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Guest Editorial: Intelligent and Affective Learning Environments: New Trends and Challenges

Ramón Zatarain-Cabada[1], Giner Alor-Hernández[2], María Lucía Barrón-Estrada[1], Ricardo Colomo-Palacios[3] and Hao-Chiang Koong Lin[4]

[1]Instituto Tecnológico de Culiacán, México // [2]Instituto Tecnológico de Orizaba, México // [3]Østfold University College, Norway // [4]National Taipei University of Business, Taiwan // rzatarain@itculiacan.edu.mx, lbarron@itculiacan.edu.mx // galor@itorizaba.edu.mx // ricardo.colomo-palacios@hiof.no // koonglin@gmail.com

Technology poses a huge potential in the educational field (Stantchev et al., 2014). As a result of this, researchers in this field of study devote great part of their efforts on finding better technological solutions (Vásquez-Ramírez et al., 2014). Within this field, Traditional Intelligent Tutoring Systems (ITS) are able to support and control students' learning at several levels; however, it does not provide space for student-driven learning and knowledge acquisition. From this perspective, Intelligent Learning Environments and similar tutoring systems have emerged as a type of intelligent educational system that combines the features of traditional ITS with learning environments. This kind of educational system can be very helpful in supporting human learning by using Artificial Intelligence (AI) techniques, transforming information into knowledge, using it for tailoring many aspects of the educational process to the particular needs of each actor, and timely providing useful suggestions and recommendations (Brusilovsky et al., 1993; Carbonell, 1970; Clancey, 1979; Anderson et al., 1990; Aleven & Koedinger, 2002; Woolf, 2009).

In addition to traditional cognitive state identification, ITS have recently incorporated the ability to recognize the emotions of students (Calvo & D'Mello, 2010; Wolf et al., 2009; Baker et al., 2010). These tutoring systems can detect the affective states of learners by using different types of data sources such as dialogs, speech, physiology, and facial expressions (Zeng et al., 2009; Calvo & D'Mello, 2010; Arroyo et al., 2009; Conati & Maclaren, 2009; Burleson, 2011). Moreover, they seek to transform negative states of students (e.g., confusion) into positive (e.g., commitment) in order to facilitate appropriate emotional conditions for learning. Affective Tutoring Systems identify confusion, frustration, boredom, engagement, and other prominent emotions during learning activities (D'Mello & Graesser, 2012; D'Mello et al., 2014; Graesser & D'Mello, 2012). The recognition of students' affective states can be implemented by different machine learning techniques, such as Bayesian Networks (Conati & Maclaren, 2009), Hidden-Markov Models (D'Mello & Graesser, 2010), or Neural Networks (Moridis & Economides, 2009). Although many works and studies have considered the development of affective tutoring systems, no research works have yet focused on Intelligent and Affective Learning Environments, where components involved in the environment (the learning environment, the intelligent tutoring system, and/or the adaptive system) support the learning process. Therefore, it is necessary to propose new approaches, techniques, methods, and processes in the field of Intelligent and Affective Learning Environments in order to consider cognitive and affective aspects in the teaching-learning and decision making processes.

This special issue of Journal of Educational Technology & Society (ET&S) on Intelligent and Affective Learning Environments: New Trends and Challenges, contains one kind of contribution: regular research papers. These works have been edited according to the norms and guidelines of JETS. Several call for papers were distributed among the main mailing lists of the field for researchers to submit their works to this issue. In the first deadline, we received a total of 32 expressions of interest in the form of abstracts. Due to the large amount of submissions, abstracts were subject to a screening process to ensure their clarity, authenticity, and relevancy to this special issue. Proposals came from several countries such as Algeria, Bosnia and Herzegovina, Brazil, Canada, Colombia, Denmark, Germany, Greece, India, Ireland, the Republic of Korea, Malaysia, Malta, Mexico, New Zealand, Norway, Philippines, Poland, Romania, Serbia, Spain, Taiwan, Tunisia, Turkey, United Kingdom of Great Britain, Northern Ireland, and United States of America.

After the screening process, 25 papers were invited to submit full versions. At least two reviewers were assigned to every work to proceed with the peer review process. Ten papers were finally accepted for their publication after corrections requested by reviewers and editors were addressed. The ten regular research papers introduce novel and interesting results in the form of theoretical and experimental research and case studies that apply new perspectives on Intelligent and Affective Learning Environments.

