Workshop on Non-Cognitive Factors & Personalization for Adaptive Learning (NCFPAL)

Many computer-based learning environments adapt to individual learners based on cognitive factors like skill mastery, but recently research has been increasingly directed at improving personalization and adaptation in such systems by harnessing non-cognitive factors such as learner affect, motivation, preferences, self-efficacy, self-regulation, and grit. This workshop brings together researchers studying non-cognitive factors in a variety of environments and contexts, using various experimental, measurement, and/or data mining and statistical methods. In addition to presenting on-going research on specific non-cognitive factors and their impact of learning outcomes, speakers at the workshop will present various creative approaches to address methodological issues endemic to research on non-cognitive factors.

Of one invited paper and five accepted papers, three papers explore non-cognitive factors in intelligent tutoring systems (ITSs) used in K-12 schools. Walkington and collaborators, in an invited paper, provide an account of various text-based features of mathematics word problems that are associated with learner performance in ITSs (specifically, Carnegie Learning's Cognitive Tutor). While explanations that point to both cognitive and non-cognitive factors may account for this association, Bernacki and Walkington follow up this observational study by exploring an intervention in the same ITS wherein word problems are personalized based on learners' out-of-school interests in areas like sports and music and find that personalization has benefits for both learner interest and measures of learning. A third study by Ostrow and colleagues considers an intervention in the ASSISTments system in which learners were presented with different types of "growth mindset" motivational messages (e.g., animations, audio, etc.). The impact of these messages on measures like persistence and learning are considered.

The next three papers consider data from college-level courses and learners. Ezen-Can and Boyer present an unsupervised method for classifying dialogue acts (e.g., ask a question, give a command) when learners interact with (human) tutors in a text-based dialogue environment; their method leverages gender and learner self-efficacy as noncognitive factors along which sub-populations of learners can be identified so that dialogue acts can be better classified. Next, Moretti and colleagues mine data about university computer science courses that are publicly available on the web to determine factors (e.g., choice of programming language and grading criteria) that are associated with learner feedback and other aspects of instruction. Finally, Gray and colleagues provide an analysis, using both classification and regression methods, of various psychometric measures of non-cognitive factors as predictors of whether students are "at risk" or likely to fail in their university courses.

The papers that comprise these proceedings represent a diverse set of measurement and analytical approaches and of student populations and learning platforms to which they are applied. We take this as a sign of developments to come, especially as researchers and developers in the learning sciences, educational data mining, and learning analytics increasingly turn to non-cognitive factors as possible "levers" to adapt and personalize learning experiences in more and more sophisticated technology-enhanced learning platforms and environments.

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Vincent Aleven, Carnegie Mellon University
Ryan S.J.d. Baker, Columbia University
Matt Bernacki, University of Nevada, Las Vegas
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Andrew Krumm, SRI International
Timothy Nokes-Malach, University of Pittsburgh
John Stamper, Carnegie Mellon University
Candace Walkington, Southern Methodist University
Michael Yudelson, Carnegie Learning, Inc.

The NCFPAL workshop organizers
Steven Ritter
Stephen E. Fancsali