, concerning the acquisition of domain-general knowledge. Learners' internal scripts influenced the acquisition of domain-specific knowledge. Results from two case studies reveal differences in argumentation processes attributable to the learners' internal scripts. Results are discussed in terms of their theoretical relevance and practical implications for learning with collaboration scripts.

Keywords: Collaboration scripts, internal scripts, inquiry learning, science education, learning environments.

A Cognitive Tool in Handheld Devices for Collaborative Learning: Comprehending Procedural Knowledge of the Addition of Common Fractions

Siu Cheung KONG
Department of Information & Applied Technology, H.K. Institute of Education, sckong@ied.edu.hk

Sau Yin LAM
Department of Computer Science, City University of Hong Kong
sylam@cs.cityu.edu.hk

Lam For KWOK
Department of Computer Science, City University of Hong Kong
cslfkwok@cityu.edu.hk

Abstract. The aim of this research is to design a scenario for collaborative learning using a handheld or mobile device to aid the comprehension of new procedural knowledge. A cognitive tool (CT) – the graphical partitioning model (GPM) – that aids the development of the procedural knowledge needed to add fractions with unlike denominators was established from the results of a series of experimental studies. This paper discusses the redesign of the CT for use in handheld or mobile devices. The key to mediating the generation of procedural knowledge of the addition of fractions with unlike denominators is the process of searching for common denominators in the GPM. A scenario for collaborative learning is depicted, and the distribution of the cognitive load of learners across the GPM and their collaborative learning partners is elaborated. Three essential structures that promote collaborative work are discussed, namely, task structure, incentive structure, and group motivation.

Keywords: cognitive tool, collaborative learning, common fraction, handheld/mobile devices.

Arguing on the Computer

Deanna Kuhn and Wendy Goh
Teachers College
Columbia University
New York, NY 10027
dk100@columbia.edu

Abstract. We describe a collaborative computer-based activity as a means of developing argumentive discourse skills in middle-school students. The rationale for use of this technology is that it heightens the opportunity, and indeed demand, for metacognitive reflection on the communication, relative to direct verbal exchange. This demand is further heightened procedurally in two ways: (a) each dialog takes place among four participants, two who collaborate in producing and transmitting one side of the dialog and two who collaborate in producing and transmitting the other; subsequently, the respective pairs engage in analysis of a written transcript of it, with the aim of identifying how it might be improved.

Keywords: Argumentive discourse skills, metacognitive reflection

A Lightweight Approach for Flexible Group Management in the Classroom

Markus Kuhn, Marc Jansen, Andreas Harrer, Ulrich Hoppe
Institute for Computer Science and Interactive Systems
University Duisburg-Essen
{ kuhn, jansen, harrer, hoppe }@collide.info

Abstract. In this paper we describe a session management system for setting up various collaborative classroom scenarios. The approach is addressing the additional workload of administrating classroom networks on the teacher, which is an important aspect for teachers' willingness to implement technology enhanced learning in schools. The system facilitates preparation of classroom scenarios and the adhoc installation of networked collaborative sessions. We provided a graphical interface, which is usable for administration, monitoring, and for specification of a wide variety of different classroom situations with group work. The resulting graphical specifications are well suited to be re-used in the more formal learning design format IMS/LD; this is achieved by a automatable transformation of the scenarios to LD documents.

Keywords: Collaborative classroom scenarios, lightweight classroom orchestration, learning design, shared workspaces

Information and Communications Technology and Literacy Development

Mary Lamon
Institute for Knowledge Innovation and Technology
Ontario Institute for Studies in Education, University of Toronto
mlamon@kf.oise.utoronto.ca

Abstract. This paper reports an investigation of how students' literacy improved through on-line discourse. Two English literature classes in an inner city multicultural secondary school participated. The teacher taught both classes-an experimental and a control class. The experimental group was a class of Grade 9 students with access to the discourse space, Knowledge Forum®, for writing narrative and expository texts, critiquing others' texts, and exploring ideas. The control class did not have access to Knowledge Forum. Overall, discourse in the database resulted in improved literacy, a positive correlation between database activity and final grades, and to a more harmonious classroom culture.

Keywords: literacy, dialogue, knowledge building

Language Learning in a Virtual Classroom: Synchronous Methods, Cultural Exchanges

Deborah K. LaPointe
Health Sciences Center
University of New Mexico
dlapointe@salud.unm.edu

Kerrin A. Barrett
Organizational Learning and
Instructional Technologies
College of Education
University of New Mexico
kbarrett@unm.edu

Abstract. Exploring language development through using synchronous (real-time) voice and chat technology will be the focus of this paper. Researchers interviewed students, teaching assistants, and teachers of an online English as Second Language program based in Taiwan, using grounded theory to begin generating a theory of language learning using this new technology. Students of all ages reported preferring the online environment because they were less fearful of speaking online due to the anonymity afforded by the technology. Engaging article content motivated learners to interact with teachers and, as they became comfortable to interact collaboratively with each other. The opportunity to speak English with native speakers enabled students to obtain the necessary fluency for business, school and travel.

Keywords. Synchronous communication, voice over Internet protocol (VoIP) technology, computer supported collaborative learning (CSCL), English as a Second Language (ESL)

Assessing Learning Outcomes in CSCL Settings

Nancy Law
University of Hong Kong, Pokfulam
nlaw@hku.hk

Abstract. A variety of models and methodologies for assessing learning outcomes in CSCL settings have been reported in the literature, most of which were developed either within the framework of assessing levels of critical thinking or phases in problem solving. These generally assess outcomes at the individual level though the learning context was clearly a social collaborative one. Recent studies on the characteristics of productive online collaborative discourse have identified features at the group/community level that cannot be sufficiently described at the individual level. Building on the theory of knowledge building (Scardamalia & Bereiter, 2003) as a social intentional activity, this paper proposes a model of assessing learning in CSCL contexts as group/community outcomes with four inter-related but distinct dimensions: a social dynamic for sharing and open exploration, a progressive inquiry orientation, a socio-metacognitive orientation and a communal habit of mind. An application of the model is reported and the implication of the findings is discussed.

Keywords: assessment, online discourse, knowledge building, self-directed learning, critical thinking

Students Assessing Their Own Knowledge Advances in a Knowledge Building Environment

Eddy Y.C. Lee
Raimondi College
h9297168@hkusua.hku.hk

Carol K.K. Chan
Faculty of Education
University of Hong Kong
ckkchan@hkucc.hku.hk

Jan van Aalst
Faculty of Education
Simon Fraser University
vanaalst@sfu.ca

Abstract. We describe the design of a knowledge-building environment and examine the roles of knowledge-building portfolios in characterizing and scaffolding collaborative inquiry. Three classes of Grade 9 students in Hong Kong used Knowledge Forum (KF) under several design conditions. Results showed (1) Students working on portfolios guided with knowledge building principles showed more participation, deeper inquiry and conceptual understanding than students working on KF only, or producing KF portfolios with no principles, (2) Students' knowledge-building inquiry and discourse were related to their conceptual understanding, and (3) Knowledge-building portfolios provided ways for identifying and characterizing collective knowledge advances in the community.