The special issue opens with a research paper proposed by Shelly Christian and Anuradha Mathrani. It proposes a game-based learning (GBL) approach to engage students in learning and enhance their programming skills. The work explains in detail how an educational game was mapped with the curriculum of a prescribed programming course in a computing study program. The main contribution of this work is the use of gaming elements for ongoing development of innovative pedagogies in teaching and learning.

Also, Fernando Martínez Reyes et al. describes a case based study carried out to observe and understand the level of attention, cognition, and memory of children with ADHD (Attention Deficit Hyperactivity Disorder). In this third research, the author developed a system called KAPEAN that collects information about the affective states that are present during the educational game, as it aims to understand how children's emotions should be considered for future designs of adaptive tutoring tools.

Adriana Peña et al. introduce the third paper of the special issue. The research proposes the analysis of nonverbal interaction to identify affective behavior during the accomplishment of collaborative tasks, which can be extended to verbal content. An exploratory study was conducted to understand the possibilities of this approach. Results showed behavior patterns that can be associated with task-focused affective states.

The fourth paper by Karla Muñoz et al. describes the design and evaluation of an emotional student model of Control-value theory applied to online Game-Based Learning environments using Approach 2. The model was implemented by using a dynamic sequence of Bayesian Networks (BNs). PlayPhysics - an emotional GBL environment for teaching Physics - was designed, implemented, and evaluated. Cross-validation and Cohen's Kappa were used to evaluate the model.

The fifth paper, proposed by Kwang-Soon Lee and Bong-Gyu Kim, explores the positive learning effect of formulating English sentences via Social Network Service (SNS; Kakao-Talk). Results support the benefit of correlated factors: the efficiency of input, challenge, social presence, the usefulness of to-verb practice, and feedback. The research work emphasizes on the potential of using SNS as an educational platform and highlights the necessity of a transactional space that combines classroom-based education with enjoyable leisure activities for young people.

Gustavo Padrón-Rivera et al. presents an analysis regarding the identification of action units (AUs) related to affective states and their impact on learning with a tutoring system. To assess affective states, a tool was devised to identify AUs on pictures of human faces. The paper aims to show that AUs are easier means to analyze affective states.

In the following paper, Marta Arguedas, Thanasis Daradoumis and FatosXhafa analyze the effects of emotion awareness, supported by specific teaching strategies, on students' motivation, engagement, self-regulation and learning outcome in long-term blended collaborative learning practices. Results show that when students are aware of their emotions and guided by specific teaching strategies, their learning performance improves in relation to their motivation, engagement, and self-regulation. Likewise, findings suggest that when teachers are conscious of students' emotional states, their attitudes and feedback become more effective and timely.

The eighth paper by Tze Wei Liew and Su-Mae Tan presents a study of the effects of positive and negative mood on cognition and motivation in multimedia learning environments. The work is supported by two experiments. Experiment 1 was conducted to determine whether facilitating effects of positive mood found in previous works could be replicated with a multimedia learning system that teaches basic programming algorithm to learners at an Asian university. Experiment 2 researched the effects of induced negative mood on learners' cognition and motivation in a multimedia learning environment.

Yasmin Hernandez et al. proposes a b-learning model to support adaptive and distance training for electrician examinations. The adaptation is based on a representation of the trainees' knowledge and affective states. An animated pedagogical agent was developed for this study. The agent guides trainees and provides them with instructions. It also deploys different facial expressions that convey emotions and empathy to trainees. These facial expressions were incorporated into the learning model in order to achieve believability, social interaction, and user engagement, and hence improve learning.

The last paper, proposed by Hao-Chiang Koong Lin et al., studies the design of a non-simultaneous distance education system with affective computing. Such system integrates interactive agent technology with the curricular instruction of affective design. The curricular collocation system design used affective design as the learning material to provide respondents with more impressive learning experiences. Prototype assessment and final assessment were employed to discuss the usability of the system and its satisfaction among users.

Once a brief summary of papers has been provided, we would also like to express our gratitude to the reviewers who kindly accepted to contribute in the evaluation of papers at all stages of the editing process. We equally and especially wish to thank the Editor-in-Chief, Demetrios G. Sampson, for grating us the opportunity to edit this special issue and providing valuable comments to improve the selection of research works.

Reviewer board

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