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APPLYING GAMIFICATION TECHNIQUES TO ENHANCE THE EFFECTIVENESS OF VIDEO-LESSONS

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Gamification techniques are commonly used in e-learning to enhance the effectiveness of educational activities and the learners' partaking. In fact, owing to the engagement effect, they can improve learning processes in diverse disciplines, empowering the traditional methods of acquisition of competences and skills. This approach is giving results in informal education activities both in traditional Learning Management Systems and in Massive Open Online Course platforms, mostly based on the consumption of video-lessons. In this context, we describe the gamification-oriented design choices made for the realization of a video-course for the training on the use of office automation software programs. Specifically, we planned the revamping of a course produced in 2012, whose lessons are made by short fictional videos, animated tutorials, and screen captures that show how to perform common operations. The design of the gamification process is following the hype for the launch of the new Star Wars™, Episode 7, and, as a consequence, will be

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delivered as "Star Words". In the paper we present the gamification methodologies adopted to create the first prototype of Star Words, also analyzing the criticisms that emerged.

1 Introduction

The goal of any learning activity is taking learners to achieve specific objectives, such as the attainment of new knowledge and/or skills in a given discipline or application scenario. Then, any course should be followed by evaluation and assessment activities, to measure its effectiveness in terms of new notions acquired and the relevant advantage for the attendees. However, another important parameter has to be taken into account, which is the effort required to reach that result. In order to get better performances, e.g., in terms of passed exams, we have to keep low that effort, while improving learners' satisfaction as well as their knowledge and ability. This is not only a matter of pedagogy and the learning environment assumes a huge relevance. In this perspective, owing to rapid technological evolutions of modern portable devices and to the wide availability of reliable and cheap network connections (Caviglione *et al.*, 2011), e-learning is expanding towards a more pervasive and integrated space of learning, which includes many theoretical aspects and exploits the best technology available, allowing the experimentation of new methodologies based on the novel approaches of the Semantic Web and Internet of Things (IoT) (Adorni *et al.*, 2012) as well as the creation of virtual laboratories (Gaudina *et al.*, 2013; Perino *et al.*, 2015).

In this context, we observe that the gamification approach can greatly enhance the effectiveness of educational activities, through the engagement mechanism, which can make learners more interested and, hence, improve their performances and make their learning experience more enjoyable. This solution is widely adopted in video-lessons, within both traditional Learning Management Systems (LMS) and Massive Open Online Course (MOOC) platforms. Hence, we decided to apply modern gamification techniques to an already existing and tested learning activity. In more details, the application scenario is a video-course on the use of office automation software programs, delivered in an online course. Such video-lessons are gathered from a training program addressed to the technicians and the administrative personnel in our University, thus, we can rely on results achieved in the past years and we will be able to make comparisons, evaluations and assessments, as soon as the new statistics will be available.

Specifically, we chose this particular application scenario for two reasons: (i) the above-cited video-course was primarily designed for the University administrative personnel, i.e., adult people with different individual characteristics and personal attitudes, but, in a second phase, it was delivered to younger

people, i.e., students; (ii) the video-course involves the specific issue of using office automation software programs, which presents interesting peculiarities that we are going to discuss in the following.

With reference to (i), we observe that students currently enrolled in University courses belong to the so-called digital-natives generation, for which playing video games is a very common activity. Hence, we believe we can profitably exploit the same mechanisms that cause engagement in games, to the aim of enhancing their level of involvement in educational activities (Oblinger, 2004). The idea comes from both the game-based learning and the serious games (Prensky, 2001) theoretical frameworks and, recently, the application of gamification techniques to the design of video-lessons is being widely investigated (Vaibhav & Gupta, 2014). It is worthwhile noticing that the success and the effectiveness of video-lessons also depend on the capabilities offered by the delivery platform, which can be a traditional LMS such as, e.g., Moodle, or a MOOC platform as well. Due to environmental constraints, our experience is tied to the use of Moodle, which is the e-learning platform adopted by our University, duly customized to the specific needs and integrated with other services such as, e.g., the accounting system, the LDAP (Lightweight Directory Access Protocol) services, the mailing lists, and the rest of the University information system.

For what concerns (ii), we perceive that daily activities involve appliances, electronic devices and embedded computers that do not require particular skills to be used, for they are intuitive and easy to use; in brief, they are user-friendly since they are designed following ergonomics and they adopt natural and intuitive user interfaces such as, e.g., smartphones. Among these, the Personal Computer is the most widespread, yet, apparently it is still the more difficult to use, being a general-purpose machine. This is confirmed by our experience as University teachers, since in our classes we see that many students lack in the ability of using basic software tools such as, e.g., the office automation ones. As a consequence, fundamentals on the use of such tools must be strengthened. This is also confirmed by recent study on the fallacy of digital natives (ECDL Foundation, 2014) phenomenon, which put in evidence the need for young people to further develop their digital skills, despite they believe to be already very competent. In this publication, authors reported on some surveys about the situation of University students in different European countries: among the others, in Italy, for example, «*[..] 42% of the students are not adequately aware of the risks of a free Wi-Fi*», while in Austria «*[..] 84% of respondents claimed that they had 'very good' or 'good' knowledge of the Internet; however, in practical tests 49% of them scored 'bad' or 'very bad'. The biggest gap between perceived skills and actual skills is persistently found among young people (15 - 29 years old)*».

