

Table of Contents

Keynote Speaker Abstracts

Rethinking Education in the Age of Technology	1
<i>Allan M. Collins</i>	
Life-Long Learning, Learner Models and Augmented Cognition	3
<i>Judy Kay</i>	
Intelligent Training Systems: Lessons Learned from Building Before It Is Time	6
<i>Alan M. Lesgold</i>	
The Interaction Plateau: Answer-Based Tutoring < Step-Based Tutoring = Natural Tutoring	7
<i>Kurt VanLehn</i>	
Social Learning Environments: New Challenges for AI in Education	8
<i>Julita Vassileva</i>	

Emotion and Affect

Self Versus Teacher Judgments of Learner Emotions During a Tutoring Session with AutoTutor	9
<i>Sidney D'Mello, Roger Taylor, Kelly Davidson, and Art Graesser</i>	
Towards Emotionally-Intelligent Pedagogical Agents	19
<i>Konstantin Zakharov, Antonija Mitrovic, and Lucy Johnston</i>	
Viewing Student Affect and Learning through Classroom Observation and Physical Sensors	29
<i>Toby Dragon, Ivon Arroyo, Beverly P. Woolf, Winslow Burleson, Rana el Kaliouby, and Hoda Eydgahi</i>	
Comparing Learners' Affect While Using an Intelligent Tutoring System and a Simulation Problem Solving Game	40
<i>Ma. Mercedes T. Rodrigo, Ryan S.J.d. Baker, Sidney D'Mello, Ma. Celeste T. Gonzalez, Maria C.V. Lagud, Sheryl A.L. Lim, Alexis F. Macapanpan, Sheila A.M.S. Pascua, Jerry Q. Santillano, Jessica O. Sugay, Sinath Tep, and Norma J.B. Viehland</i>	
What Are You Feeling? Investigating Student Affective States During Expert Human Tutoring Sessions	50
<i>Blair Lehman, Melanie Matthews, Sidney D'Mello, and Natalie Person</i>	

Responding to Student Uncertainty During Computer Tutoring: An Experimental Evaluation	60
<i>Kate Forbes-Riley, Diane Litman, and Mihai Rotaru</i>	

Tutor Evaluation

How Does an Intelligent Learning Environment with Novel Design Affect the Students' Learning Results?	70
<i>Marina Lepp</i>	
Learning Linked Lists: Experiments with the iList System	80
<i>Davide Fossati, Barbara Di Eugenio, Christopher Brown, and Stellan Ohlsson</i>	
Re-evaluating LARGO in the Classroom: Are Diagrams Better Than Text for Teaching Argumentation Skills?	90
<i>Niels Pinkwart, Collin Lynch, Kevin Ashley, and Vincent Aleven</i>	
Automatic Multi-criteria Assessment of Open-Ended Questions: A Case Study in School Algebra	101
<i>Élisabeth Delozanne, Dominique Prévôt, Brigitte Grugeon, and Françoise Chenevotot</i>	
Why Tutored Problem Solving May be Better Than Example Study: Theoretical Implications from a Simulated-Student Study	111
<i>Noboru Matsuda, William W. Cohen, Jonathan Sewall, Gustavo Lacerda, and Kenneth R. Koedinger</i>	
A Case Study Empirical Comparison of Three Methods to Evaluate Tutorial Behaviors	122
<i>Xiaonan Zhang, Jack Mostow, and Joseph E. Beck</i>	

Student Modeling

Children's Interactions with Inspectable and Negotiated Learner Models	132
<i>Alice Kerly and Susan Bull</i>	
Using Similarity Metrics for Matching Lifelong Learners	142
<i>Nicolas Van Labeke, Alexandra Poulouvasilis, and George Magoulas</i>	
Developing a Computer-Supported Tutoring Interaction Component with Interaction Data Reuse	152
<i>Chi-Jen Lin, Chih-Yueh Chou, and Tak-Wai Chan</i>	

Machine Learning

Towards Collaborative Intelligent Tutors: Automated Recognition of Users' Strategies	162
<i>Ya'akov Gal, Elif Yamangil, Stuart M. Shieber, Andee Rubin, and Barbara J. Grosz</i>	
Automatic Generation of Fine-Grained Representations of Learner Response Semantics	173
<i>Rodney D. Nielsen, Wayne Ward, and James H. Martin</i>	
Automatic Construction of a Bug Library for Object-Oriented Novice Java Programmer Errors	184
<i>Merlin Suarez and Raymund Sison</i>	

