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Integrating Open Educational Resources to Foster Serious Games and Gamification Design Principles

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INTEGRATING OPEN EDUCATIONAL RESOURCES TO FOSTER SERIOUS GAMES AND GAMIFICATION DESIGN PRINCIPLES

Complete Research

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Abstract

This paper presents aspects of the design, development and integration of open educational resources (OERs) on serious games design principles and gamification to foster good practices among faculty members of Higher Educational Institutions and other interested educators. The paper presents the methodology followed for the design and integration of OERs in this topic. The resulting modules are delivered through a synchronous e-learning platform and consist of thematic lectures, a variety of asynchronous tools for communication and support integration of OERs, serious games and gamification practices. Through its pilot implementation, learners became aware of aligning educational objectives to methodological principles and relevant tools using existing platforms, serious games and gamification aspects; they accessed videos and animations and they played games that let them realize the potentials of serious games in formal education or other learning contexts. Some preliminary results on their assessment are included.

Keywords: Open Educational Resources, Serious Games, Gamification, eLearning

1 Introduction

The research presented in this paper has been motivated by concerns of faculty members at Higher Educational Institutions (HEI) who had identified the need for effective means to promote students' motivation and engagement and eventually increase students' learning potential. As serious games and the selective use of gamification elements is a known approach to increase motivation, educators in all sorts of domains may wish to experiment with such approaches. However, not all of the educators are familiar with the required concepts and skills. Thus, the main objective of this research has been to use related theories and develop an e-learning platform that integrates OERs targeting educators who wish to employ serious games and gamification in learning activities designed for their students.

Integrating Open Educational resources (OERs) to support educators in their effort to undertake serious games and gamification elements for the development of learning activities is a complex task; it requires the alignment of learning objectives with learning tools and learning methods. In view of this, educators need to develop competencies on game elements and game mechanics, learn how to incorporate them within learning activities, which ought to be designed and developed with explicit consideration on the desired learning objectives for the end users.

Serious games, that is, applying games to non-game domains, have been extensively employed in educational contexts because they lead to high engagement of learners and through that to improvement of their skills. Recently, attention has been directed towards "gamification," which applies game elements and game design techniques to non-game systems (Deterding et al., 2011; Werbach and Hunter, 2012). As noted in (Cheong et al. 2013) a significant difference between the two concepts is that serious games are primarily games augmented with pedagogical components whereas

gamification refers to non-game activities to which game-like features have been added. In order to enhance the learning process and help learners conquer the specified learning outcomes, a gamified learning activity should be motivating, challenging, engaging and even stressful at times (Kapp 2012). This cannot be achieved by adding game elements like points, leaderboards, or badges to an existing activity or system; instead, it is the outcome of integrating game elements (Kapp, 2012; Nicholson, 2012) promoting a motivating and meaningful experience for the learners, especially suited for problem-solving and quick decision making. The volume and span of gamified applications (McGonigal, 2011; Reeves & Read, 2009) in business, education, health, marketing and other domains has also stirred interest among educators in the relevant fields and an inclination for some to acquire knowledge and skills that will enable them to employ it properly for pedagogical purposes in their courses. Despite the increased interest among educators, there has not been identified an e-learning initiative to examine how to educate course developers on this topic. To address this gap, an e-learning course for educators; it aims to provide them with the necessary knowledge and skills to identify learning objectives, design the learning activities and employ serious games and gamification to serve them. Based on the nationality of our audience the e-learning course content is in the Greek language.

Pedagogical, technological and economic aspects are involved in the design, development and implementation of e-learning courses and this renders the process challenging. For the specific course, considerations included the limited availability of resources in the specific language, the number of people who might be interested in and capable to follow this particular course, and the need for the methodology developed to be scalable.

This paper presents aspects of the design, development and implementation of an initial prototype of an e-learning course serious games and gamification, which was developed for Greek speaking educators who want to encompass serious games and gamification in their own courses. Through a localization process, however, other interested parties may localize the contents of the e-learning environment to their own special requirements. In an effort to preach what we pray, emphasis has been placed on employing game-based learning and appropriate gamification techniques for letting learners discover the different forms and aspects of serious games and gamification.

This paper aims at 1) outlining the methodology for identifying users educational needs related to the topic of gamification and serious games, 2) presenting a specific framework of the design of an e-course using game-based learning and gamification elements on the very same topic, 3) allowing interested parties who may wish to localize this course to understand the design parameters and thus perform their tasks more efficiently, and 4) facilitating the evaluation of the design and development of the e-course on serious games and gamification. For this course, the development team consisted of an expert on e-learning pedagogy and technologies with strong IS skills, a domain expert with experience and a developer. The development team was responsible for the design of the course and the corresponding learning material.