Keywords: Knowledge building, assessment, portfolios, inquiry, computer discussion forums

Vulgar Competence, Ethnomethodological Indifference and Curricular Design

Oskar Lindwall
Department of Education
Göteborg University

Gustav Lymer
Department of Education
Göteborg University

oskar.lindwall@ped.gu.se

Abstract. In the paper, we discuss the relation between ethnomethodologically inspired video analysis and curricular design. Often the relation between analysis and design is taken as a relation between descriptive and prescriptive accounts. Conceptualised in this way, ethnomethodology and curricular design is a world apart. With a focus on ethnomethodology's take on analytical and normative questions, however, some ethnomethodological insights might play an interesting role in investigation as well as development of computer based learning environments. The discussion is structured around four analytical commitments: become vulgarly competent; be indifferent to formal analytic methods, not member concerns; focus on actions and immanent pedagogies, not learning; and, do hybrid studies.

Keywords: Ethnomethodology, video analysis, conversation analysis, design experiments, methodology

How Representation Matters: Comparing Collaborative Learning with Alternative Versions of Hypermedia

Lei Liu, Cindy E. Hmelo-Silver, Surabhi Marathe
Graduate School of Education
Rutgers, the State University of New Jersey
leiliu@eden.rutgers.edu, chmelo@rci.rutgers.edu, surabhim@eden.rutgers.edu

Abstract. The goal of this comparative case study is to investigate how students collaboratively learn about complex systems with hypermedia. This study also investigates how the conceptual representation underlying the hypermedia influences students' collaborative activities and knowledge co-construction. We use two different types of hypermedia to study the human respiratory system. One version of the hypermedia highlights the structural and the second version the functional-behavioral aspects of the human respiratory system. An in-depth analysis of two dyads, working on two versions of the hypermedia, will be presented in this paper.

Keywords: Knowledge co-construction, conceptual representation, hypermedia

A Structured Chat Framework for Distributed Educational Settings

Jacques Lonchamp
LORIA, BP 254, 54500 Vandoeuvre-lès-Nancy, France
jloncham@loria.fr

Abstract. Chat tools are an integral part of many collaborative e-learning environments. However, standard chat tools suffer from important coordination and coherence deficiencies. The solution proposed in this paper is a generic framework for building malleable structured chat applications. The paper discusses the approach and the main design decisions, emphasizing the importance of dynamic malleability in educational settings.

Keywords: chat, structured chat, computer-mediated communication, process-centric system, generic framework, malleability, on line education, cooperative learning

We Learn Better Together: Enhancing eLearning with Emotional Characters

Heidy Maldonado[1], Jong-Eun Roselyn Lee[2], Scott Brave[2], Cliff Nass[2], Hiroshi Nakajima[3], Ryota Yamada[3], Kimihiko Iwamura[3], Yasunori Morishima[4]

1. School of Education, Stanford University. heidym@cs.stanford.edu
2. Communications Department, Stanford University. {jroselyn, brave, nass}@stanford.edu
3. Control Technology Lab, Omron Corporation. nak@ari.ncl.omron.co.jp, {ryamada, kiwamura}@oas.net
4. Division of Languages, International Christian University. morishima@icu.ac.jp

Abstract. In this paper we explore a new direction for pedagogical computer characters, which we believe will maximize students' learning gains and enjoyment. To the traditional scenario where students interact primarily with a single coach or tutor character on-screen, we introduce the addition of both a social, animate colearner, and the student's own avatar character. Variations of the colearner's attributes, informed by research literature on human partners, are explored through an online testbed application of English language idioms. Results from an experimental study with 76 Japanese college students reveal that cooperative colearners have a positive impact on students' performance and experience, as well as increasing perceptions of the character's intelligence and credibility. Findings provide grounding for a fruitful new direction for pedagogical characters, where students learn alongside emotional companions.

Keywords: Pedagogical computer characters, evaluation of computer characters, language learning, colearners.

Cognitive Tutoring of Collaboration: Developmental and Empirical Steps Towards Realization

Bruce M. McLaren*, Lars Bollen+, Erin Walker*, Andreas Harrer+, Jonathan Sewall*

*Human-Computer Interaction Institute
Carnegie Mellon University
Pittsburgh, PA USA
bmclaren@cs.cmu.edu,
erinwalk@andrew.cmu.edu, sewall@cs.cmu.edu

+Collide Research Group
University Duisburg-Essen
Duisburg, Germany
harrer@collide.info,
bollen@collide.info

Abstract. In this paper, we describe developmental and empirical steps we have taken toward providing Cognitive Tutoring to students within a collaborative software environment. We have taken two important steps toward realizing this goal. First, we have integrated a collaborative software tool, Cool Modes, with software designed to develop Cognitive Tutors (the Cognitive Tutor Authoring Tool). Our initial integration does not provide tutoring *per se* but rather acts as a means to capture data that provides the beginnings of a tutor for collaboration. Second, we have performed an initial study in which dyads of students used our software to collaborate in solving a classification / composition problem. This study uncovered five dimensions of analysis that our approach must use to help us better understand student collaborative behavior and lead to the eventual development of a Cognitive Tutor for collaboration. We discuss our plans to incorporate such analysis into our approach and to run further studies.

Keywords: Collaborative learning, Cognitive Tutors, jigsaw design, spatial effects on problem solving

CSCL Scripts: Modelling Features and Potential Use

Yongwu Miao, Kay Hoeksema, Heinz Ulrich Hoppe, Andreas Harrer
Institute of Computer Science and Interactive Systems
University of Duisburg-Essen
(miao, hoeksema, hoppe, harrer)@collide.info

Abstract. The design of collaboration scripts is a new focus of research within the CSCL community. In order to support the design, communication, analysis, simulation and even execution of collaboration scripts, a general specification language to describe collaboration scripts is needed. In this paper, we analyse the suitability and limitations of IMS LD for modelling collaborative learning processes. Based on the analysis, we propose a CSCL scripting language. This paper presents the conceptual framework of this modelling language and the underlying design ideas. Furthermore, two developed CSCL script authoring tools are briefly described. Finally, we discuss potential types of usage and system support possibilities of CSCL scripts.

Keywords: IMS LD, CSCL scripting language, CSCL script, CSCL script authoring tool

An Experimental Study on Collaborative Scientific Activities with an Actual/Imaginary Partner

Kazuhisa Miwa, Yoshie Baba, and Hitoshi Terai
Graduate School of Information Science
Nagoya University
{miwa, baba, terai}@cog.human.nagoya-u.ac.jp

Abstract. In this study, we experimentally investigate collaborative scientific activities that are undertaken through a virtual space such as the Internet. In such cases, a partner has two aspects: an *imaginary partner* with whom the problem solver seems to work together, and an *actual partner* with whom he/she actually works. We design an experimental environment in which we can control the two factors independently. The experimental result shows: (1) a bias appearing in human behavior, such as the positive test bias in hypothesis testing, was not influenced by the change of an *actual partner*; however (2) the degree of using information given by a partner, such as reference to a partner's hypothesis, varied considerably with the change of an *actual partner*. Neither phenomenon above depended on the type of *imaginary partner*.