Summarizing, we decided to apply gamification techniques to an existing course on office automation programs, which dates back to 2012 and covers the Microsoft Office 2010 suite. The design of the gamification process is following the hype for the launch of the new Star Wars movie, Episode 7, and, as a consequence, the newly created video-course will be delivered as *Star Words* (pun indented). Then, the same strategy will be applied to future versions of the same course, as content needs to be updated due to the rapid evolution of software. Moreover, a new generation of products is emerging, i.e., online services and web applications, which are not covered in the actual release. In addition, this experience allowed us designing a new educational strategy with an appealing methodology, whose core concepts can be reused in many other situations.

The remainder of the paper is organized as follows. First, we recall basics on gamification principles and take a glance on related works, and then we describe the design choices made in the realization of the Star Words video-course, also putting in evidence some criticisms related to the delivery platform. Finally, in the conclusions section, we report provisional results and we look ahead to future works.

2 Gamification principles

The term gamification was probably used for the first time in 2002 by the UK-based game developer Nick Pelling who coined it making reference to the use of a game-like accelerated user interface in the design of applications for electronic transactions, to make them more enjoyable and faster (Perryer *et al.*, 2012). In a few words, the gamification process can be described as the adoption of some techniques inherited from game design into different situations, other than games. In this perspective, the application of the typical game elements and the exploitation of common game design patterns are used to the aim of making some activities more appealing. In this way, users are stimulated to complete tasks by the desire of getting some rewards (Werbach & Hunter, 2012). Hence, gamification is not related to solve difficult puzzles or avoid tricks but it is the finding of effective ways to drive individuals to their goals faster. Through gamification, people feel involved in the process and are called to be proactive so that they can empower their own abilities and enhance their attitudes both online, in virtual worlds, and offline, in real world situations. Currently, gamification is used by industries to enhance the outcome of their communication campaigns and to drive the attention of people to advertising and marketing messages, in order to maximize their outcome.

To conclude, gamification requires a deep understanding of what we can learn from games, so that we can design enjoyable environments and raise passion for the *game* we are playing.

Werbach and Hunter (2012) describe the subset of the elements that characterize game design (Fig. 1), putting in evidence only those useful in the gamification processes. They are listed in the following, ordered on the basis of the abstraction level from the specific design element:

1. **Dynamics**: the higher abstraction level. They include constraints, emotions, narrative, progression, relationships.
2. **Mechanics**: the way to push interactions and create engagement. They include challenges, chances, competition, cooperation, feedback, resources acquisition, rewards, transactions, turns, win states.
3. **Components**: the instantiations of mechanics and dynamics. They can appear in the form of achievements, avatars, badges, boss fights, collections (of objects, badges), combat, content unlocking, gifting, leaderboards, level, points, quest (predefined challenges with objectives and rewards), social graph, team, virtual goods (game assets with perceived or real-money value).

The items listed in points 1-3 are the basic design elements that we should use to get an experience able to create all the positive dynamics of gamification.

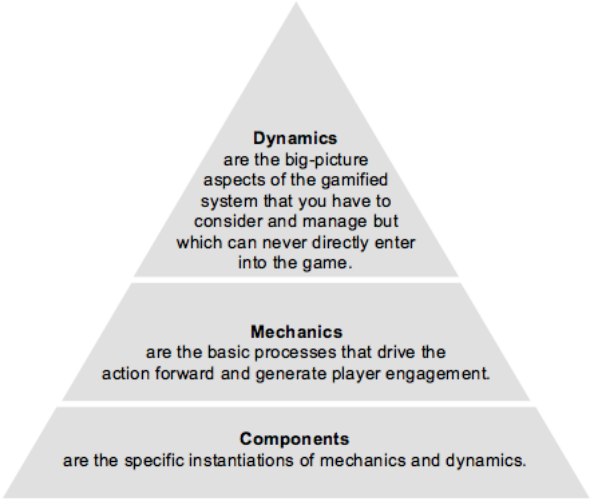

Fig. 1 - The hierarchy of game elements (Werbach & Hunter, 2012).

3 Related works

The idea of using gamification techniques to enhance retention, user engagement and learning success when teaching by means of video-based courses has been widely studied in the recent years. Well-known MOOC platforms, like,

e.g., Coursera and edX (Mamgain *et al.*, 2014) or Udacity (Williams, 2014), reported the problem of retaining the enrolled students throughout the course (Krause *et al.*, 2015), mainly due to the lack of motivation, feelings of isolation, and lack of interactivity (Khalil & Ebner, 2014). According to available statistics, only a marginal part of the total enrolled students completed courses. Drop-outs in several universities depend on: (i) occasional participants joining courses only for personal interests or curiosity with no rewards, nor institutional commitments and lesser motivations, and (ii) officially enrolled students abandoning too long and challenging courses, which are considered, sometimes, too boring. As Wilkowski *et al.* (2014) witness, there is only a 25% of students aiming for a certificate, which actually achieved their final badges in MOOCs.