The remaining of this paper is structured as follows. Section 2 provides a brief literature review on relevant pedagogical approaches, game-based learning and gamification elements as well as the methodology used for identifying the educational needs of the target audience. Section 3 provides a description of the design of the e-course along with examples. Section 4 provides a roadmap through the implementation and evaluation of the environment on this implementation. Section 5 concludes this paper.

2 Learning Context and Identified Educational Needs

For the design framework of this research and the learning models to be applied, we follow a social-constructivist approach (Vygotsky, 1978), which proposes learner-centered activities and recognizes intrinsic learning through social interactions. Specific theories that guided the design of this e-course include:

- Vygotsky's (1978) theory of the "zone of proximal development", which posits that when learners engage in social behavior and enjoy the collaboration of peers they achieve more fulfilled learning experiences than what they might achieve by working individually;
- Kolb's (1984) experiential learning theory, which suggests that learning intertwined with applied, real life incidents and reflection upon this experience leads to higher learning achievements, and
- Lave's (1990) situated learning theory, which distinguishes a progression line among active learner initiating from "newcomer" status to "old timer" level within a learning community.

The overall design of the desired e-course observes is in alignment with these theoretical frameworks, furthermore, it employs game-based learning and other gamification elements.

A game may be defined as a system in which players engage in an abstract challenge, defined by rules, interactivity, and feedback, that results in a quantifiable outcome often eliciting an emotional reaction (Koster 2004). There is plenty of supporting evidence on the pedagogical role of fun in learning and of the potentials games to support learning (Ellis et al., 2006, Garris et al., 2002, Kolb 1984, Kolodner et al., 2003). Recently, gamification, that is, "[...] *the use of game design elements in non-game contexts*" (Deterding et al., 2011), has received attention as a potential mechanism for increasing users' engagement and behavioral change (Burke 2011).

The e-course was designed according to active learning, learner-centred principles and it includes certain common gamification elements and a set of learning activities that the learner performs in order to acquire or advance knowledge in this topic. The sequencing of these learning activities ranges from the simplest, to the most complex. The e-course specifies the learning objects involved (such as self-assessment test, video-lectures, exercises, handles to selected tools, text, games), the learning objectives (and other Metadata: who prepared it, when, for what type of learners, prerequisites, IPRs, technical infrastructure needed), and the learning environment (e.g., Moodle, WebEx, including the structure of the platform used, i.e. Moodle). Gamification elements are embedded in the e-course design; furthermore challenges, rewards, social influences and gamification specific self-expressing and self-assessment activities are included in the e-course.

In the design of the e-course we also included the profile of the learner, the learning objectives, possible prerequisites of each learning session, the learning environment structure and the utilized ICT skills. We have also included a description of the learning activities, possible sequencing of the learning activities and time restrictions or recommended timing: e.g., "one session per week". A (high level) description of the learning objects, including sizing (e.g., a 20min video), sources, and recourses necessary for implementation; as well as a series of self-assessment tools as well as guidelines for a cap-stone activity.

In alignment with the overall pedagogical paradigm and in order to identify the profile of the learners, the project team did secondary research. To maximize its potential impact on the target audience, it was designed as an open educational resource; the OER is in the Moodle server of the host University accessible at the The course includes discussions with facilitators, a variety of learning activities, methodologies and tools, relevant videos and animations and self-assessment exercises, as explained in the following section.

3 Design, Development and Integration of OERs

A fundamental principle followed in this research is the separation, with clearly defined interfaces, of the design, the implementation and the delivery of the course. The design requires the combined