Authoring Tools

Helping Teachers Build ITS with Domain Schema	194
<i>Brent Martin and Antonija Mitrovic</i>	
Evaluating an Authoring Tool for Model-Tracing Intelligent Tutoring Systems	204
<i>Stephen B. Blessing and Stephen Gilbert</i>	
Open Community Authoring of Targeted Worked Example Problems ...	216
<i>Turadg Aleahmad, Vincent Aleven, and Robert Kraut</i>	
Agent Shell for the Development of Tutoring Systems for Expert Problem Solving Knowledge	228
<i>Vu Le, Gheorghe Tecuci, and Mihai Boicu</i>	

Tutor Feedback and Intervention

Balancing Cognitive and Motivational Scaffolding in Tutorial Dialogue	239
<i>Kristy Elizabeth Boyer, Robert Phillips, Michael Wallis, Mladen Vouk, and James Lester</i>	
Assessing the Impact of Positive Feedback in Constraint-Based Tutors	250
<i>Devon Barrow, Antonija Mitrovic, Stellan Ohlsson, and Michael Grimley</i>	
The Dynamics of Self-regulatory Processes within Self-and Externally Regulated Learning Episodes During Complex Science Learning with Hypermedia	260
<i>Amy M. Witherspoon, Roger Azevedo, and Sidney D'Mello</i>	

The Politeness Effect in an Intelligent Foreign Language Tutoring System	270
<i>Ning Wang and W. Lewis Johnson</i>	
Investigating the Relationship between Spatial Ability and Feedback Style in ITSS	281
<i>Nancy Milik, Antonija Mitrovic, and Michael Grimley</i>	
Individualizing Tutoring with Learning Style Based Feedback	291
<i>Shahida M. Parvez and Glenn D. Blank</i>	
Use of Agent Prompts to Support Reflective Interaction in a Learning-by-Teaching Environment	302
<i>Longkai Wu and Chee-Kit Looi</i>	
A Standard Method of Developing User Interfaces for a Generic ITS Framework	312
<i>Mikaël Fortin, Jean-François Lebeau, Amir Abdessemed, François Courtemanche, and André Mayers</i>	

Data Mining

Helping Teachers Handle the Flood of Data in Online Student Discussions	323
<i>Oliver Scheuer and Bruce M. McLaren</i>	
What's in a Cluster? Automatically Detecting Interesting Interactions in Student E-Discussions	333
<i>Jan Miksatko and Bruce M. McLaren</i>	
Scaffolding On-Line Discussions with Past Discussions: An Analysis and Pilot Study of PedaBot	343
<i>Jihie Kim, Erin Shaw, Sujith Ravi, Erin Tavano, Aniwat Arromratana, and Pankaj Sarda</i>	
How Who Should Practice: Using Learning Decomposition to Evaluate the Efficacy of Different Types of Practice for Different Types of Students	353
<i>Joseph E. Beck and Jack Mostow</i>	
How Does Students' Help-Seeking Behaviour Affect Learning?	363
<i>Moffat Mathews and Tanja Mitrović</i>	
Toward Automatic Hint Generation for Logic Proof Tutoring Using Historical Student Data	373
<i>Tiffany Barnes and John Stamper</i>	

Does Help Help? Introducing the Bayesian Evaluation and Assessment Methodology	383
<i>Joseph E. Beck, Kai-min Chang, Jack Mostow, and Albert Corbett</i>	

Using Knowledge Discovery Techniques to Support Tutoring in an Ill-Defined Domain	395
<i>Roger Nkambou, Engelbert Mephu Nguifo, and Philippe Fournier-Viger</i>	

More Accurate Student Modeling through Contextual Estimation of Slip and Guess Probabilities in Bayesian Knowledge Tracing.....	406
<i>Ryan S.J.d. Baker, Albert T. Corbett, and Vincent Aleven</i>	

E-Learning and Web-Based ITS

Interoperable Competencies Characterizing Learning Objects in Mathematics	416
<i>Erica Melis, Arndt Faulhaber, Anja Eichelmann, and Susanne Narciss</i>	

Comparing Classroom Problem-Solving with No Feedback to Web-Based Homework Assistance	426
<i>Leena Razzaq, Michael Mendicino, and Neil T. Heffernan</i>	

