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Computers in Education: New Developments in e-Learning Technology

J.UCS Special Issue

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The huge impact of computers on modern society is widely acknowledged as computers appear in almost every aspect of our lives. Nowadays, for instance, databases store critical information related to financial or health systems, and common activities such as turning the lights on at home or using public transportation depend on computers that control processes which remain hidden to the users. Moreover, the Internet's repercussion in the world is driving the efforts of companies and institutions, which try to offer added value services while fostering other aspects such as content accessibility or ubiquity (e.g., by the seamless integration of mobile devices). Also more companies are providing new support for building the so called cybersociety – e-mail accounts, blog services, social bookmarking… – or even cyberdemocracy. Hence e-learning, or cybereducation, is commonly recognized as a powerful technology to offer new educational services and also to support and complement more traditional educational approaches.

The field of education is so affected by computers and the Internet that many research and development efforts have been instituted in order to use them as a means of improving the outcomes of learning processes. As computer programs have been used in many fields to make processes easier, they can also be employed to support students and teachers. E-learning provides different advantages such as increasing technology awareness, simplifying communication or the possibility of studying topics that might be unapproachable without the help of computer programs that simulate study cases. But there are other open issues concerning new educational software proposals, novel approaches that take advantage of new technologies (e.g., mobile devices) or the role that e-learning standardization plays in these innovative experiences. Thus more effort is needed in order to produce more successful cases and to generalize e-learning in industry, universities and schools.

This special issue on new developments in e-learning is an attempt to present several perspectives and efforts in the e-learning field. The selection of the contributions has taken into account not only the point of view of research but also practical applications.

Daniel Burgos, Colin Tattersall, both from the Open University of the Netherlands (The Netherlands), Martin Dougiamas from Moodle (Australia), and Hubert Vogten and Rob Koper, both from the Open University of the Netherlands (The Netherlands), have entitled their paper *A First Step Mapping IMS Learning Design and Moodle*. On the one hand, IMS Learning Design provides a pedagogically flexible approach to the creation of Units of Learning; on the other hand, Moodle provides a well-known and easy-to-learn Course Management System. In this contribution, the authors show how to achieve mutual understanding between the two of them in order to allow the interoperability and reusability of information packages/UoLs.

Luis Panizo, Ramón-Ángel Fernández and Lidia Sánchez from the University of León (Spain) show their experience using WebQuests as learning tools with first year Computer Science students. In their paper *A WebQuest Framework to improve the study of Deadlock and Process Synchronization* they describe a project for helping students learn topics related to *Operating Systems*. They also detail the observed learning outcomes of using the WebQuest and point out its impact on the students' both technical writing/speaking and group-working abilities.

Iván Martínez-Ortiz, Pablo Moreno-Ger, José Luis Sierra and Baltasar Fernández-Manjón from the Complutense University of Madrid (Spain) have entitled their contribution *Supporting the Authoring and Operationalization of Educational Modelling Languages*. They propose a general authoring and operationalization architecture, <e-LD>, for modelling educational processes (i.e., using IMS Learning Design), which integrates authoring tools with a workflow-oriented execution platform. An implementation of <e-LD> based on XML using BPEL4WS as workflow language is also detailed.

Maximiliano Paredes from Rey Juan Carlos University (Spain), Pedro Pablo Sánchez-Villalón, Manuel Ortega, both from the University of Castilla – la Mancha (Spain) and J. Ángel Velázquez-Iturbide from Rey Juan Carlos University (Spain) present in their paper, entitled *Collaborative Composition in a Foreign Language with Handheld Computing and Web Tools*, a proposal to integrate computers with other activities carried out in classrooms. Hence, they describe AULA, a new platform of ubiquitous computing which gathers mobile devices together with collaborative educational environments in order to improve the study of English as a Foreign Language in the classroom.