Keywords: Scientific discovery, Collaborative problem solving, Internet, Hypothesis testing

Promotion of Self-Assessment for Learners in Online Discussion Using the Visualization Software

Toshio MOCHIZUKI
Information Science and Technology Center, Kobe University
tmochi@kobe-u.ac.jp

Hiroshi KATO
National Institute of Multimedia Education
hkato@nime.ac.jp

Shin-ichi HISAMATSU
Graduate School of Media and Governance
Keio University
bm@sfc.wide.ad.jp

Kazaru YAEGASHI
Graduate School of Interdisciplinary
Information Studies, the University of Tokyo
kazaru@interlink.or.jp

Satoru FUJITANI
Faculty of Business Administration
Mejiro University
fujitani@mejiro.ac.jp

Tomoko NAGATA
Hyogo University of Teacher Education
tnagata@life.hyogo-u.ac.jp

Jun NAKAHARA
National Institute of Multimedia Education
jun@nakahara-lab.net

Toshihisa NISHIMORI
National Institute of Multimedia Education
nisimori@nime.ac.jp

Mariko SUZUKI
Faculty of Education, Shiga University
mariko@sue.shiga-u.ac.jp

Abstract. This study describes a method of self-assessment for learners in a collaborative discussion. The authors propose a method of self-assessment in an online discussion and examine its effectiveness through the development and evaluation of a software program to visualize the discussion on a Bulletin Board System. The software, referred to as “i-Bee” (Bulletin board Enrollee Envisioner), can visually display the co-occurrence relation between keywords and learners. Thus, the i-Bee can display the content-wise contribution made by each learner to the discussion. In addition, the i-Bee can display the recent level of participation of each learner and the frequency of each keyword used by the learners. The i-Bee enables students to assess and reflect over their discussion, to understand the condition, and to reorganize their commitment in a discussion reflecting their learning activity.

Keywords: Visualization, Self-assessment, Reflection, Online Discussion

Designing for Constructionist Web-based Knowledge Building

Yishay Mor
London Knowledge Lab
University of London, UK
y.mor@ioe.ac.uk

Jakob Tholander & Jesper Holmberg
Royal Institute of Technology
Stockholm, Sweden
{jakobth},{jesperh}@dsv.su.se

Abstract. This paper describes the iterative design of a web-based collaborative workspace used in educational practice, called *WebReports*. The system's unique feature is that it allows participants to discuss mathematical and scientific concepts using programmed animated and interactive models of their ideas. Rather than focusing on the specific features of the collaboration tool, we analyze it as part of a constructionist activity system. We describe the context in which the system was developed and used and compare our approach to previous research in the field. Further, we then present two scenarios which demonstrate the system in action. Following that, we attempt to map our cases to an activity theory framework. We highlight several issues in the process of the systems' development, where the contradictions between the WebReports system and other elements in the activity system shaped its design, and comment on several issues which go beyond the activity theory framework.

Keywords: Iterative design; Design experiment; Web-based collaboration; Constructionism; Activity Theory

Explicit Referencing in Chat Supports Collaborative Learning

Martin Mühlpfordt **Martin Wessner**
Fraunhofer Institute for Integrated Publication and Information Systems (IPSI)
{martin.muehlpfordt, martin.wessner}@ipsi.fraunhofer.de

Abstract. In Pfister & Mühlpfordt (2002) a study was presented showing that chat discussions with a strict turn order combined with the requirement to assign a type and an explicit reference to each message lead to a higher learning score than discussions in a normal chat or in a chat with strict turn order only. Due to the experimental design it was not possible to judge the role of explicit referencing. Now we present the "missing" data: The higher learning score can be explained just by the explicit referencing. We argue that this is an important design issue for chat applications, because it seems that explicit referencing leads to a more homogeneous discourse behavior (more homogeneous participation, more participation in parallel discussion threads) and a better grounding. A case study explored the use of the referencing function in a less restricted everyday collaborative situation.

Keywords: CSCL, Chat, Referencing, Experimental Study, Case Study

iTree: Does the Mobile Phone Encourage Learners to Be More Involved in Collaborative Learning?

Jun Nakahara
NIME/ The University of Tokyo
Jun[at]nakahara-lab.net

Kazaru Yaegashi
The graduate school of
The University of Tokyo
kazaru[at]interlink.or.jp

Shinichi Hisamatsu
The graduate school of
Keio University
bm[at]sfc.wide.ad.jp

Yuhei Yamauchi
The University of Tokyo
yamauchi[at]iii.u-tokyo.ac.jp

Abstract. A web-based collaborative learning sites has the bulletin board system (BBS) and allow learners to interact, exchange information, engage in discussion, and collaborate on projects. This paper outlines the development and evaluation of iTree, a Java mobile phone application that encourages learners to participate in online BBS forums. In essence, the application reminds the students of their level of participation in a class BBS forum via an image on the wallpaper on their mobile phones. Postings to the forum are represented as a tree, the growth of which reflects the learner's degree of participation. Our evaluation has shown that iTree encourages learners to engaging in forum exchange in a positive light. Many learners have come to regard iTree as a useful learning tool..

Keywords: Mobile phone, e-learning, discussion, collaborative learning

From CSCL Classroom to Real-World Settings through Project-Based Learning

Naoko Osada
Graduate School of Literature
Aoyama Gakuin University
d1203001@cc.aoyama.ac.jp

Naomi Miyake
School of Computer and Cognitive Sciences
Chukyo University
nmiyake@sccs.chukyo-u.ac.jp

Abstract. A number of studies indicate that project-based learning enhances a student's motivation and in-depth understanding, while the CSCL environment promotes collaboration within the project. However, we know little about how teachers or curriculum designers should design a course utilizing the project-based learning approach according to real-world activities. In this study, we investigate an undergraduate cognitive science course that combines CSCL classroom activities with observational project activities in educational fields. As a result we identified three requirements of a project-based learning design to promote integration between classroom knowledge and authentic field activities: 1) Parallel-structured course involving both disciplinary and project activities; 2) Reality of the project activities; and 3) accessibility of the project content. In the conclusion, we discuss how these findings should guide the development of CSCL-based, project-oriented courses.

Keywords: Project-based learning, knowledge integration, teaching cognitive science

Collaborative Scaffolding in Synchronous Environment: Congruity and Antagonism of Tutor/Student Facilitation Acts

Kai Pata
Science Didactics Department,
University of Tartu
kpata@ut.ee

Tago Sarapuu
Science Didactics Department,
University of Tartu
tago@ut.ee

Raymond Archee
School of Communication, Design and Media,
University of Western Sydney
r.archee@uws.edu.au

Abstract. This paper focuses on the theoretical framework for investigating facilitation acts of the tutor and the students in problem-solving groups as reciprocally congruent. We propose to broaden the scaffolding debate in collaborative teams towards the areas of students' shared metacognitive and cognitive grounding acts. Similar tutor-supported and untutored science-related dilemma-solving activities in network-based synchronous mode were categorically analyzed and compared with respect to their scaffolding acts. We asked the question, whether there emerges the collaborative scaffolding situation in teams and how does tutor influence the peer scaffolding. Results indicated the presence of several scaffolding actors in collaborative teams. The nature of activity (tutored or untutored) had an influence on the practice of specific supportive acts by the tutor and the students. The various interrelations between student and tutor scaffolding acts must be considered when preparing the tutor support during problem solving.