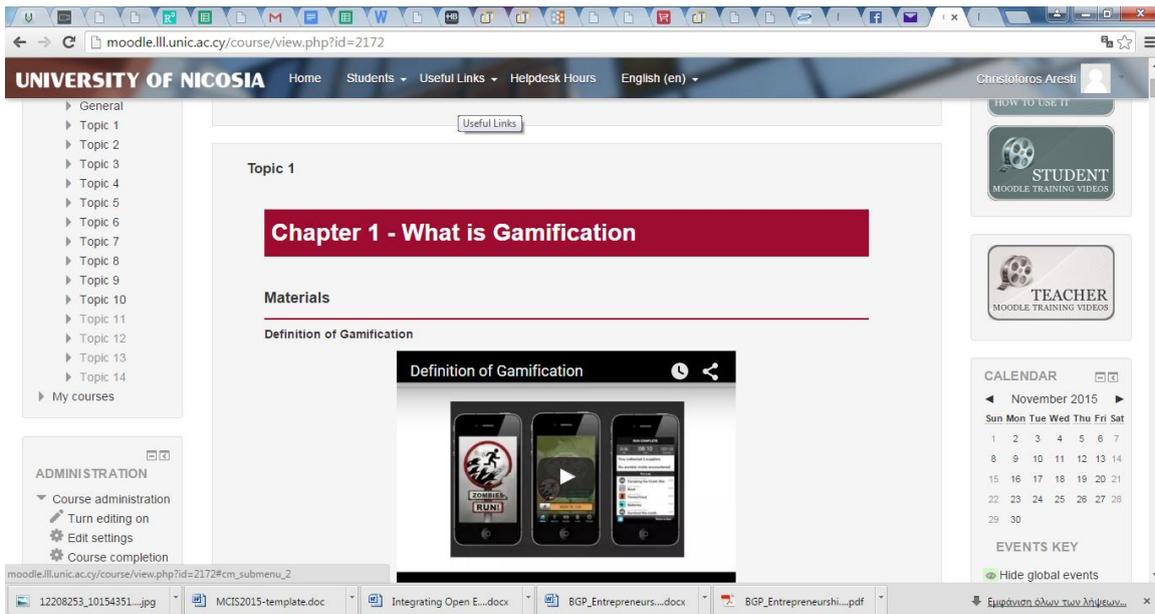


Figure 1. The Interface of the OER

expertise of e-learning pedagogy, technology and of domain knowledge. The implementation does not require the presence of an e-learning pedagogy or technology expert, any more. This separation of levels supports scalability and transferability.

The methodological approach allows the learners to perform a number of e-learning activities.

- Learners may participate in synchronous distance learning sessions that entail tutorial discussions on serious games and gamification concepts. Such sessions could be coordinated by a remote instructor. At implementation level, it is supported by WebEx®.
- An asynchronous e-learning system (Moodle, an open source LMS) and various Web and Web 2.0 tools were used. Furthermore, selected gamified activities have been developed and used as best practices.
- Participants design and develop their own educational material using appropriate method and tools (asynchronous distance learning).
- Learners may communicate, cooperate and form new knowledge with their fellow students, using embedded tools, educational activities and gamification elements.
- Finally, participants had the opportunity to undertake self-assessment exercises, play games and get engaged in gameful activities that empower learners follow their individual learning skills.

From a pedagogical perspective, the primary objectives of this course are to: i) raise awareness among learners on serious games and gamification; ii) let them develop skills and competences for developing their own educational resources undertaking appropriate design principles methods and tools and iii) enable them towards formative learning through individual projects. Example of how objectives (ii) and (iii) are implemented are given in the Figure 2 and 3.

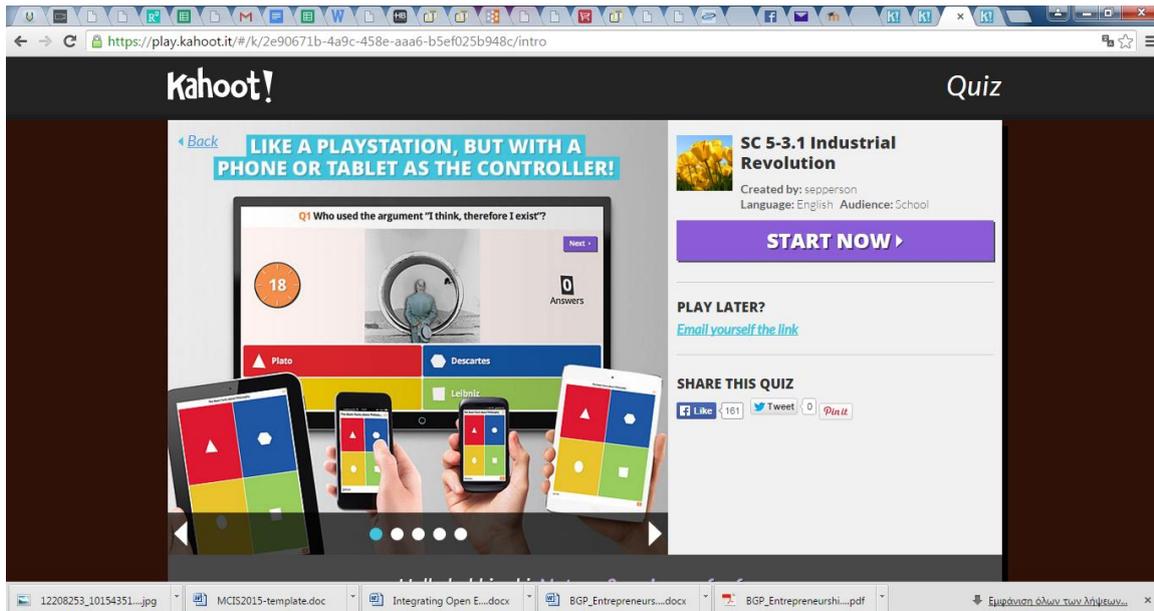


Figure 2. The educator may use an existing software tool for developing a serious game on the topic of his/her choice



[Επιστροφή στο Εκπαιδευτικό Περιβάλλον](#)

Figure 3. The educator may parameterize a well-known game and apply it in his/her course.

