Chapter 5.6
Computer-Based Learning Environments with Emotional Agents

Dorel Gorga
University of Geneva, Switzerland

Daniel K. Schneider
University of Geneva, Switzerland

ABSTRACT

The purpose of this contribution is to discuss conceptual issues and challenges related to the integration of emotional agents in the design of computer-based learning environments and to propose a framework for the discussion of future research. We review some emotion theories and computational models that have been developed in cognitive science and Artificial Intelligence (AI). We then will discuss some basic principles pertaining to motivation and emotion in instructional design. Grounded on these principles, we then shall present the state of the art of integrating emotions into the design of educational systems, and notably examine how to create intelligent emotional agents that enhance interaction with users. We will introduce the concept of "socio-emotional climate" as an evaluative indicator of the diversity of desirable interactions within a computer-based learning environment. We formulate the conjecture that a socio-emotional climate capable of enhancing learner motivation, self-assessment and self-motivation could be developed through the use of various socio-emotional agents.

DOI: 10.4018/978-1-60960-818-7.ch5.6

INTRODUCTION

Emotion is a topic in several computer science subfields. Human-Computer-Interaction (HCI) studies for example the role of affect in human-interface interactions or attempts to design software that express emotions. Artificial intelligence

and computational cognitive science may model human thought and behaviour. A new emerging transversal field, *affective computing*, unites attempts to design emotional software. Interest in emotional computing is grounded in the hypothesis that emotion plays an important role in cognitive processes and therefore has an impact on decision-making and performance (Damasio, 1994; Kort & Reilly, 2002; Picard, 1997).

Educational and learning theories are also concerned with emotion. In constructivist and cognitivist learning theories, learning is a result of cognitive processing and leads to knowledge construction. Learners construct their own reality through interaction with the environment, or at least interpret it based upon their perceptions or experiences. Emotions play a role in all these processes and have the potential to influence learning processes. The learning situation creates a context for a variety of emotional experiences. The effects of emotions on learning are mediated by self regulation and motivation and both positive and negative emotions influence learning. For example, students' emotions, such as enjoyment, boredom, pride, and anxiety are seen to affect achievement by influencing the student's involvement and attitude towards learning and learning environments (see e.g., Boekaerts, 2003; Pekrun, 2005).

In addition, working with a computational learning environment puts motivational challenges on the learner and increases the emotional load of the learning situation. For instance, O'Reagan (2003) interviewed 11 students studying online and concludes that the students surveyed positioned emotion as central and essential to the teaching/learning process. So, a learning situation is not only a mental performance, but also an emotional coping situation. According to Wosnitza and Volet (2005), emotions in computer-based learning could be derived from self, context, task or technology and other people. Technical environments should answer students' needs and expectations and have an influence on their emotional state (Brave & Nass, 2002). The question of how students feel about the environment and technology has been much debated in order to determine the amount of attention they allocate to their learning activities. For example, an impractical environment or unstable technology could distract attention, cause frustration, and disturb the users (Picard & Wexelblat, 2002).

The integration of technologies in education added some effectiveness and efficiency to pedagogical practice. However, little attention has been paid to emotions in educational technology. Some technology-based instructional designs (Astleitner, 2001; MacFadden et al., 2005) not only suggest ways to alleviate problems related to emotional learner states, but also address the more fundamental issue of how to build emotions into the design of learning activities, including collaborative scenarios. In addition, in modern electronic learning environments, emotions also intervene in various person-to-person interaction and person-to-system (human computer) interaction. All these factors contribute to some overall socio-emotional climate.

In order to create emotionally sound agent-supported learning environments we need to model and to simulate cognitive and emotional processes and we shall start with a discussion of some theoretical and practical aspects of emotional computing. Various computational architectures enable the creation of intelligent agents capable of sophisticated reasoning, of showing affective and expressive behaviours and of recognising the learner's affective state. The question is now whether emotional agents could change the user's attitudes and behaviours over multiple and extended periods of interaction, more effectively than non emotional agents. Some recent studies have suggested that users tend to like and trust emotional agents' more than unemotional agents (Brave, Nass & Hutchinson, 2005; Bickmore & Picard, 2004). On the other hand, the key to