Keywords: collaborative scaffolding, synchronous learning, supporting dilemma solving

Assessment of Collaboration in Online Courses

Mariano Pimentel, Marco Aurélio Gerosa, Hugo Fuks, Carlos José Pereira de Lucena
Computer Science Department
Catholic University of Rio de Janeiro
{mariano, gerosa, hugo, lucena}@inf.puc-rio.br

Abstract. New educational dynamics require new assessment strategies. In this article, three strategies for evaluating the collaboration of learners are presented and discussed: assessment of participation in conferences, assessment of competence and collaborative assessment. These strategies have been investigated in a course taught entirely at distance by the AulaNet, which supplies some mechanisms for the application of these new assessment strategies.

Keywords: Assessment, Collaboration, Distance Education

Mediated Chat Development Process: Avoiding Chat Confusion on Educational Debates

Mariano Pimentel, Hugo Fuks, Carlos José Pereira de Lucena
Computer Science Department
Catholic University of Rio de Janeiro
{mariano, gerosa, hugo, lucena}@inf.puc-rio.br

Abstract. The objective of this research is to reduce confusion in chat conversation, which is the main problem regarding the use of chat tools for holding online course debates. This problem is investigated using a Groupware Engineering approach. A number of successive versions of the Mediated Chat tool have been developed as part of this research. This research aims at producing an enhanced chat tool designed for educational debates through which a chat conversation could be followed more easily.

Keywords: Chat Confusion, Education Debates, Online Education

Computer-Supported Collaboration in a Scripted 3-D Game Environment

Hämäläinen Raija, Researcher
Häkkinen Päivi, Professor

University of Jyväskylä Finland
Institute for Educational Research
PL 35, FIN-40014, University of Jyväskylä
raija.hamalainen@ktl.jyu.fi

Järvelä Sanna, Professor

University of Oulu
Finland
sanna.jarvela@oulu.fi

Manninen Tony, Assistant Professor

University of Oulu Finland
tony.manninen@oulu.fi

Abstract. The particular focus of this paper is on scripting collaboration in a 3-D virtual game environment intended to make learning more effective, but also take into account the risk of over-scripting learning. The empirical experiment eScape, which encourages learners to solve problems collaboratively, is also presented. This study attempts to find out whether the features of 3-D games can be used to create meaningful scripted collaborative learning environments. The results indicated that scripting persuaded student teams to enter into collaboration, but the actual processes varied.

Keywords: CSCL, scripting, 3-D virtual game

Mining Learning Groups' Activities in Forum-type Tools

Pablo Reyes
LIUM-CNRS FRE 2730
Université du Maine, France
Pablo.Reyes@lium.univ-lemans.fr

Pierre Tchounikine
LIUM-CNRS FRE 2730
Université du Maine, France
Pierre.Tchounikine@lium.univ-lemans.fr

Abstract. Mining data produced by students involved in communication through forum-like tools can help revealing aspects of their communication. In this paper we propose an approach to the construction of models to highlight structural properties of learning groups based on a relational perspective (analysis of chains of references) and the use of Social Network Analysis techniques. These models can be useful both for the tutor and the participants. We begin by introducing the overall approach, then we describe how the models are constructed and finally we present preliminary results from the integration of these ideas in a forum-type tool.

Keywords: Link analysis, peer-to-peer support, social network analysis.

Establishing Communities of Practice among Students and Start-Up Companies

Markus Rohde
International Institute
for Socio-Informatics (IISI)
Bonn, Germany
rohde@iisi.de

Ralf Klamma
Lehrstuhl Informatik V
RWTH Aachen
Germany
klamma@cs.rwth-aachen.de

Volker Wulf
Information Systems
and Digital Media
University of Siegen,
Germanys
wulf@fb5.uni-siegen.de

Abstract. This paper presents the concept and an empirical evaluation of the course “High-tech Entrepreneurship and New Media”. The course design is based on socio-cultural theories of learning and considers the role of social capital in entrepreneurial networks. By integrating student teams into the communities of practice of local start-ups, we offer learning opportunities to students, companies, and academia. The student teams are connected to each other and to their supervisors in academia and practice through a community-system. Moreover, the course is accompanied by a series of lectures and group discussions. In this paper we present empirical findings and reflect on changes in the design of the course which took place between its first and the second instantiation. These design changes were based on the empirical evaluation of the first course and a deeper analysis of the role of social capital.

Keywords: Communities of Practice, Social Capital, Regional Start-Up Networks

Towards A Design Framework for Mobile Computer-Supported Collaborative Learning

Jeremy Roschelle
Center for Technology in Learning
SRI International
Jeremy.Roschelle@sri.com

Ricardo Rosas
Dept. of Psychology
P. Universidad Católica de Chile
rrosas@puc.cl

Miguel Nussbaum
Dept. of Computer Sciences
P. Universidad Católica de Chile
mn@ing.puc.cl

Abstract. We present one component of a foundation for mobile, handheld device-supported collaborative learning (mCSCL), a design framework. Our design framework proposes that mediation can occur in two complementary layers, social (e.g. rules and roles) and technological. Further we suggest that for mCSCL, the technological layer has two components, representational mediation and networked mediation. A particular design challenge is achieving an effective allocation of supporting structure to each layer as well as simple, transparent flow between them.

Keywords: CSCL, mobile, handheld, design, collaboration

Implementing Online Collaborative Professional Development for Innovative Educators

Donna Russell, Ph.D.
Assistant Professor
University of Missouri-Kansas City
5100 Oak St.
Kansas City, Missouri, U.S.A.
russelldl@umkc.edu

Art Schneiderheinze, Ph.D.
Professional Development/Project Supervision
Project Construct National Center
Columbia, Missouri, U.S.A.

Abstract. The purpose of this study was to describe how four teachers in different cities in Missouri implemented an innovation cluster that paired an online technology with a problem-based unit design framework. The motivating principle for the study originated from prior research on teacher adoption of technology innovations and principles of professional development for educators. Using a multiple case study research method, the researchers collected and analyzed data to (1) understand how effectively the teachers implemented the unit while participating in online collaborative professional development and (2) identify cross-case issues that arose as the teachers collaboratively implemented the problem-based unit.

Keywords: Guidelines, formatting instructions, author's kit, conference publications

Local and Distributed Interaction in a Collaborative Knowledge Building Scenario

Kurt Rysjedal
Department of Information and Media Science & InterMedia
University of Bergen
kurt.rysjedal@intermedia.uib.no

Barbara Wasson
Department of Information and Media Science & InterMedia
University of Bergen
barbara.wasson@intermedia.uib.no

Abstract. The structure and organization of a learning environment has implications for how students organize their collaborative interactions and learning activities. Investigating how students understand and utilize the collaborative conditions in a learning environment is thus a key issue to obtain insight into how to improve the design of such environments. In this paper we identify how collaborative knowledge building is produced in distributed and co-located interactions between students and discuss how this is related to the design of the learning environment.

Keywords: Interaction analysis, distributed collaborative learning, inquiry learning, knowledge building.

