



## Supporting Human Capital development with Serious Games: An analysis of three experiences



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### ARTICLE INFO

#### Article history:

Available online 9 October 2013

#### Keywords:

Human Capital  
Serious Games  
Formal education  
Technology enhanced learning  
Game-based learning  
Learning scenarios

### ABSTRACT

Serious Games (SGs) are increasingly being used in formal educational settings and it is almost universally acknowledged that they have strong potential for bringing innovation to education and for enhancing learning, this way also contributing to the development of Human Capital. This paper proposes some reflections on the usefulness and effectiveness of SGs when used in formal learning contexts. The considerations are derived from a set of SG-based educational experiences carried out in three European countries: Italy, Spain and Romania. The paper briefly summarizes the key aspects of the three research experiences and, by referring to the main lessons learnt, it also draws some general conclusions as to the potential of SGs to support the development of Human Capital both from the cognitive and from the affective/behavioural standpoint.

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### 1. Introduction

Game-play is a pervasive phenomenon that is affecting a multitude of aspects in our everyday lives and social activities. The question naturally arises as to whether, and to what extent, it is also transforming education and contributing to the development of Human Capital. Following Becker (1964), in this paper we refer to Human Capital as to the knowledge and skills developed through education, training, and experience. In the context of the Knowledge Society, the two concepts of Human Capital and of lifelong learning are very close each other. According to Rose (1999a,b), in fact, the lifelong learning process contributes to promote the development of the social and human capital by offering continuous learning opportunities. In the context of lifelong learning (both as to formal and informal learning), digital games are widely regarded as effective educational tools capable of providing learners with new enhanced learning opportunities (de Freitas & Oliver, 2006; Hong, Cheng, Hwang, Lee, & Chang, 2009; Pivec, 2007; Prensky, 2005; Sandford R. & Facer K., 2006). The specific term “Serious Games” (SGs) has been coined to define those games whose primary purpose is “other than entertainment” (Michael & Chen, 2006) or, more explicitly, games which can sustain learning in its different aspects (Felicia, 2009).

Moreover, the learning potential of Serious Games has been extensively investigated in recent years. Despite some contrasting voices (Hays, 2005), their educational effectiveness in relation to

specific educational objectives has been widely recognized (de Freitas, 2006; Facer, Ulicsak, & Sandford, 2007; McFarlane, Sparrowhawk, & Heald, 2002; Milovanović, Minović, Kovačević, Minović, & Starčević, 2009; Mitchell & Savill-Smith, 2004). For example, recent studies have demonstrated the efficacy of game-based approaches over traditional learning in the health/medical field (Kato, 2010; Knight et al., 2010).

SGs have also been used extensively and effectively in job skills training, in order to sustain the development of those competences, knowledge, social and personal attributes (including creativity) that are embodied in the ability to perform labour and exercise leadership, in one word SGs have also widely been used to contribute to the development of the Human Capital. The three experiences briefly described in the following of this paper, suggest that SGs used within the whole educational process from early age to adulthood can contribute to build, incrementally and complementarily, the skills that would ultimately lead to a solid human capital development. Thus, for example, reasoning problem solving and soft skills can be fostered and enhanced through different SG-based learning activities, both using teacher and student centred approaches.

With respect to logical and strategy games as well as to those for developing decision making and cultural awareness (the types of games used in the experiences presented in this paper) the following can be said:

1. Logical and strategy games, if properly used, can contribute to improve logical reasoning and problem solving abilities together with strategic thinking.

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2. The games that train decision-making and develop communication skills are virtual training environments where the decision maker can learn through experience. According to Orasanu (1993) and Flin, O'Connor, and Crichton (2008), being alert to developing situations, being sensitive to cues and aware of implications is the first stage in the cognitive process to reach a decision. Digital games offer immediate, interactive feedback, reacting “dynamically to player’s decisions” (Salen & Zimmerman, 2004) and, according to Raybourn, Deagle, Mendinin, and Heneghan (2005, p. 3) “provide the opportunity for experiential learning [... and] an environment for active, critical learning”
3. Developing cultural awareness is a process by which we develop sensitivity to difference, simultaneously causing reflection and awareness; cultural competence means demonstrating knowledge of the other cultures and even adopts it. Affective skills are developed, active participation and communication, both verbal and non-verbal. Cultural awareness games have proved to be a more effective educational tool compared to the traditional teaching materials. Should we look at the issue from a pedagogical viewpoint, Patrick (1992) argues that “the most common and powerful method of training is to allow the trainee to perform the task and then provide some info about the correctness of his action”. According to Raybourn (2005) games open up possibilities for simultaneous learning on multiple levels as players learn from contextual information embedded in the dynamics of the game.