José Manuel Chaves, Miguel A. Vega-Rodríguez, Juan A. Gómez-Pulido and Juan M. Sánchez Pérez, all from the University of Extremadura (Spain), present a tool to help Computer Science students and professors with the study of pipelining scheduling, a common technique that improves processors' performance. In their paper *Pipeline-scheduling Simulator for Educational Purpose* they describe the software simulator and also their experience with graduate students, discussing the impact of the simulator on the students by means of a survey among the students.

Erla M. Morales, Francisco J. García and Ángela Barrón, all from the University of Salamanca (Spain), examine the different issues that should be considered in qual-

ity Learning Objects instructional designs for e-learning systems. Moreover, they propose an ontological knowledge model for improving instructional design which involves a clear, easy way to structure LO elements with quality characteristics. Their paper is called *Improving LO Quality through Instructional Design Based on an Ontological Model and Metadata*.

Manuel Caeiro, Martín Llamas and Luis Anido, from the University of Vigo (Spain), and Maria Jose Marcelino and Antonio José Mendes, from the University of Coimbra (Portugal), have entitled their contribution *Supporting the Modeling of Flexible Educational Units. PoEML: A Separation of Concerns Approach*. They propose an educational modelling language that separates the modelling in several issues which are as independent as possible in order to provide the capacity to support flexibility of models of educational practices. Therefore, an educational modelling problem is no longer considered in a holistic way, since it can be divided into separated issues instead. Moreover, the last part of their paper presents, as a case study, the modelling of some parts of a simulation course at the University of Coimbra (Portugal).

Davinia Hernández-Leo from the University of Valladolid (Spain), Andreas Harrer from the University of Duisburg-Essen (Germany), Juan Manuel Dodero from the University Carlos III of Madrid (Spain), Juan I. Asensio-Pérez from the University of Valladolid (Spain), and Daniel Burgos from the Open University of the Netherlands (The Netherlands) present a create-by-reuse framework for the creation of Units of Learning (UoLs) by reusing learning design solutions. In their contribution, which they have entitled *A Framework for the Conceptualization of Approaches to "Create-by-Reuse" of Learning Design Solutions*, a comparison framework is introduced for both conceptually analyzing and classifying reusable learning design solutions and processes, which drive the creation of a ready-to-run Unit of Learning (UoL).

Gregory L. Heileman, Chaouki T. Abdallah, Wei Shu, Christos G. Christodoulou and Debby Knotts, all from the University of New Mexico in Albuquerque (USA), describe in their contribution *Creating On-line Graduate Engineering Degrees at the University of New Mexico* the motivation, strategies and implementation details that led to the creation of on-line graduate-level degree programs in the department of Electrical & Computer Engineering at the University of New Mexico (Albuquerque, USA). They also show the benefits and challenges encountered during the process.

Maria Jose Marcelino from the University of Coimbra (Portugal) has entitled her paper *HME: a Handheld Model Editor for Educational Contexts*. She presents Sim-H, a modular authoring-tool for handheld modelling and simulation. In particular, she describes one of its modules, the HME editor, which allows teachers and students to create and run models of systems without previous knowledge of either programming languages or mathematical formalisms.

César A. Collazos from the Universidad del Cauca (Colombia), Luis A. Guerrero, José A. Pino, Sergio F. Ochoa, from the Universidad de Chile (Chile), and Gerry Stahl from Drexel University (USA), have entitled their paper *Designing Collaborative Learning Environments using Digital Games*. They propose a model for designing well-specified environments so as to induce collaborative activities within a group. Based on that model, they have also developed a game which requires collaboration among the players if they want to win.

Raquel Morales and Patrick Carmichael from the University of Cambridge, (UK) have entitled their contribution *Mapping Academic Collaboration Networks: Perspectives from the First Year of the Reusable Learning Objects CETL.* They describe the experience of using a 'network mapping' activity to improve academic collaboration within the multi-institutional Centre for Excellence in Teaching and Learning (CETL).

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