Harnessing Learner's Collective Intelligence: A Web2.0 Approach to E-Learning	438
<i>Hicham Hage and Esma Aïmeur</i>	

Bridging the Gap between ITS and eLearning: Towards Learning Knowledge Objects.....	448
<i>Amal Zouaq, Roger Nkambou, and Claude Frasson</i>	

Natural Language Techniques and Dialogue

Semantic Cohesion and Learning	459
<i>Arthur Ward and Diane Litman</i>	

Dialogue Modes in Expert Tutoring	470
<i>Whitney L. Cade, Jessica L. Copeland, Natalie K. Person, and Sidney K. D'Mello</i>	

Seeing the Face and Observing the Actions: The Effects of Nonverbal Cues on Mediated Tutoring Dialogue	480
<i>Federico Tajariol, Jean-Michel Adam, and Michel Dubois</i>	

Affective Transitions in Narrative-Centered Learning Environments	490
<i>Scott W. McQuiggan, Jennifer L. Robison, and James C. Lester</i>	

Word Sense Disambiguation for Vocabulary Learning	500
<i>Anagha Kulkarni, Michael Heilman, Maxine Eskenazi, and Jamie Callan</i>	

Narrative Tutors and Games

Student Note-Taking in Narrative-Centered Learning Environments: Individual Differences and Learning Effects	510
<i>Scott W. McQuiggan, Julius Goth, Eunyoung Ha, Jonathan P. Rowe, and James C. Lester</i>	
Assessing Aptitude for Learning with a Serious Game for Foreign Language and Culture	520
<i>W. Lewis Johnson and Shumin Wu</i>	
Story-Based Learning: The Impact of Narrative on Learning Experiences and Outcomes	530
<i>Scott W. McQuiggan, Jonathan P. Rowe, Sunyoung Lee, and James C. Lester</i>	

Semantic Web and Ontology

An Architecture for Combining Semantic Web Techniques with Intelligent Tutoring Systems	540
<i>Pedro J. Muñoz Merino and Carlos Delgado Kloos</i>	
The Use of Ontologies to Structure and Support Interactions in LOR . . .	551
<i>Aude Dufresne, Mohamed Rouatbi, and Fethi Guerdelli</i>	
Leveraging the Social Semantic Web in Intelligent Tutoring Systems . . .	563
<i>Jelena Jovanović, Carlo Torniai, Dragan Gašević, Scott Bateman, and Marek Hatala</i>	
Structurization of Learning/Instructional Design Knowledge for Theory-Aware Authoring Systems	573
<i>Yusuke Hayashi, Jacqueline Bourdeau, and Riichiro Mizoguchi</i>	
Expanding the Plausible Solution Space for Robustness in an Intelligent Tutoring System	583
<i>Hameedullah Kazi, Peter Haddawy, and Siriwan Suebnukarn</i>	

Cognitive Models

Using Optimally Selected Drill Practice to Train Basic Facts	593
<i>Philip Pavlik Jr., Thomas Bolster, Sue-mei Wu, Ken Koedinger, and Brian MacWhinney</i>	

Eliminating the Gap between the High and Low Students through Meta-cognitive Strategy Instruction	603
<i>Min Chi and Kurt VanLehn</i>	
Using Hidden Markov Models to Characterize Student Behaviors in Learning-by-Teaching Environments	614
<i>Hogyeong Jeong, Amit Gupta, Rod Roscoe, John Wagster, Gautam Biswas, and Daniel Schwartz</i>	
To Tutor the Tutor: Adaptive Domain Support for Peer Tutoring	626
<i>Erin Walker, Nikol Rummel, and Kenneth R. Koedinger</i>	

Collaboration

Shall We Explain? Augmenting Learning from Intelligent Tutoring Systems and Peer Collaboration	636
<i>Robert G.M. Hausmann, Brett van de Sande, and Kurt VanLehn</i>	
Theory-Driven Group Formation through Ontologies	646
<i>Seiji Isotani and Riiichiro Mizoguchi</i>	

