Chapter 14
The Potential of Affective Computing in E–Learning:
The Journey from Theory to Practice in the "Myself" Project

Fabrizia Mantovani
University of Milan-Bicocca, Italy

Linda Confalonieri
University of Milan-Bicocca, Italy

Marcello Mortillaro
Swiss Center for Affective Sciences, Switzerland

Olivia Realdon
University of Milan-Bicocca, Italy

Valentino Zurloni
University of Milan-Bicocca, Italy

Luigi Anolli
University of Milan-Bicocca, Italy

ABSTRACT

The main goal of this chapter is to discuss the potential of affective computing for improving the e-learning experience, both from a theoretical and a practical perspective. First, we focus on the important role emotions play in the (e-)learning process and on the rationale to include affect in e-learning design . Second, we briefly present three trends in the affective computing domain which represent the core features of the EU-funded project on technology-enhanced learning "Myself": the use of affective Embodied Conversational Agents as virtual tutors; the possibility of automatic recognition of - and adaptation to- the emotional and motivational state of the learner; the use of 3D simulations for web-based training of emotional competence. Finally, focusing on the feature of automatic recognition and adaptation, we present an account of the approach developed within the project and use it as a framework for discussing the main benefits and current limitations to the complex process of integration of affective computing features into e-learning systems.

INTRODUCTION

The design and implementation of personalized e-learning solutions, tailored to learners' and trainees' characteristics currently represents one of the most relevant challenges to better leverage the opportunities offered by technology-enhanced learning.

Together with the effort of adapting to individual preferences, levels of knowledge, and learning styles, some recent advances in research on the use of adaptive media for learning have highlighted the importance of including users' mental states (affective and cognitive), as a key element in the design of personalized **e-learning** systems (D'Mello, Picard, & Graesser, 2007; Prendinger, Mori, & Ishikuza, 2005).

The underlying assumption is that a technology-enhanced learning system which is able to identify and respond to the dynamic changes in emotional, attentional, and cognitive states of the learner (which are strongly intertwined with the ongoing learning process), would highly empower the effectiveness and efficacy of the process, increase users' satisfaction, as well as significantly reduce drop-outs, offering therefore benefits at both individual and organizational level.

In particular, the role **emotions** play in learning processes is more and more acknowledged both in educational and cognitive sciences research literature (Gardner, 1999; Kinard, 2001; LeDoux, 1998; Schutz & Pekrun, 2007).

In academic and educational contexts, emotions were found to be significantly related to student motivation, learning strategies, cognitive resources and achievement (Pekrun, Goetz, Titz, & Perry, 2002). As stated by Barrett and Salovey (2002), affect in learning facilitates the development of persistence and interest in a topic*;* also, emotions can influence learning through information processing activity and organization of recall (Pekrun et al., 2002). Our learning, therefore, is heavily dependent on the emotional state we are in (LeDoux, 1998), and on the dynamic pattern of positive and negative emotions occurring in a given time period within a learning context (Sansone & Thoman, 2005).

In particular, studies in cognitive sciences pointed out how positive and negative emotions can trigger different neural activity patterns and thinking styles (Damasio, Grabowski, Bechara, Damasio, Ponto, Parvizi, & Hichwa, 2000; Isen, 1999; Lane, Reiman, Ahern, Schwartz, & Davidson,1997): on the one hand, the presence of a positive emotional state can foster a thinking style characterized by higher creativity and flexibility in problem-solving, by more articulated information processing and higher efficacy in decision-making (Isen, 1999; Picard, Papert, Bender, Blumberg, Breazeal, Cavallo, Machover, Resnick, Roy, & Strohecker, 2004); on the other hand, negative emotions, such as fear, sadness and anger, can influence the blood inflow to different brain areas, making learning more difficult (Damasio et al., 2000; Lane et al., 1997).

Moreover, emotions are intrinsically related to the learner's ongoing evaluation of the experience, since they are linked to control- and value-related appraisals within a learning environment (Gläser-Zikuda & Mayring, 2003): their expression by the learner can therefore represent an important source of information to a teacher or a tutor in order to tune and adapt rhythm, contents and strategies. For instance, positive emotions generally indicate that successful task-control and interest have been experienced, as well as negative emotions such as frustration, puzzlement and confusion can suggest that some form of feedback might be opportune.

When the learning process takes place in e-learning settings, some specific features can make the affective issue more difficult to deal with but at the same time even more relevant. On the one hand, in fact, the reduced social presence experienced, due to both the longer time spent in self-directed, individual learning and to the reduced communication cues (in particular nonverbal) available when interacting with teachers/tutors

13 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/potential-affective-computing-learning/40562

Related Content

Concept Maps and Meaningful Learning
Patricia Lupion Torres, Luiza Tatiana Forteand Josiane Maria Bortolozzi (2010). *Handbook of Research on Collaborative Learning Using Concept Mapping (pp. 430-448).*
www.irma-international.org/chapter/concept-maps-meaningful-learning/36307

Technology Infusion (Level 4.0)
Lawrence A. Tomei (2005). *Taxonomy for the Technology Domain (pp. 171-193).*
www.irma-international.org/chapter/technology-infusion-level/30050

The Instruction Theory of Jerome Bruner: The Guided Discovery Learning Theory
(2021). *4C-ID Model and Cognitive Approaches to Instructional Design and Technology: Emerging Research and Opportunities (pp. 94-111).*
www.irma-international.org/chapter/the-instruction-theory-of-jerome-bruner/267266

New Forms of Deep Learning on the Web: Meeting the Challenge of Cognitive Load in Conditions of Unfettered Exploration in Online Multimedia Environments
Mike DeSchryver (2009). *Cognitive Effects of Multimedia Learning (pp. 134-152).*
www.irma-international.org/chapter/new-forms-deep-learning-web/6609

Cognitive Styles and Design Interactions in Web-Based Education
Michael Workman (2009). *Cognitive and Emotional Processes in Web-Based Education: Integrating Human Factors and Personalization (pp. 58-71).*
www.irma-international.org/chapter/cognitive-styles-design-interactions-web/35958