Supporting Collaborative Discovery Learning by Presenting a Tool

Nadira Saab
Graduate School of Teaching and Learning
University of Amsterdam
Nadira@ilo.uva.nl

Wouter van Joolingen
Graduate School of Teaching and Learning
University of Amsterdam
Wouter@ilo.uva.nl

Abstract. In collaborative discovery learning students jointly perform experiments to test generated hypotheses with as a result the co-construction of knowledge by means of sharing knowledge and negotiating. In this study, we introduce the Collaborative Hypothesis Tool (CHT), which guided 15 of 25 dyads through the collaborative discovery learning process. The results show that working with the CHT can influence the use of communicative and discovery activities, which can lead to a better learning performance. Future research should be aimed at the stimulation of the use of the tool, since the learners did not use the tool very frequently.

Keywords: Cognitive tools, Collaborative discovery learning, Communication, Discourse analysis

Experiences with Interactive Lectures –

Considerations from the Perspective of Educational Psychology and Computer Science

Nicolai Scheele[1], Anja Wessels[2], Wolfgang Effelsberg[1], Manfred Hofer[2] & Stefan Fries[2]

[1] Department of Computer Science, University of Mannheim
{scheele,effelsberg}@informatik.uni-mannheim.de
[2] Department of Educational Science II (Pedagogical Psychology), University of Mannheim,
{wessels,hofer,fries}@uni-mannheim.de

Abstract. The conventional lecture scenario implicates fundamental didactic problems due to a lack of interactivity and opportunity for feedback. In an interactive lecture, each student is equipped with a lightweight, mobile device that can be used to wirelessly interact with the lecturer during the lesson. This creates an additional channel of communication. In this paper, we present our experiences with this new scenario over the last three years. After discussing the benefits of interactive lectures, similar projects, and possible mobile devices, we introduce the software-toolkit used in our scenario and present a selection of results from over our six major studies.

Keywords: interactive lectures, ubiquitous computing, wireless communication, blended learning

The Impact of Role Assignment as Scripting Tool on Knowledge Construction in Asynchronous Discussion Groups.

Tammy Schellens tammy.schellens@ugent.be
Hilde Van Keer hilde.vankeer@ugent.be
Martin Valcke martin.valcke@ugent.be
Bram De Wever bram.dewever@ugent.be

Department of Education
Ghent University

Abstract. The present paper describes the impact of learning in asynchronous discussion groups on students' levels of knowledge construction. Multilevel analyses were applied to uncover the influence of student, group, and task variables and the specific impact of the assignment of roles. Results indicate that students' attitude towards the learning environment and their engagement in the discussion group are significant predictors. No significant overall differences in students' mean levels of knowledge construction between the role and no role condition were observed. However, additional analyses revealed (1) that students in the role condition more often reached the highest level; and (2) that assigning students the role of summarizer resulted in significantly higher levels of knowledge construction.

Keywords: CSCL, collaborative learning, asynchronous discussion groups, roles, scripting

A New Direction for Log File Analysis in CSCL: Experiences with a Spatio-Temporal Metric

Till Schümmer[1], Jan-Willem Strijbos[2], Thomas Berkel[1]

[1]Computer Science Department
FernUniversität Hagen, Germany

[2]Department of Educational Sciences
Leiden University, The Netherlands

Corresponding author: Till.Schuemmer@fernuni-hagen.de

Abstract. This paper discusses the importance and difficulties of assessing interaction between students. To ease the detection of interaction in student groups, a metric is developed that can measure the level of interaction based on log file data. The metric is based on a spatial model and detects actions that take place in close spatial or temporal proximity. After providing a formal definition of the metric, an exploratory analysis of interaction in two different settings is reported to determine the feasibility of the measure: synchronous interaction in a collaborative puzzle game and asynchronous interaction in student groups that use the BSCW shared workspace system.

Keywords: Log file analysis, Spatial models, Interaction awareness, Interaction assessment

Teaching Distributed Software Development with the Project Method

Till Schümmer, Stephan Lukosch, Joerg M. Haake

Computer Science Department
FernUniversität in Hagen, Germany

Corresponding author: Till.Schuemmer@fernuni-hagen.de

Abstract. Lab courses are an integral part of higher education in engineering sciences. In this paper, we report about a blended learning approach for such courses in computer science education. We show how the project method for co-located learning can be translated into a blended CSCL setting for a lab course on distributed software development, and how the resulting learning scenario can be supported with the collaborative virtual learning environment CURE. Experiences from the application of the educational approach in two courses indicate benefits but also highlight the need for further technical support.

Keywords: CSCL, project method, blended learning, distributed lab courses, collaborative virtual learning environments, CURE.

Non-linear Dynamical Development of CSCL Communities

Li Sha
Faculty of Education
Simon Fraser University
lsha@sfu.ca

Jan van Aalst
Faculty of Education
Simon Fraser University
vanaalst@sfu.ca

Abstract. The goal of this study was to explore the dynamics of the formation and development of CSCL communities, which is believed to reflect, to a large extent, the interaction among learners. Two different types of CSCL communities (grade four students and teacher education) were investigated. The data representing note reading were analyzed from a non-linear dynamical system perspective. The findings indicate that the grade four data are best described by an exponential model, and the teacher education data by an oscillatory model. We conclude that the method we discuss is potentially useful for understanding the development of reading practices in a CSCL community.

Keywords: Knowledge building, development, non-linear dynamical system

Why All CSL is CL: Distributed Mind and the Future of Computer Supported Collaborative Learning

David Williamson Shaffer
Department of Educational Psychology
University of Wiscomsin-Madison
dws@education.wisc.edu

Katherine A. Clinton
Department of Curriculum and Instruction
University of Wisconsin-Madison
kaclinton@wisc.edu

Abstract. In this paper, we argue that this distinction between CSCL and HCI is based on a particular understanding of the relationship between humans and computers—and more generally between humans and their tools in activity systems. We draw on work by Shaffer and Kaput (1999), Clark (2003), and Latour (1996a; 1996b; 1996c) to conduct a thought experiment, extending the analytical reach of *activity theory* (Nardi, 1996b), *mediated action* (Wertsch, 1998) and *distributed cognition* (Pea, 1993) by adopting a stronger form of the concepts of *distribution* and *mediation* in the context of cognitive activity. For rhetorical purposes, we posit this stronger form of the distribution of intelligence across persons and objects as a theory of *distributed mind*. Our purpose in describing a theory of distributed mind as an extension of (but not replacement for) extant sociocultural theories on this 10th anniversary of the International Conference on Computer Supported Collaborative Learning is to problematize for the field its current focus on *human* collaboration as supported by computers. We are concerned that a field focusing on the interactions of humans will overlook the ways in which meaningful cognitive (and therefore pedagogical) activity is distributed among human and non-human agents within activity systems. We argue that *all* computer-supported learning is fundamentally collaborative—whether or not the computer is supporting the interaction of persons in the learning process. The consequences of such a move are a call for a tighter integration of the fields of CSCL and HCI, and a more powerful framework to help guide pedagogical choices in an age marked by rapid expansion of powerful cognitive technologies.