Poster Papers

Self-assessment in Vocabulary Tutoring	656
<i>Michael Heilman and Marine Eskenazi</i>	
Automatically Generating and Validating Reading-Check Questions	659
<i>Christine M. Feeney and Michael Heilman</i>	
Dynamic Browsing of Audiovisual Lecture Recordings Based on Automated Speech Recognition	662
<i>Stephan Repp, Andreas Groß, and Christoph Meinel</i>	
Agent-Based Framework for Affective Intelligent Tutoring Systems	665
<i>Mahmoud Neji, Mohamed Ben Ammar, Adel. M. Alimi, and Guy Gouardères</i>	
Measuring the Perceived Difficulty of a Lecture Using Automatic Facial Expression Recognition	668
<i>Jacob Whitehill, Marian Bartlett, and Javier Movellan</i>	
Minimal Feedback During Tutorial Dialogue	671
<i>Pamela Jordan and Diane Litman</i>	
Can Students Edit Their Learner Model Appropriately?	674
<i>Susan Bull, Xiaoxi Dong, Mark Britland, and Yu Guo</i>	

When Is Assistance Helpful to Learning? Results in Combining Worked Examples and Intelligent Tutoring	677
<i>Bruce M. McLaren, Sung-Joo Lim, and Kenneth R. Koedinger</i>	
Enabling Reputation-Based Trust in Privacy-Enhanced Learning Systems	681
<i>Mohd Anwar and Jim Greer</i>	
Authoring Educational Games with Greenmind	684
<i>Brent Martin</i>	
An Experimental Use of Learning Environment for Problem-Posing as Sentence-Integration in Arithmetical Word Problems	687
<i>Tsukasa Hirashima, Takuro Yokoyama, Masahiko Okamoto, and Akira Takeuchi</i>	
Automatic Analyses of Cohesion and Coherence in Human Tutorial Dialogues During Hypermedia: A Comparison among Mental Model Jumpers	690
<i>Moongee Jeon and Roger Azevedo</i>	
Interface Challenges for Mobile Tutoring Systems	693
<i>Quincy Brown, Frank J. Lee, Dario D. Salvucci, and Vincent Aleven</i>	
Agora UCS Ubiquitous Collaborative Space	696
<i>Pascal Dug��nie, Stefano A. Cerri, Philippe Lemoisson, and Abdelkader Gouaich</i>	
Adapte, a Tool for the Teacher to Personalize Activities	699
<i>Marie Lefevre, Nathalie Guin, and St��phanie Jean-Daubias</i>	
Framework for a Competency-Driven, Multi-viewpoint, and Evolving Learner Model	702
<i>Lucie Moulet, Olga Marino, Richard Hotte, and Jean-Marc Labat</i>	
Use Chatbot CSIEC to Facilitate the Individual Learning in English Instruction: A Case Study	706
<i>Jiyou Jia and Meizian Ruan</i>	
Using an Adaptive Collaboration Script to Promote Conceptual Chemistry Learning	709
<i>Dimitra Tsovaltzi, Bruce M. McLaren, Nikol Rummel, Oliver Scheuer, Andreas Harrer, Niels Pinkwart, and Isabel Braun</i>	
Towards an Intelligent Emotional Detection in an E-Learning Environment	712
<i>Iness Nedji Milat, Hassina Seridi, and Mokhtar Sellami</i>	

How Do We Get the Pieces to Talk? An Architecture to Support Interoperability between Educational Tools	715
<i>Andreas Harrer, Niels Pinkwart, Bruce M. McLaren, and Oliver Scheuer</i>	
Cognitive Load Estimation for Optimizing Learning within Intelligent Tutoring Systems	719
<i>François Courtemanche, Mehdi Najjar, and André Mayers</i>	
Investigating Learner Trust in Open Learner Models Using a ‘Wizard of Oz’ Approach	722
<i>Alice Kerly, Norasmita Ahmad, and Susan Bull</i>	
Personalized Learning Path Delivery: Models and Example of Application	725
<i>Hend Madhour and Maia Wentland Forte</i>	
Semi Automatic Generation of Didactic Resources from Existing Documents	728
<i>Mikel Larrañaga, Jon A. Elorriaga, and Ana Arruarte</i>	
An Evaluation of Intelligent Reading Tutors	731
<i>Sowmya Ramachandran and Robert Atkinson</i>	
An Intelligent Web-Based Learning System for Group Collaboration Using Contracts	734
<i>Henri Eberspächer and Michelle Joab</i>	
An Adaptive and Customizable Feedback System for Intelligent Interactive Learning Systems	737
<i>Maite Lopez-Garate, Alberto Lozano-Rodero, and Luis Matey</i>	
Detection of Learning Styles from Learner’s Browsing Behavior During E-Learning Activities	740
<i>Nabila Bousbia, Jean-Marc Labat, and Amar Balla</i>	
Analyzing Learners’ Self-organization in Terms of Co-construction, Co-operation and Co-ordination	743
<i>Patrice Moguel, Pierre Tchounikine, and André Tricot</i>	
Authoring Mobile Intelligent Tutoring Systems	746
<i>Ramón Zatarain, M.L. Barrón-Estrada, Guillermo A. Sandoval-Sánchez, and Carlos A. Reyes-García</i>	
XTutor: An Intelligent Tutor System for Science and Math Based on Excel	749
<i>Roxana Gheorghiu and Kurt VanLehn</i>	
Tying Ontologies to Domain Contents for CSCL	752
<i>Seiji Isotani and Rūchiro Mizoguchi</i>	

