Workshop Format and Organization:

The workshop will consist of paper presentations, discussion sessions, and possibly a demo session. The workshop will be organized thematically. Approximately three themes will be selected based on the paper submissions. Possible themes include (but are not limited to):

- Conceptual frameworks and theoretical models of metacognition and SRL,
- Empirical studies of learners’ metacognitive processing and SRL during learning of complex topics/tasks with CBLEs,
- CBLE features designed to support metacognitive processing and SRL (e.g., adaptive help-seeking behavior, explicit scaffolding techniques, questioning techniques, etc.), and their individual and combined role in supporting learners’ emerging understanding of the task/topic/domain,
- System issues associated with difficulties in detecting, monitoring, modeling, and fostering learners’ metacognitive processing and SRL.
- AI techniques and frameworks necessary to detect, monitor, and foster students’ metacognitive monitoring and SRL.

There will be one session for each theme, led by a researcher knowledgeable in that area. During each session, there will be a small number of paper presentations followed by a discussion and a brief wrap-up by the session leader. The discussion will focus on comparing and contrasting different approaches and exploring whether the new metaphor (i.e., using computers as MetaCognitive Tools for enhancing students learning) is adequate in accounting for the various phases and areas of learning.

Presenters will be asked to relate their papers to the session theme as part of their presentation. Further, presenters will be asked to study the other papers in their session, so that during their presentation they can compare and contrast their approach to others, as a way to kick off the discussion. All accepted papers and abstracts will be made available on the workshop website.

Since the AIED 2003 conference emphasizes the importance of design, one of the themes of the workshop will be to explore related design issues and provide guidelines for developers of CBLEs for school and professional domains. Presenters will be asked to include a “design guidelines” section in their papers based on their research and assessment of the effectiveness of system features designed to support metacognitive monitoring and SRL.
FOREWORD

Learning is a complex phenomenon that includes intricate and complex interactions among cognitive, motivational, affective, and social processes. Current psychological and educational research provides a wealth of empirical data indicating that learners of all ages have difficulty learning complex topics in areas such as math, science, and other professional domains. Traditionally, researchers have used either cognitive theories or constructivist models of learning and instruction to explain different aspects of learning. Recently, several researchers have extended these theories and models by advancing models of metacognition and self-regulated learning (SRL) to describe the intricate interaction of variables related to students’ learning of these complex topics and domains. These new models have been advanced to account for the various phases (e.g., planning, metacognitive monitoring, strategy use, and reflection) and areas (e.g., cognitive, affect/motivation, behavior, and context) of learning. These emerging frameworks pose significant challenges for the design of computer-based learning environments (CBLEs). The goal of this workshop is to bring researchers, educators, AI researchers, and designers together to discuss various theoretical, conceptual, empirical, and design issues related to using computers as “MetaCognitive Tools” for enhancing student learning.

Relevant questions include:

1. Can existing cognitive and constructivist theories and models of learning be extended into a unifying metacognitive or SRL framework for studying the various phases (e.g., planning, metacognitive monitoring, strategy use, and reflection) and areas (e.g., cognition, affect/motivation, behavior, and context) of learning with CBLEs?
2. Can existing CBLEs be used to study, detect, trace, monitor, and foster students’ metacognitive processes and SRL?
3. What are the implications of existing models and data for the design of CBLE components necessary to detect, trace, model, and foster learners’ metacognitive processes and SRL?

The workshop will deal with many issues related to these broad questions, including (but not limited to):

1. Empirical studies of learners’ metacognitive processing and SRL of complex topics and domains in school and professional domains. How do they account for the complex interaction between the various phases and areas of learning?
2. How effective are existing CBLEs’ in detecting, tracing, and monitoring learners’ metacognitive and self-regulatory behaviors during learning? What are implications for the design for MetaCognitive tools to support learning? Which of these components and/or aspects of metacognition and SRL can and should be modeled and why?
3. How can recent advances in AIED be used to design Metacognitive tools to detect, trace, model, and foster students’ metacognitive and self-regulatory behaviors during learning? Can existing computational and AI techniques be used to model the several phases (e.g., planning, metacognitive monitoring, strategy use, and reflection) and areas (e.g., cognitive, affective, motivational, contextual) of metacognition and SRL?
TABLE OF CONTENTS

Foreword ........................................................................................................................................... 532

FULL PAPERS

StoryStation: Agent-based scaffolding of metacognitive processes for writing.......................... 534
Peter Wiemer-Hastings, Kathryn Glasswell

Neurofeedback and metacognition ................................................................................................. 541
Lars Hall, Petter Johansson

Designing metacognitive support for learning from hypertext: What factors come into play? .... 556
Sadhana Puntambekar, Agnes Stylianou

Supporting self-explanation in a data normalizing tutor ................................................................. 565
Antonija Mitrovic

Toward supporting information quality in rhetorical, dialogic, and collective on-line
communication ................................................................................................................................. 578
Tom Murray

Difference visualization to pull the trigger of reflection ................................................................. 592
Tsukasa Hirashima, Tomoya Horiguchi

Towards helping learners master self-regulation skills ............................................................... 602
Michiko Kayashima, Akiko Inaba
WORKSHOP SCIENTIFIC COMMITTEE

Program Chair:
- Roger Azevedo (Chair) Department of Human Development, University of Maryland, USA

Committee Members:
- Benedict du Boulay, University of Sussex
- Arthur C. Graesser, University of Memphis
- Kenneth R. Koedinger, Carnegie Mellon University
- Susanne P. Lajoie, McGill University
- Barbara Y. White, UC Berkeley
- Philip H. Winne, Simon Fraser University

Reviewers:
- Benedict du Boulay, University of Sussex
- Jennifer G. Cromley, University of Maryland
- Arthur C. Graesser, University of Memphis
- Kenneth R. Koedinger, Carnegie Mellon University
- Susanne P. Lajoie, McGill University
- Barbara Y. White, UC Berkeley
- Philip H. Winne, Simon Fraser University
- Fielding I. Winters, University of Maryland
Metacognition and Self-regulation in Learning with Metacognitive Tools

Roger Azevedo

Monday, July 21st, 2003