4 Assessment of the OER

We employed the Questionnaire for User Interaction Satisfaction (QUIS) for the assessment of the OER. Beyond the demographic questions, QUIS hierarchically organized measures of nine specific interface factors (screen factors, terminology and system feedback, learning factors, system capabilities, technical manuals, on-line tutorials, multimedia, teleconferencing, and software installation) as well as a measure of overall satisfaction. Each area measures the users' overall satisfaction with that facet of the interface, as well as the factors that make up that facet, on a 9-point scale. The questionnaire is designed to be configured according to the needs of each interface analysis by including only the sections that are of interest to the user. The QUIS questionnaire was translated into Greek and uploaded onto an online survey platform. The educators who had access to the OER were invited to access the system. The overall assessment of the project, including evaluation of the OER offered is described in more detail, as follows.

1. Γενική αντίδραση στο σύστημα												
	0	1	2	3	4	5	6	7	8	9	N/A	
απεχθές	2 2.3%	5 5.7%	4 4.6%	2 2.3%	1 1.1%	3 3.4%	9 10.3%	9 10.3%	16 18.4%	27 31.0%	9 10.3%	υπέροχο
δύσκολο	2 2.3%	3 3.5%	1 1.2%	0 0.0%	4 4.7%	1 1.2%	11 12.8%	7 8.1%	17 19.8%	30 34.9%	10 11.6%	εύκολο
απογοητευτικό	4 4.7%	1 1.2%	1 1.2%	1 1.2%	3 3.5%	4 4.7%	7 8.2%	8 9.4%	27 31.8%	17 20.0%	12 14.1%	ικανοποιητικό
ανεπαρκές	1 1.2%	3 3.7%	1 1.2%	3 3.7%	4 4.9%	2 2.4%	7 8.5%	10 12.2%	29 35.4%	14 17.1%	8 9.8%	επαρκές
βαρετό	3 3.7%	1 1.2%	1 1.2%	2 2.4%	2 2.4%	6 7.3%	8 9.8%	8 9.8%	20 24.4%	16 19.5%	15 18.3%	ενδιαφέρον
δύσκαμπτο	3 3.7%	3 3.7%	0 0.0%	2 2.5%	2 2.5%	5 6.2%	13 16.0%	22 27.2%	16 19.8%	11 13.6%	4 4.9%	προσαρμόσιμο

Figure 4. The overall assessment (part 1 of the QUIS questionnaire)

Overall, the e-course is very positively perceived by the learners; it also gathered high marks with regards to its perceived ease of use, satisfaction with regards to the scope of topics covered and completeness. The majority of learners found it interesting and flexible. Although the overall assessment is positive, the analysis of specific aspects reveals points for further improvement.

Follow up interviews validated that learners conquered the fundamentals on serious games and gamification, knew how to use tools to develop serious games and gamification, followed animation spots, conducted self-assessment tests, and overall enabled themselves to proceed in formative learning. Learners were particularly satisfied with regards to the methodology followed in the OER, although some concerns were expressed that the one-week time period between classes was not always enough for doing the suggested exercises and studying the additional material. Video clips and animations, were received very positively because they contained mostly applied examples, addressing all the main aspects of gamification. Another aspect of the integrated OERs that was very positively perceived was the gamified activities that were included.

In sum, the majority of the learners are satisfied with usability of the system, its content and its structure. Moreover, they are clearly in favor of the use of video segments and educational games. Users are content with the self-assessment exams, quizzes and the feedback given by fellow users and trainers. To a great extent, users believe that the OER provides the necessary content and skills to enable them undertake the serious games and gamification aspects in the design and development of their own educational material.

5 Conclusions

This paper focuses on the design and development of an OER on serious games and gamification. The authors report findings related to initial implementation; it is expected that the design process will go through repetitive iteration cycles to reach a higher level of maturity. The presented research works as a proof of concept that integrating OERs on serious games and gamification targeting educators can be an economically feasible and scalable process. The main contribution of such work remains to be validated through additional research. Another aspect that needs to be examined is the extent to which gamification has an impact on the learning process of users and explore ways that gamification can further support aspects of an overall educational strategy.

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