Keywords: Sociocultural theories, activity systems, distributed mind, virtual culture

Fostering Social Presence in Asynchronous Online Class Discussions

Lifang Shih
State University at Albany
Lifang@nycap.rr.com

Karen Swan
Kent State University
kswan@kent.edu

Abstract. The study examined the role of social presence in relation to students' perception of online asynchronous learning. Specifically, this study (a) examined the magnitude of the relationship between students' perceptions of social presence and their satisfaction with online class discussions, (b) investigated students' online behaviors which contributed to their own projected social presence, and (c) explored factors influencing students' perceptions of social presence, and the relationship between students' perceptions of others and their own projected presence in online course discussions. The study closes by exploring the implications for its findings for learning and teaching in online asynchronous learning environments.

Keywords: social presence, online communication, online learning community, web-based learning

Instructional Methods for CSCL: Review of Case Studies

Hyo-Jeong So
Instructional Systems Technology
Indiana University Bloomington
hyso@indiana.edu

Bosung Kim
School of Information Science
& Learning Technologies
University of Missouri-Columbia
bkq22@mizzou.edu

Abstract. The purpose of the present study is to provide instructional methods for collaborative learning in computer-supported learning environments which would be useful information for CSCL researchers, instructional designers, and online instructors. Although several researchers have provided instructional design theories and guidelines for collaborative learning in traditional classroom environments, there are a few instructional design studies developed specifically for collaboration in online learning environments. This study critically reviewed and analyzed ten case studies to identify instructional goals, methods, effectiveness, and conditions of collaborative online learning. Twenty-three methods identified from the synthesis and comparison of cases were grouped into five categories representing commonalities: a) grouping, b) collaborative tasks, c) team-building, d) computer-mediated communication, and e) instructor. It appeared that while some methods are equally important for both face-to-face and computer-supported learning environments, instructional methods related to group composition, synchronous interaction, and communication modes are particularly critical for collaborative online learning.

Keywords: collaborative learning, instructional method, case survey

Understanding Computer Mediated Social Experience: Implications for CSCL

Social Computing Research Group
School of Information Science & Learning Technologies
University of Missouri-Columbia
laffeyj@missouri.edu

Abstract. A group of 9 graduate students and one faculty member formed an extra-curricular study group to explore the social nature of online learning. Following a review of literature and adopting Strauss's (1993) framework for coming to understand social activity, the group collected and analyzed interview reports of experiences of social learning and online systems. The results include five categories of responses: 1) task engagement, 2) social engagement, 3) environment engagement, 4) goal or motivation and 5) role of expert. The paper presents the positive and negative statements about social engagement and the role of expert in gaming and learning experiences and in online and face-to-face experiences.

Keywords: online learning, face-to-face learning, networked multiplayer games, social engagement, role of the expert

A New Method to Assess the Quality of Collaborative Process in CSCL

Hans Spada, Anne Meier, Nikol Rummel, Sabine Hauser
Department of Psychology
University of Freiburg, Germany
<first name.last name>@psychologie.uni-freiburg.de

Abstract: In CSCL research, the collaborative process – the way people collaborate while working on tasks and learning – is of central importance. Instructional measures are being developed to improve the quality of the collaboration which itself determines to a great extent the results of working and learning in groups. However, assessing collaborative process is not easy. We have developed a new assessment method by quantitatively rating nine qualitatively defined characteristic dimensions of collaboration. In this paper, we first describe how these dimensions were extracted from video-recordings of dyads collaborating to solve interdisciplinary tasks. Then we explain how the resulting rating system was applied to and tested on another sample. Based on positive findings from this application, we argue that the new method can be recommended for different areas of CSCL research.

Keywords: Collaborative Process, Assessment Method, Rating System, Videoconferencing, Cognitive Dimensions, Affective Dimensions

Group Cognition:
The Collaborative Locus of Agency in CSCL

Gerry Stahl
College of Information Science & Technology
Drexel University, Philadelphia, USA
www.cis.drexel.edu/faculty/gerry
Gerry.Stahl@drexel.edu

Abstract. CSCL faces the challenge of not only designing educational technologies and interventions, but of inventing analytic methodologies and theoretical frameworks appropriate to the unique character of collaborative learning as an interactional group accomplishment. This paper argues that thinking in CSCL settings should be primarily analyzed at the small-group unit of analysis, where contributions coming from individual interpretive perspectives are interwoven into group cognition. The collaborative discourse is the agent of knowledge building that requires computer support and curriculum design. Groups can think; with the help of CSCL in the next decade, they may be able to overcome the limitations of the individual mind.

Keywords: agency, shared knowledge, intersubjectivity, dialogism, group cognition, discourse, AI, emergence, Turing, Searle, Dreyfus

How Can We Use Hypervideo Design Projects to Construct Knowledge in University Courses?

Elmar Stahl
Psychological Institute III
University of Muenster
stahlel@psy.uni-muenster.de

Carmen Zahn
Knowledge Media Research Center, Tuebingen
c.zahn@iwm-kmrc.de

Matthias Finke
Computer Graphics Center, Darmstadt
mfinke@zgdv.de

Abstract. In this paper a course concept based on collaborative construction of hypervideos is presented. The course concept integrates a) hypervideo technology development, b) research on learning with hypervideo systems, and c) the application of research on knowledge acquisition by writing texts or hypertexts to hypervideos. We demonstrate how collaborative construction of hypervideo can support knowledge transforming processes (see Bereiter & Scardamalia, 1987; Stahl & Bromme, 2004) in university courses of psychology students. In the first part of the paper a hypervideo system that enables collaborative design activities by users is discussed. Afterwards the course concept is presented in detail. Evaluation results are consistent with our assumptions. The course concept showed to be successful and well appreciated by the students.

Keywords: Collaborative hypervideo design, knowledge transforming, hypervideo.

Functional Versus Spontaneous Roles During CSCL

Jan-Willem Strijbos[13], Maarten De Laat[2], Rob Martens[1] & Wim Jochems[3]

[1]Leiden University [2]University of Southampton & University of Utrecht [3]Open University of the Netherlands

Corresponding author: jwstrijbos@fsw.leidenuniv.nl

Abstract. In this paper, two studies are reported on the effect of functional roles on computer-supported collaborative learning (CSCL) in higher education – the second is a replication of the first. Prescribed functional roles were implemented in half of all groups during a project-based course in higher education. All communication was via e-mail. Analysis of Likert-scale evaluation questionnaires gathered in both studies revealed a latent variable 'perceived group efficiency' (PGE) which – depending on the level of constraints set by preconditions – appears to increase the awareness (Study 1) or the level of efficiency (Study 2). However, Likert-scales provide a surface level analysis of actual behaviour and no insight in the collaborative process. Hence, the e-mail communication was investigated with two content analysis procedures: content analysis of the type of communicative statements and analysis of the role behaviours performed in role and nonrole groups. Results from both studies reveal that significantly more statements are focused on coordination in role groups. In addition, analysis of role behaviour reveals that students in role groups perform significantly more according to the functional roles than their counterparts in nonrole groups, although spontaneous role behaviour emerged in nonrole groups as well.

