Computers in Human Behavior 31 (2014) 602–611

Contents lists available at SciVerse ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

Design and analysis of collaborative interactions in social educational videogames

Carina González-González [a,*], Pedro Toledo-Delgado [a], Cesar Collazos-Ordoñez [b], José L. González-Sánchez [c]

[a] Department of Engineering of Systems and Automatic and Computer Architecture, University of La Laguna, Spain
[b] Systems Department, University of El Cauca, Colombia
[c] Department of Language and Computing, University of Granada, Spain

ARTICLE INFO

Article history:
Available online 2 August 2013

Keywords:
DGBL
CSCL
Playability
Videogames
Emotions

ABSTRACT

Children with serious illness face enormous challenges in their daily life. These individuals must not only deal with the direct consequences of their disease, but they must often cope with being in a hospital or at home, being unable in many cases go to school. Frequently, connections with classmates, neighbours, and sometimes even some with relatives are lost. Therefore, entertainment and enjoyment should be provided in order to avoid boredom and to improve their affective state. Currently, children in the HUC (University Hospital of the Canary Islands) have a classroom with computers, books and toys supervised by a teacher. Children in their individual rooms are isolated. Social videogames can be a solution by allowing students to enhance their communication, education and entertainment possibilities. In this paper, we present the design, development and evaluation of a collaborative educational videogame prototype for hospitalised children based on a Massively Multiplayer Online Role-Playing Game (MMORPG) engine. Moreover, we present a case study of students' social and affective interactions using said videogame. This work was developed as part of the Hospital Virtual Educative Service (SAVEH) project funded by the European program MAC 2007–2013.

1. Introduction

During long periods of hospitalisation, children are liable to develop stress and anxiety caused by physical discomfort due to their illnesses and treatments, by fear of medical procedures, separation, change of environment, and by being confined with restricted movements. Lack of face to face interaction and little communication with the family can contribute to the low morale that could obstruct the efficiency of the medical treatment or cause psychological trauma. One recommended solution is to counteract this situation with toys and promote gaming activities with a proven therapeutic value that involve love and fun, raise their morale, augment tolerance to pain, and improve the effectiveness of the treatments. In this sense, the use of new technologies, and in particular videogames, can become an element of compensation, because games are a vital part in the process of healing for a child and may work as a 'social companion' for the minor in a moment of necessity, particularly when there is no one else around.

The lack of motivation for conducting studies on hospitalised minors can be addressed through the use of adequate tools and methodologies which take isolation into consideration. One way to mitigate isolation wold be to use methodologies and techniques originated in collaborative learning systems that make possible and necessary the interaction with other students (Soller & Lesgold, 2000). Since children in hospitals have widely differing personalities, it is difficult for teachers to provide them with individual attention. Also, the circumstances that surround the hospitalised student can change quickly in short periods of time. Their emotional state, necessities and skills can be seriously affected. In order to contribute to the normalisation of children who cannot attend school normally, we have developed educational virtual worlds in which the students have the opportunity to play and go on quests while engaging in activities specially designed so they can learn, play, enjoy and interact.

The type of gaming activity that we propose in this paper not only offers a way to amuse the children in their everyday lives, but also a way of being in touch with others while giving them goals to achieve as a group, thus maintaining their social relationships. Moreover, through the collaborative learning videogame, significant skills like communication, collaboration and team work are improved.

* Corresponding author. Tel.: +34 922318284.
E-mail addresses: carina@isaatc.ull.es (C. González-González), pedro@isaatc.ull.es (P. Toledo-Delgado), ccollazos@unicauca.edu.co (C. Collazos-Ordoñez), joseluisgs@ugr.es (J.L. González-Sánchez).

0747-5632/$ - see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.chb.2013.06.039

In this paper we aim to design and develop multi-player (collaborative) game-based learning, combining theories based on Digital Game-Based Learning (DGBL) with Computer-Supported Collaborative Learning (CSCL). Our main hypothesis states that tools based on DGBL + CSCL can better support not only the learning of hospitalised children but the development of significant skills like communication, collaboration and team work. We have studied and analysed the human factors (Norman, 2004) associated with the videogame, such as the playability and its attributes (González Sánchez, Gil Iranzo, & Gutiérrez Vela, 2011), paying special attention to the emotional and social aspects resulting from the teamwork (Gunes & Pantic, 2010; Russell, 1980).

The main research questions discussed in this paper are the following:

(a) What requisites define the design and development of social educational videogames to connect hospitalised children with their classmates?
(b) What types of interactions occur in a multiplayer educational videogame and what emotions does it cause?

The paper is organised as follows: first, we consider the unique problem posed by hospitalised children; second, we offer a theoretical background on digital game based learning and discuss prototypes; third, we present the objectives and methodology; finally, we describe the case study and offer our results and conclusions.

