

Modeling and Scaffolding Affective Experiences to Impact Learning

Sidney D'MELLO¹, Scotty CRAIG², Rana el KALIOUBY³, Madeline ALSMEYER⁴,
and Genaro REBOLLEDO-MENDEZ⁴

¹University of Memphis, ²University of Pittsburgh

³Massachusetts Institute of Technology, ⁴University of Sussex

Learning is accompanied by episodes of success and failure that inevitably invoke a host of associated affective responses. Interest driven content exploration (curiosity), being encouraged by success (happiness), making mistakes (feeling confused), recovering from them (overcoming frustration), diagnosing what went wrong (not becoming dispirited), and starting over again (with hope, determination, and maybe even enthusiasm) are the natural phases involved in the mastery of deep-level concepts. While, the last decade has been ripe with research investigating the interplay between emotions and learning, there are several open challenges hindering progress in this area. These include *empirical and theoretical questions* such as: (1) What are the emotions that are important to learning? (2) How are they linked with cognition and meta-cognitive processes (e.g. self-regulation and goal orientation)? (3) How do they get recognized by tutors, peers, and the learners themselves?

The next generation of educational technologies needs to be more than mere cognitive machines. Their educational strategies should be tailored in order to restore the balance between cognition and affect. This transition into the affective domain requires innovative approaches to construct online models of the emotion dynamics of a learner and efficiently utilize these models to optimize learning. In addition to the questions raised above, this endeavor brings to light additional *computational issues*: (1) How can we develop and evaluate systems to automatically detect learner centric emotions in real-time? (2) How should intelligent learning environments modify their dialogue planners to be responsive and reactive to the learner's affect? (3) What social rules should our embodied conversational agents that serve as artificial tutors or peer learning companions employ in order to synthesize affective expressions so as to yield more naturalistic communication?

This multidisciplinary area within the learning sciences includes researchers from psychology, education, cognitive science, computer science, artificial intelligence, and neuroscience. Since many of these researchers share the same goals of developing learning environments that effectively coordinate pedagogy with the learner's emotions, the proposed workshop seeks to create crosstalk between the areas. By providing a framework to discuss and evaluate novel research we hope to leverage recent advances to speed-up future research in this area.

We recognize the need for broad, fleshed-out, theories of affect and learning that can be implemented in computational architectures. While we do not expect to construct a theory from this workshop alone, we hope that merging perspectives from the learning sciences with recent advances in artificial intelligence will help set the foundation for a comprehensive theory to scaffold future research in this area.