Keywords: roles, coordination, collaboration, computer-mediated communication, triangulation

Identifying Peer Interaction Patterns and Related Variables In Community-Based Learning

Heejeon Suh, Myunghee Kang, Kyungae Moon, Howook Jang
Electronics and Telecommunications Research Institute, Republic of Korea
hjsuh@etri.re.kr, mhkang@ewha.ac.kr, kamoon@etri.re.kr, hwjang@etri.re.kr

Abstract. The purpose of this study was to investigate patterns of peer interactions and to identify the relationships of peer interactions with learner characteristics and learning outcome in community-based learning. The participants were 24 middle school students joined in an online learning community for a week. Two patterns of peer interactions such as in-degree and out-degree centrality were identified. Students with high intra-personal or verbal-linguistic intelligence were related to high in-degree centrality, while students with high interpersonal intelligence or prior knowledge were related to high out-degree centrality. That means “self smart” or “word smart” students were popular and played knowledge broker’s roles in their community. On the other hand, “social smart” students or “high prior knowledge” students were open and friendly activators and delivered vast information. Moreover, higher peer interactions were related to better learning outcome. These results indicated that peer interactions were important intervening variables to enhance learning effect.

Keywords: Community-based learning, peer interaction, learner characteristics, social network analysis

Technology Affordances for Intersubjective Learning: A Thematic Agenda for CSCL

Daniel D. Suthers
Department of Information and Computer Sciences
University of Hawai`i
suthers@hawaii.edu

Abstract. After a brief survey of epistemologies of collaborative learning and forms of computer support for that learning, the study of technology affordances for intersubjective learning is proposed as a thematic agenda for CSCL. A fusion of experimental, ethnomethodological and design methodologies is proposed in support of this agenda. A working definition of intersubjective learning as joint composition of interpretations of a dynamically evolving context is provided, along with an outline for analysis under this definition.

Keywords: CSCL research agenda, interactional practices, representational guidance

Using Paper to Support Collaboration in Educational Activities

Ella Tallyn[1], David Frohlich[2], Nadja Linketscher[3], Beat Signer[4], Guy Adams[2],

[1] MRL, University of Nottingham
ezt@cs.nott.ac.uk

[2] Hewlett Packard Labs. Bristol, UK
{david_frohlich, guy_adams}@hp.com

[3] Orange Pcs
nadja.linketscher@orange.co.uk

[4] IIS, ETH Zurich
signer@inf.ethz.ch

Abstract. This paper describes findings from a pilot study that compared the collaborative use by children of three different media formats: a paper book, a CD-ROM in a standard PC set-up, and a paper booklet augmented with digital content. These findings show how the book's ergonomics provide a flexible and easily accessible interface which engenders fluid collaboration between pairs of children. These qualities are also observed when children work with the augmented paper booklet. The value of digital content is demonstrated in a participatory design activity, where we find how digital media can 'bring to life' the information presented on paper. In contrast to developments focused narrowly on new technologies, this study presents evidence for the use and value of paper, and paper augmented with digital media, in educational settings.

Keywords: Collaboration, children, computers in education, tangible interfaces, augmented paper

A Heterogeneous Animated Platform for Educational Participatory Simulations

Bill Tomlinson
ACE (Arts Computation Engineering) program
University of California, Irvine
wmt@uci.edu

Abstract. This paper describes a multi-user interactive installation featuring real time animated creatures and a mobile interaction paradigm. This paradigm has been designed to serve as a platform for education in a variety of content domains. Drawing on previous research in mobile computing and animated educational systems, this project contributes a novel metaphor for interactions among real and virtual creatures and worlds. This "Land/Water" metaphor offers that virtual space is like land for virtual creatures, and real space is like water for them. The interaction paradigm involves groups of animated creatures that live on desktop screens, and may be transported from screen to screen by means of mobile Tablet PCs carried by human participants. This paper presents a working implementation of this paradigm and describes its use as an educational tool.

Keywords: Human-Computer Interaction, Handheld/Mobile Devices, Virtual/3D Environments, Participatory Simulations

The Effect of Video-augmented Chat on Collaborative learning with Cases

Michael Tscholl
Department of Computer Science
University College London
m.tscholl@cs.ucl.ac.uk

John McCarthy
Department of Computer Science
University College London
j.mccarthy@cs.ucl.ac.uk

Jeremiah Scholl
Department of Computer Science
Lulea University of Technology
jeremiah@cdt.luth.se

Abstract. Efficient learning with cases requires discussion on the facts of the case as well as on their meaning. We investigated the focus (factual vs. abstract) of a case-based learning discussion when video was added to a chat-based learning system. Students whose first experience includes high-quality video, focus significantly more on abstract knowledge than students first exposed to chat-only or chat + low-quality video. We also found that these students expressed a preference for face-to-face discussion. We conclude that video may improve learning where discussions on abstract *and* concrete knowledge are important.

Keywords: case-based CSCL, video, eye tracking, dialogue analysis, non-verbal communication

CSC*: Computer Supported Collaborative Work, Learning, and Play

Michael B. Twidale
GSLIS
University of Illinois at Urbana-Champaign
twidale@uiuc.edu

X. Christine Wang
Graduate School of Education, University at Buffalo, SUNY
wangxc@buffalo.edu

D. Michelle Hinn
Educational Psychology
University of Illinois at Urbana-Champaign
hinn@uiuc.edu

Abstract. The authors combine their experiences in three independent studies of informal learning in the contexts of the workplace, school and leisure. They uncover aspects of collaborative work, learning and play involving the use of different learning and teaching techniques, and supported by appropriations of the regular use of the applications. The importance of play, both for application learning and innovative use in different settings, including the workplace, is examined. The implications of explicitly supporting ad hoc collaborative approaches to learning how to use a computer application are explored.

Keywords: collaborative help-giving, informal learning, workplace learning, play, CSCW

Exploring Collaborative Aspects of Knowledge Building Through Collaborative Summary Notes

Jan van Aalst
Faculty of Education
Simon Fraser University
vanaalst@sfu.ca

John Kamimura
British Columbia
School District 40
jkamimura@sd40.bc.ca

Carol K.K. Chan
Faculty of Education
The University of Hong Kong
ckkchan@hkucc.hku.hk

Abstract. We explore the use of collaborative summary notes in Knowledge Forum™ (KF) as a way to capture the distributed nature of knowledge advances among groups of students building knowledge together. The purpose of this exploration is to develop assessments that can be used for *scaffolding* the discourse and promoting ideas within the community, as well as for evaluation. The unit of analysis was the group on KF. Students in two high school classes collaborated on a progressive inquiry exploring aspects of a recent SARS outbreak and some related topics. They were asked to write collaborative, co-authored, summary notes to make the nature and importance of the knowledge advances they achieved clear for their peers. The findings indicate that note ratings were positively related to the number of co-authors and the number of views (different discussion spaces) in which students had worked.

Keywords: Knowledge building, assessment

Towards a Dialogic Understanding of the Relationship Between CSCL and Teaching Thinking Skills

Rupert Wegerif
School of Education
University of Southampton
Highfield, Southampton, SO17 1BJ UK
R.B.Wegerif@soton.ac.uk

Abstract. This paper reviews the literature linking information and communications technology (ICT) to teaching thinking skills and advocates a dialogic framework which has implications for practice. The computer supported collaborative learning (CSCL) movement is critiqued for not always taking into account the radical implications of the concept of 'dialogic' which is the idea that meaning-making requires the inter-animation of more than one perspective. It is argued that dialogue and dialogic is the key to 'learning to learn' and other higher order thinking skills and that the unique features of ICT particularly suit it to inducting learners into learning dialogues and to the deepening and broadening of dialogues as an end in itself.
Keywords: Affordances; CSCL; Creativity; Dialogic; Learning to learn; Thinking skills.