One Exercise – Various Tutorial Strategies	755
<i>George Gogvadze and Erica Melis</i>	
Bi-directional Search for Bugs: A Tool for Accelerating Knowledge Acquisition for Equation-Based Tutoring Systems	758
<i>Sung-Young Jung and Kurt VanLehn</i>	
Design of a System for Automated Generation of Problem Fields.....	763
<i>Ildikó Pelczér and Fernando Gamboa Rodríguez</i>	
Lessons Learned from Scaling Up a Web-Based Intelligent Tutoring System	766
<i>Jozsef Patvarczki, Shane F. Almeida, Joseph E. Beck, and Neil T. Heffernan</i>	
Tailoring of Feedback in Web-Based Learning: The Role of Response Certitude in the Assessment	771
<i>Ekaterina Vasilyeva, Mykola Pechenizkiy, and Paul De Bra</i>	
Trying to Reduce Bottom-Out Hinting: Will Telling Student How Many Hints They Have Left Help?	774
<i>Yu Guo, Joseph E. Beck, and Neil T. Heffernan</i>	
Leveraging C-Rater's Automated Scoring Capability for Providing Instructional Feedback for Short Constructed Responses	779
<i>Jana Sukkarieh and Eleanor Bolge</i>	
An Authoring Tool That Facilitates the Rapid Development of Dialogue Agents for Intelligent Tutoring Systems	784
<i>Yue Cui and Carolyn Penstein Rosé</i>	
Using an Emotional Intelligent Agent to Reduce Resistance to Change	787
<i>Ilusca Lima Lopes de Menezes and Claude Frasson</i>	
Story Generation to Accelerate Math Problem Authoring for Practice and Assessment	790
<i>Yue Cui, Rohit Kumar, Carolyn P. Rosé, and Kenneth Koedinger</i>	
Supporting the Guide on the SIDE	793
<i>Moonyoung Kang, Sourish Chaudhuri, Rohit Kumar, Yi-Chia Wang, Eric R. Rosé, Carolyn P. Rosé, and Yue Cui</i>	
Comparing Two IRT Models for Conjunctive Skills.....	796
<i>Hao Cen, Kenneth Koedinger, and Brian Junker</i>	
The Effect of Providing Error-Flagging Support During Testing	799
<i>Amruth Kumar</i>	

Cognitive Tutoring System with “Consciousness”	803
<i>Daniel Dubois, Mohamed Gaha, Roger Nkambou, and Pierre Poirier</i>	
It’s Not Easy Being Green: Supporting Collaborative “Green Design” Learning	807
<i>Sourish Chaudhuri, Rohit Kumar, Mahesh Joshi, Elon Terrell, Fred Higgs, Vincent Aleven, and Carolyn Penstein Rosé</i>	
Cognitive and Technical Artefacts for Supporting Reusing Learning Scenario Patterns	810
<i>Emmanuelle Villiot-Leclercq and Aude Dufresne</i>	
Integration of a Complex Learning Object in a Web-Based Interactive Learning System	813
<i>Françoise Le Calvez and Hélène Giroire</i>	
Semantic Web Reasoning Tutoring Agent	816
<i>Christiana Panayiotou and Brandon Bennett</i>	
An Affective Behavior Model for Intelligent Tutors	819
<i>Yasmín Hernández, Enrique Sucar, and Cristina Conati</i>	
Decision Tree for Tracking Learner’s Emotional State Predicted from His Electrical Brain Activity	822
<i>Alicia Heraz, Tariq Daouda, and Claude Frasson</i>	
Toward Supporting Collaborative Discussion in an Ill-Defined Domain	825
<i>Amy Ogan, Erin Walker, Vincent Aleven, and Chris Jones</i>	
Author Index	829