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Editorial: Special Issue on "Game-Based Learning"

Welcome to the January 2010 issue of Learning Technology.

Game-based learning attracts increasing interest worldwide, since it can bring significant benefits in various different learning settings. The issue introduces papers which describe new development frameworks and architectures, as well as specific case studies of games which are used in specific settings.

Emond et al. describe a project aiming to develop a virtual training environment using advanced user input technologies for military personnel; Padilla Zea et al. propose an architecture for designing educational video games with collaborative activities; Jurácz et al. describe a framework for developing flow-driven web-based educational games.

Chiong describes a game-based learning approach for learning introductory programming; Riemer describes a software product which was developed for facilitating the well-known beergame, a role-play game for simulating supply chain inefficiencies as depicted by the so-called bullwhip effect.

Caschera et al. propose an advanced multimodal platform for game-based learning (AMPLE), which enables the interaction in a gamed-based learning environment through a multimodal interface; Pincas describes a high-level pedagogic framework for designing educational games.

Baptista and de Carvalho describe a role-playing game (RPG) for learning, representing the setup of the city of Funchal, the capital of Madeira Island. Chu proposes a narrative approach based on informant design methods to build casual, educational games for children.

Casimir describes a management game that is used to allow students to integrate and practically apply their knowledge of all subjects taught in a specific course.

Marchiori et al. describe a visual, domain-specific language aiming to ease the creation of educational video games.

Arnab et al. discuss some design considerations for the development of game-based learning (GBL) for cross-cultural awareness, which are based on the experience of the eVita project; Boskic discusses how users perceive reality in computer games (and other artificial worlds), and how this can affect learning, as well the user's experience in general. Canbek and Kurubacak discuss self-representation of the real-self through humanoid identity immersive expressions of avatars in Second Life.

The issue also includes a section with regular submissions (i.e. not related to the special issue theme).

Ahmed et al. argue that existing learning technologies specifications and standards do not effectively support the need for dynamic adaptations in learning systems. In this context, the authors suggest the use of ontologies and related technologies.

Rosas-Colin et al. discuss work in progress aiming to investigate the epistemological bases of learning technologies.

Zouaq discusses how natural language processing and semantic web technologies and services can be used for improving learning systems.

Santanchè and da Silva describe a digital content repository (MediaBank) for storage, sharing and re-use of e-learning content.

Elwell proposes a progressive task-based virtual environment exercise (based on Second Life) which aims to improve students' competence, confidence, and independence in English.

Churchill discusses the conceptualization of learning objects, and the need for a broader definition that serves the perspective of diverse communities.

Finally, de Antonio et al. describe work in progress towards the implementation of a new student modeling approach, which is based on ontological engineering.

We sincerely hope that this special issue will help in keeping you abreast of the current research and developments in game-based learning.

We also would like to take the opportunity to invite you to contribute your own work in progress, project reports, case studies, and events announcements in this newsletter, if you are involved in research and/or implementation of any aspect of advanced learning technologies. For more details, please refer to the author guidelines at http://lttf.ieee.org/learn_tech/authors.html.

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Re/Thinking Design and Implementation of Learning Objects as Learned Objects

Introduction

Education and technology have been in strong interaction since the middle of the last century giving origin to a new study field: Educational Technology (ET) [1, 2, 3 & 4]. In the eighties a debate about ET identity took place. On the one hand it was considered as a branch of educational psychology or pedagogy; and on the other, as a branch of computer science or engineering [4, 5 & 6]. It seems that since the boom of Informatics and Communication Technologies (ICTs), ET has just followed the second path, promoting engineers work over other professionals on educational issues. Therefore we propose the necessity of guarantying an interdisciplinary view for the development of Learning Technology (LT), specifically of Learning Objects (LOs), in order to prevent the mistake of attributing intrinsic properties to new technologies. We invite to avoid the naive believe that ICTs themselves can improve, increase or accelerate learning.

Work in progress

Our research project: *Epistemological bases for science and technology education and research* joins engineers, psychologists, pedagogues and other professionals in social sciences under the leadership of an epistemologist. One of the goals: LOs development toward a new pedagogy of mathematics. We focus on mathematical reasoning in high school students where the idea is to develop not just LOs with arithmetic and algebra content, but a didactic procedure for mathematics education using ICTs based on a specific psycho-pedagogical assessment. As partial results, we got no LOs according to our assessment necessities. It is needed metadata and LOs informing the theoretical psycho-pedagogical framework of its design and possible implementation.

Likewise we realized that LOs reflects the designer's learning instead of student's learning. This result take us to a conceptual reflection about knowledge, learning, teaching, education, science & technology as linked concepts from different theoretical and disciplines views. According to the ISI Web of Knowledge [7] the concept of Learning Objects (LO) is used since 1960, but it's up to the Twenty-first Century that studies about LO increases in a notable way, specifically between the years of 2000 and 2007. Nevertheless the meaning of LO not yet is clear. There are several definitions of LO, the common one is that it is an informatics digital entity developed for the generation of knowledge, skills and attitudes that have sense in function of the subjects needs and that it has correspondence with reality [8].

However most LOs have been designed and implemented focused on the role of the teacher - to help him or to replace him- not really on the student. Then we propose a new categorization for digital entities used in education: Teaching Objects (TOs) and Learned Objects (L'dOs). Our account is that TOs are those digital entities useful as support materials for teaching. TOs can be complement or substitute of blackboards and other common didactic resources. TOs as teacher's or engineer's products are the sort of digital entities that actually, as we said above, are erroneously called LOs. Instead, L'dOs must be student's products: digital entities which must reflect what students have learned. This means that students must link informatics knowledge with concepts and skills about a specific subject to create their own L'dO. In this manner they would reflect their rationing.

This proposal involves a new pedagogical model constituted not just by digital entities but by an active educational model configured in an interdisciplinary framework. We think that Learning Technology may start to consider and guarantee *educational technology procedures* with interdisciplinary support; not just engineer's products applied to education. This support might be provided in a linking way by pedagogues, psychologist, engineers and subject experts. Then we can avoid digital entities as products with an excellent presentation and sophisticated technological support, but based on the implicit naive believe that ICTs by themselves can improve teaching or, increase and accelerate learning.

Conclusion

Our proposal is based on an epistemological view: an epistemology of engineering based on an epistemology of imagination [9] that considers next basic assumptions: 1) generation of new knowledge is not a social product but an individual product that is socialized. 2) It is a priority to focus on the individual cognitive development, particularly on symbolic-imagination experience and then in both, practical and formal experience. 3) Instruments have a very important role for the former three sorts of experiences. From this framework L'dOs are digital instruments as the combination of material instruments and mathematical knowledge. They are triggers, not determinants of learning, which means to understand technology as the coordination of the application of engineering as well as the application of psychological and pedagogical principles in education field. TOs (now known as LOs) in mathematics can be continuing developed as didactical digital tools but just as a part of an interdisciplinary pedagogical method. The challenge for LT then is a new kind of friendly software that allows the student to generate software (L'dOs) that could reflect his mathematical rationing.

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