Computer-Supported Collaborative Learning in Higher Education: Scripts for Argumentative Knowledge Construction in Distributed Groups

Armin Weinberger
Frank Fischer
Knowledge Media Research Center, Tübingen
a.weinberger@iwm-kmrc.de
f.fischer@iwm-kmrc.de

Karsten Stegmann
Department for Applied Cognitive Psychology and Media Psychology, University of Tübingen
k.stegmann@iwm-kmrc.de

Abstract. Learners rarely know how to construct knowledge together in argumentation. This experimental study analyzes two computer-supported collaboration scripts, which should facilitate processes and outcomes of argumentative knowledge construction. One script aims to support the construction of single arguments and the other script aims to support the construction of argumentation sequences. Both scripts were varied independently in a 2×2-factorial design. 120 students of Educational Science participated in the study in groups of three. Results show that the computer-supported scripts facilitate specific processes and outcomes of argumentative knowledge construction. Learners with scripts argued better and acquired more knowledge on argumentation than learners without scripts without impeding acquisition of domain specific knowledge.

Keywords: argumentative knowledge construction, computer-supported collaboration scripts

Macroscopic Study of the Social Networks Formed in Web-based Discussion Forums

Yau-Yuen Yeung
Department of Science
Hong Kong Institute of Education
yyyeung@ied.edu.hk

Abstract. It is proposed and outlined in this paper on how to investigate the macroscopic features of those large-size social networks formed in web-based discussion forums. Some preliminary results on the pattern of the distribution of replies for individual topics, views for individual topics and co-discussants of individual participants will be presented. The present results will be compared with those found in other areas of large-size social networks and the significances and future work on those macroscopic properties of social networks for better understanding of computer-supported collaborative learning will be discussed.

Keywords: Social Network Analysis, Web-based Discussion Forum, Computer-Mediated Communication

Story-Lines: A Case Study of Online Learning Using Narrative Analysis

Joyce Yukawa
Ph.D. Candidate, Communication and Information Sciences
University of Hawai‘i
yukawa@hawaii.edu

Abstract. Narrative analysis has both research and pedagogical advantages for use in CSCL. Narrative theory provides multidisciplinary perspectives and methods from diverse fields. Stories are a way of thinking, making meaning, and showing constructivism in action. This paper discusses the advantages of narrative analysis for interpreting online discourse; presents features, methodological challenges, and procedures; and presents some findings from a case study of online learning. Narrative analysis uses both text and online “talk” to construct a holistic view of the learning experience involving cognition, affect, and interaction.

Keywords: Narrative analysis, co-construction of knowledge, co-reflection, action research, affective domain, distance learning, wiki

Advanced Digital Video Technologies to Support Collaborative Learning in School Education and Beyond

Carmen Zahn, Friedrich Hesse, Matthias Finke
Knowledge Media Research Center, Tuebingen,
Computer Graphics Center, Darmstadt,
Germany
c.zahn@iwm-kmrc.de

Roy Pea, Michael Mills, Joseph Rosen
Stanford Center for Innovations in Learning,
Stanford University, CA.
USA
roypea@stanford.edu

Abstract. The aim of the paper is to characterize two new advanced video technology software systems developed for uses in collaborative learning (DIVER and HyperVideo), and how they extend the paradigms of video use in classrooms today. The rationale for and characteristics of these tools are described, and early experiences with their educational uses are characterized.

Keywords: Cognitive tools, advanced video technologies in school education, teacher education, collaborative knowledge construction

Usability as an Interactional Resource: Deictic Management of Scene Formulation

Alan Zemel
Math Forum
Drexel University
arz26@drexel.edu

Tim Koschmann
Medical Education
Southern Illinois University
School of Medicine
tkoschmann@siumed.edu

Curtis LeBaron
Organization Leadership and Strategy
Brigham Young University
lebaron@byu.edu

Paul Feltovich
Institute for Human and Machine Cognition
pfeltovich@ihmc.us

Abstract. In this paper, we describe how embodied action, in the form of pointing and other gestures, and personal and spatial indexicals are used to constitute participation frameworks and work sites in an instructional surgery. As a site for both learning and work, the operating room afforded us the opportunity to examine how usability, which is a critical design consideration, can be used as a resource for learning in interaction. In our detailed analysis of the interaction among participants (both co-present and projected) we sought to describe a particular case of how usability was achieved as a relevant consideration for surgical education in the operating room. In doing so, we demonstrate a set of members' methods by which actors establish and provide for the relevance of the projected needs of projected users as part of developing an understanding of their current activity.

Keywords: Personal deictics, spatial deictics, embodied action, pointing, gesture, interaction, collaborative instruction

Texts-In-Interaction: Collaborative Problem-Solving in Quasi-Synchronous Computer-Mediated Communication

Alan Zemel
Math Forum
Drexel University
arz26@drexel.edu

Abstract. Quasi-synchronous chat consists of the production and posting of text messages in an online environment. It differs from face-to-face talk-in-interaction in a number of important ways that are significant for participants in the chats and methodologically in terms of the way analysis can be conducted and the kinds of analytical claims that can be made. The perspective adopted in this paper is that chat interaction can be considered the computer-mediated production and reading of texts-in-interaction. However, since the production of a posted text is usually not available to anyone but the author of that text, I am not concerned with the production of posted texts. Rather, I am concerned with the way texts, as produced artifacts, are organized to be read by recipients. In particular, I consider ways in which quasi-synchronous chat postings provide instruction in their design for how they are to be read by recipients of these postings.

Keywords: Quasi-synchronous online chats, reading, interaction, collaboration, conjoint participation

Analyzing and Supporting Collaboration in Cooperative Computer-Mediated Communication

Jörg Zumbach
Jochen Schönemann
Institute of Psychology
University of Heidelberg, Germany
zumbach@uni-hd.de
jochen.schoenemann@urz.uni-heidelberg.de

Peter Reimann
Computer-supported Learning and Cognition
Faculty of Education and Social Work
University of Sydney, Australia
p.reimann@edfac.usyd.edu.au

Abstract. Two methods for fostering collaborative behavior are compared: a feedback-mechanism to scaffold collaborative behavior, and use of distributed learning resources. Based on recent research on what constitutes effective collaboration behavior, we developed a coding scheme to categorize learner-learner interaction as collaboration. In a collaboration environment for learner dyads specifically implemented to test our hypotheses, a human observer identified, in parallel with students' interactions, instances of real collaboration, and gave online feedback. In the same two-factorial design, we varied the resources available to the partners. The influence of these interventions on outcomes related to knowledge acquisition, problem-solving, group climate and collaborative behavior was tested. Results suggest there are benefits in providing a feedback approach in fostering collaboration and enhancing problem-solving quality.

Keywords: Cooperative Learning, Feedback Research, Problem-Based Learning