2. SAVEH context

Integration and inclusion have different connotations in the school organisation of children with special educational needs. School integration means incorporating a philosophy of normalisation against segregational practices and focusing on strategies and methods for adapting disabled children to traditional schooling. Moreover, the inclusive school philosophy is based on a school for all, where every student, regardless of his or her characteristics (disease, disability, etc.), has the opportunity to access an educational environments. Schools have the same opportunities and access to the same resources (curriculum, personnel, and materials). An inclusive school must give diversity due consideration, considering that learning difficulties can arise not only from student inabilities but also from inadequate educational offerings. In keeping with this argument, a teaching hospital must try to improve the quality of life of hospitalised children by normalising their lives, either in a hospital or a regular classroom. In this sense, the collaboration between the hospital setting, the school context, and the parents and professionals caring for the child is extremely important.

The "hospital classroom" concept is related to the pedagogy of hospitalised patients (Violant, Molina, & y Pastor, 2009). However, the current trend is to reduce hospitalisation periods, with an average stay time of one week followed by school supported home care provided by a tutor from the child's school.

As particular variables that arise in this special context, and that can be addressed with virtual learning environments, we have found (González and Toledo, 2011) the following: *motivation*, *isolation*, *spatial dispersion*, *heterogeneity* and *dynamism.* As has been frequently shown, these children are scarcely interested in any topic involving their educational process. This understandable attitude may be changed with appropriate tools that are specially designed to appeal to the user. The isolation may be mitigated by integrating the educational process in a framework of collaborative learning, making available tools and techniques that make it not only possible but necessary to interact with other students. As concerns the heterogeneity, this aspect makes it more difficult for teachers to adapt their educational approach to each student's particular circumstances. It cannot be assumed that students will be located in the same room at any time during the schooling process. There is no direct contact with either other students or teachers. Finally, the circumstances surrounding a student can quickly change. Their emotional needs and skills may be severely affected, meaning that any systems with which they interact should detect these changes and adapt themselves immediately to the new circumstances. It is especially important to respond to every need, the goal being to develop the welfare and quality of life of sick children through recreation and education (play, have fun) while taking into account the psychological and social aspects involved (expression of feelings, relations).

At the same time, a large number of Information Communication Technologies (ICT) solutions have arisen that allow people to enhance their communication, education and entertainment possibilities (González, Toledo, Alayón, Muñoz, & Meneses, 2011). These technologies seem perfectly suited to the problems described above. In this regard, there are initiatives like SAVEH, which is a European project currently being developed by universities, hospitals, and private organisations in Spain and Portugal, whose aim is to develop and integrate ICT tools and electronic content in the context described above. SAVEH includes a technological ecosystem that comprises social nets, learning management systems (LMS), blogs, smart games and online multiplayer educational videogames. In this paper, we describe the design and development of educational multiplayer collaborative videogames to support the socialisation of students in a hospital or home care situation with their classmates.

3. Theoretical background

Although designed for recreational, and not educational, purposes, current commercial games like World of Warcraft provide access to a world of educational possibilities (Chang, 2008; Corneliussen & Walker, 2008; Bainbridge, 2010; Ducheneau, 2010; Golub, 2010; Hui-Yin & Shiang-Kwei, 2010; Pirius & Creel, 2010), such as: students collaborating on and discussing ideas and possible solutions, connecting with other students around the world, immersing students in a learning experience that allows them to grapple with a problem, gaining higher-order thinking skills from pursuing the solution, among others. This new way of learning offers new opportunities to use collaborative tools, allowing the students to co-construct knowledge efficiently.

While not targeted at education, nor seeking to cover any type of educational content, Green and Hannon (2007) cite multiple skills associated with being a "guildmaster" (one of the roles in WOW), such as: attracting, evaluating, and recruiting new members; creating apprenticeship programs; teaching children to work together for a common goal; communication skills; understanding multiple perspectives, respecting and even embracing a diversity of views, understanding a variety of social norms, and negotiating among conflicting opinions; orchestrating group strategy and organised thinking; managing disputes, etc.

We see that the objectives intended through the use of these types of games in education are mainly the improvement of instrumental, interpersonal, informational and digital competences, which includes cognitive skills, methodological skills, technical and language skills, teamwork skills, self-critical capacity, ethical commitment, skills on the gathering, selection, analysis and extraction of information and social communication and interaction skills (collaborative work, chats, forums). In this regard, through the activities involved in the videogame it is possible to contribute to the use of information technology and communication and to develop 21st century skills. These potential formative benefits have been studied under the project "Educational Games in the Classroom" (Felicia, 2009).