When asserting the effectiveness of game-based learning, many authors focus on the nature of interaction with the game environment, citing aspects like motivation, flow and immersion (de Freitas & Neumann, 2009; Garris, Ahlers, & Driskell, 2002). Nevertheless there is also a broad consensus that SGs educational potential and actual effectiveness may vary appreciably in relation to pedagogical and methodological choices made a priori by game designers and developers (Squire, 2005) and also in relation to the choices of educators while designing and carrying out game-based interventions (Bottino & Ott, 2006).

This paper considers three different game-based learning experiences that differ in terms of country of origin (Italy, Spain and Romania), working methodology and strategy employed. The aim is to draw on these varied perspectives so to foster reflection about the effectiveness of different pedagogies and learning methodologies that can be adopted to sustain the employment of SGs in formal learning contexts so to sustain the development of different aspects of Human Capital at different stages of human life.

In all the experiences presented below, connections between the game and the real world are well established, besides, they have in common the ability to adapt to the learners and offer ground for observing their attitudes, behaviour and learning potential. The three case studies take into consideration the skills needed in handling difficult emotional situations that are built, incrementally, based on a variety of games targeting different objectives. This is what actually forms the common thread of the three experiences: the games used and the studies conducted are like a brick way, building competences in a bottom-up approach. By joining three different European-settled educational contexts in a common paper, the authors also wanted to highlight the idea that the educational process is incremental and SGs can serve the scope of building knowledge and skills starting from first training in basic “transversal” skills and ending with the development of higher order thinking skills, like decision making and cultural awareness.

The work is grounded on the considerations that have emerged in the framework of the Technical Committee on Pedagogy of the

Game and Learning Alliance (GaLA) Network of Excellence (NoE) financed by the EC under FP7.

After briefly presenting the three SGs-based experiences and their associated findings, the paper examines methodological aspects underpinning game-based learning actions in more general terms.

The study can be useful for both societal levels and scientific arenas. As technologies evolve, so will society (Morgan, 1877). This change has a clear impact on human imagination. Personal knowledge will be of utmost importance (Moravec, 2008) and students will have to be able to learn, work, play and share in almost any configuration.

Moreover, as Moravec states in Rethinking Human development in knowledge societies, individuals will build knowledge experiences, leverage their potential to produce new ideas; students can apply their ideas in various organizations and are highly motivated to collaborate as natural networkers, develop habits of mind and learn continuously, by practice. Also, in focusing on HOW to learn, not on WHAT to learn, learning becomes invisible (Meyer, 2010).

In the proposed experiences, the adoption of SGs proved that the development of Human Capital can be sustained and fostered via SG-based learning experiences; this model should be extensively adopted for building up a broadminded, advanced society able to prepare our youth and other members of our society for future challenges even in the world of work. The development of skills and habits of mind can (and therefore should) be fostered through lifelong learning also by means of innovative applications; in this light SG-based learning experiences can contribute to develop mindware: they are social, experimental and continuously evolving just like our society.

## 2. The Italian experience

The Italian experience was carried out in a primary school over a three-year period and involved children aged from eight to eleven. The research team comprised educational technologists, psychologists from the Local Health Authority and primary school teachers from the school where the experience took place.

The main focus of the experience was to explore the potential that digital games offer to support young students’ reasoning and problem solving abilities. The project also sought to shed light on the cognitive abilities involved in the use of a selection of digital mind games and to identify the design and interface characteristics making games more or less fruitful for the targeted educational purposes.

Throughout the three years of the project, a group of around 40 children belonging to two classes of the same age level used digital mind games in computer sessions carried out during normal school hours. The student group was followed from the third grade (age 8–9) up to the fifth grade (age 10–11); it remained largely stable over that period, with only a few arrivals and withdrawals per year.

The adopted games (freeware, shareware and open source products) were mind games, namely games that require enactment of thinking and reasoning skills in a deep manner. All were mini-games (Prensky, 2001), that is “games that take less than an hour to complete”, as the experience called for game play to be completed within single class sessions; games of other types can require a substantial and prolonged time investment (Becker, 2007).

### 2.1. Methodology and pedagogical approach adopted

The students were divided into groups of 5 or 6, with each group taking it in turns to attend a computer session of

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