Towards Creative Smart Learning Environments: Experiences and Challenges

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ABSTRACT

The creation of artefacts and entities to be used in simulated worlds and games has been used in practice to foster creativity in informal activities. Motivational issues and entertainment have therefore been combined along with creative tasks. The systems with higher complexity and more creative capabilities are usually based on WIMP interfaces, which negatively impact on the role of collaboration and active participation. This paper summarizes the main findings and the authors’ experiences in the project CreateWorlds, which relies on an interactive tabletop interface in order to support the creation of 2D games. Finally, the paper discusses some key challenges that will have to be addressed to support creative smart learning environments in the future.

Keywords: Ambient Intelligence, Challenges, Creativity, Entertainment, Learning, User Engagement

1. INTRODUCTION

Supranational entities such as the EU commission are recognizing creativity as a key driver for economic development in a competitive global market. The EU is fostering the development of a knowledge and creative based society by means of the strategic framework for European cooperation in education and training (EU, 2009). It aims at enhancing creativity and innovation at all levels of education and training, a response to facilitate the change in our society and the economy in the long term.

Although the term creativity always seems to cause controversy due to the wide range of definitions (Aleinikov, Kackmeister, & Koenig, DOI: 10.4018/IJCICG.2015010104
2000), all of them essentially refer to the idea of novelty, originality, innovation, unusualness, difference, etc. Creativity is defined in most of the main thinking streams as a multidimensional concept, which is related to several personal traits, skills, product features, processes, and environmental conditions (Sawyer, 2006).

In one way or another, creativity is important because it is related to divergent thinking and the process of generating and exploring multiple ideas to obtain reasonable solutions to complex or open problems and facing new challenges.

Digital information and communication technologies (ICT) have been seen as powerful tools to facilitate learning in general, as well as to develop creativity and related skills. The main features behind this idea are the exploration and representation of ideas in multiple ways (multimedia); interactivity; reproducibility of problems in a controlled manner; retrial without or with a reduced risk in case of failure; and communication and information sharing among users for discussion.

Myriads of digital systems have been created with learning purposes and to support learning task (Maloney, et al., 2004), (Fernaeus & Tholander, 2006), (Parkes, Raffle, & Ishii, 2008). They have been used as a complement in informal learning settings and relied on many different technologies: from multimedia offline applications on CD/DVD to online web-based on desktop systems; from virtual and augmented reality in static settings to networked augmented and mobile systems, etc. Regardless of the base technology, learning activities have been focused on games and playing activities and have relied on appealing and engaging user interfaces. This shows that entertainment along with constructivist approaches as a resource are used as a mean to facilitate learning (Michael & Chen, 2006). The point is that learning would take place if these systems succeeded in keeping users highly motivated and engaged in the activities for a sustained period of time.

This paper discusses, in section 2, how a set of learning systems focused on creativity have been used for learning purposes, and section 3 reviews our own research based on digital tabletops and discusses the related experiences. Section 4 poses some general challenges that must be taken into account by those systems, including entertainment oriented, that use new ICT with the purpose of supporting some kind of creative learning.

2. RELATED WORK

The present section briefly reviews a collection of selected works that have used digital technologies in creative tasks with the purpose of learning. For two decades, these proposals based on entertainment technology for creative learning have focused on the creation of some kind of artefacts. According to the supported creation capabilities, the reviewed works fall within two primary categories identified here.

2.1. Programming and Performing in a Pre-Established World

This first category deals with those proposals that have been focused on supporting performances of pre-established characters or entities in a world ecosystem in a broad sense. Hence, the common feature for works in this group is that users cannot create the characters or entities themselves but these are already pre-existing and then users are allowed to perform with them or specify their behaviour by encoding a program to tell a story.

Since the programming language Logo and Graphics Turtle (Papert, 1985) was devised as a way to show and teach computational concepts, many proposals have been inspired in a subset of the features of Logo and have focused on social and collaboration skills.

For instance, AlgoBlock (Suzuki & Kato, 1995) describes an educational tool where users use physical block-like pieces that can be arranged all together to program the movement of a submarine within a labyrinth. The result of the program execution is shown on a monitor by means of an animated submarine moving on a map. The system allows students to improve
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