

Chapter 2

Learning Engineering Skills through Creativity and Collaboration: A Game-Based Proposal

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ABSTRACT

Games are a very helpful tool for developing both technical and social skills and considerable experience has already been gained in using computer games for introducing young people to the digital world. Game-based educational tools have been proven to increase soft skills in learners, such as critical thinking, creative problem solutions, and abilities for teamwork. In this chapter the authors propose the use of computer games in a Computer Science course to provide students with a deeper and more complete acquisition of the skills required in Engineering than that available in ordinary lab exercises. The games used for the lab are real complete distributed applications based on a server and client part and open source, enabling students to study the code and propose changes to add functionalities or improve those already existing. The fact that these changes in the code affect students' satisfaction as players themselves makes the study more appealing and furnishes a better learning experience.

INTRODUCTION

Computer Software Engineering will continue to be a demanding job, as stated in the 2010-11 edition of the Bureau of Labor Statistics Occupational Outlook Handbook. Engineering education should promote “habits of mind” in line with what many believe to be essential skills for citizens in the 21st century. These include systematic thinking, creativity, optimism, collaboration, communication and regard for ethical considerations.

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As regards current Engineering curricula, the European Parliament and the Council of the European Union define key competences as “.... those which all individuals need for personal fulfilment and development, active citizenship, social inclusion and employment.” Some of these key competences are qualitative, personal and subjective skills closely related with personal attitudes such as willingness to listen to, to look at, to discover the needs of others.

In regard to technical skills, pervasiveness and distribution are the main characteristic in today’s technological world: the development of data-centric and user-centric applications is growing and becoming increasingly common, as may be seen in the way that computational devices can be found everywhere (Kostakos, O’Neill & Penn, 2006). Smart spaces such as smart cities and domotics are well-known examples of pervasive systems. Other distributed systems are cloud and, in the scientific field, High Performance Computing or HPC.

Furthermore, the career of a software professional requires a preferably high level of people interaction for face-to-face communication as well as application interface (i.e. to be user-friendly).

Thus, one may distinguish three dimensions in engineering educational concerns:

1. How the problem is solved (computational skills).
2. How the solution is presented (creativity).
3. How the work is done (social and collaboration skills).

Games are a very helpful tool for developing skills in all these three dimensions –creativity, computational and working-style. Games provide the opportunity to develop both technical and social skills and considerable experience has already been gained in using computer games as a pedagogical approach for developing thinking skills in students, as well those for introduction into the digital world (McGonigal, 2007).

Games enable a specifically-controlled situation case to be recreated that is at once sufficiently simple but also quite close to the real world. Computer games have a broad appeal whatever the culture, age and socio-economic status (Smeaton, n.d.). In addition, distributed multiplayer games foster the participation of players from different places, with different backgrounds, ages, cultures and countries.

In this chapter the authors present the subjects on a Computer Science course based on game activity for the purpose of acquiring the required competences. The following points are developed:

- **Technical Skills:** To devise a simple and basic game that enables students to learn by playing as well as being able to contribute more components to the game itself.
- **Social Skills:** Since this is an interactive multiplayer game, players are required to interact and to collaborate with each in order to arrive at the final solution. This sets the challenge to improve and develop social skills in a positive and mutually helpful way.
- **Creative Skills:** The design and appearance of the game should give participants a feeling and understanding of how to follow the game. This will teach them the importance of the solution design from the point of view of the final user. Thus, they will be able to propose the most appropriate framework for building new components or even improve existing ones in order to make them more appealing and/or user-friendly.

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