Vaibhav and Gupta (2014) developed an experimental setup for analyzing the differences between gamified and non-gamified MOOC platforms, resulting in an increase of student retention of 28% of a gamified course with reference to the same non-gamified version, with 79% of enrolled students observing improvements in their learning outcomes.

For both MOOCs and games, it is possible to identify formal and dramatic elements and a detailed comparison is presented in the work by Tan (2013), which highlights the analogies between MOOCs and games. Furthermore, Krause *et al.* (2015) recently conducted a controlled experiment to discriminate the effects of gamification from those induced by social elements. The initial hypothesis of a gain due to gamification vs. social networks were disproved; nevertheless, using both gamification and social communications together proved a significant learning retention rate of +40%.

4 The road to "Star Words"

4.1 From "The fundamentals"

As already mentioned, the Star Words project raises from a set of video-lessons, previously released in 2012. Such lessons are arranged in an online video-course called "The fundamentals", which covers the basics of Microsoft Office 2010 in three modules: (i) word processing, i.e., Word, (ii) spreadsheets, i.e., Excel, and (iii) multimedia presentations, i.e., PowerPoint.

The video-course includes both tutorial and fictional videos, as well as screen captures, and users can consume them according to a *buffet*-like model, depending on individuals' needs, indeed, their perceived needs. In this way, one can start from her/his preferred module and draw a customized educational path, even disregarding one or more of the units inside. More precisely, each module is composed by six units (Table 1), which include videos, materials, and links to online resources.

Table 1
THE STRUCTURE OF "THE FUNDAMENTALS"

	Word	Excel	PowerPoint
Unit 1	User interface	User interface	Basics
Unit 2	Text	Cells	Design
Unit 3	Non-text elements	Formulas and functions	Animations
Unit 4	Layout	Graphics	Hypertext, audio & video
Unit 5	Mail merge	Special formatting	Presentation management
Unit 6	Tips & tricks	Layout and formatting for printing	Most wanted stuff

Each of the units in Table 1 can be consumed by students regardless other units have been consumed or not, without any logical constraints. In this way, the course can be customized on the basis of specific needs and the available time of individuals. To advise users on the path they should better follow, the introductory lessons are followed by self-evaluation tests aimed to discover «*How much do you already know?*» and to drive more skilled users to overlook the lessons on basics and to concentrate on advanced topics or on individual gaps, to better take advantage of their time. Once the three modules have been completed, users reach the final evaluation test, which aims to verify and certificate their newly acquired level of competence and skills on using office automation software.

The video-course is made available through the official University e-learning platform, which is based on the renowned Moodle LMS, and it can be accessed by University's employees and students as well. Presently, after three years of activity (and a new release of Microsoft Office), an updated version is needed and the revamping process we designed includes a revision of the contents and a new learning strategy, based on gaming. Hence, future editions will cover a wider fan of tools, e.g., Google Docs, LibreOffice and Office365, and will be more attractive and engaging for learners.

4.2 To "Star Words"

In this sub-section we describe how gamification principles have been applied to the above-described course, to enhance the users' experience and make the course more enjoyable.

A straight approach to gamification for the presented situation of the University course would result in a leaderboard, to be compiled on the basis of the scores achieved in the quizzes included within the lessons. Learners are involved in a competition and they can compare their achievements with others

trying to make the best score to be first classified. This does not result in a very rich and engaging experience, even if this approach to gamification is very common. Instead, we decided to bet on the use of storytelling, taking into account a classic and very popular cinema topic, which is returning very actual, i.e., the George Lucas' Star Wars saga. In fact, following the last title published in 2005, a brand new trilogy is being presented, whose first episode will be launched within the end of the current year 2015, and the hype around this event is demonstrating that the fan base is very large and this is also witnessed by the fact that three *Star Wars day* are currently celebrated along the year. People are very enthusiast about the characters of the saga and lot of popular quotes are extracted from the movies and used in common language, and we thought of exploiting this to enhance participation and engagement in our course for a wide range of age, from young students to adult employees of the University. Moreover, the Star Wars movies form a trilogy and this fits perfectly with the number of modules included in the course.

So we decided to ride the wave of the forthcoming Episode 7, which will be in cinemas since December 18th, 2015, to drive students to consume the course within the current academic year.

Starting from these premises, we have set off the transformation process, which would drive "The fundamentals" on the road to become "Star Words", with the following constraints: (i) the need of reusing the syllabus of the course, (ii) the need of reusing the videos, which are valuable assets, and (iii) the compulsory use of the Moodle LMS to deliver the video-course and to keep track of the students' activities.

In this respect, to stay in-line with the story of the original Star Wars saga, we associated each module of the course to a specific movie of the trilogy and the events depicted in each course will correspond to frames of the relevant movie. Specifically, (i) the Word module is corresponding to the episode "A new hope", the PowerPoint module is associated to "The Empire strikes back" and, finally, (iii) the Excel module matches with "Return of the Jedi". As already mentioned, in the original course, users could consume single videos without a specific order, and this clashes with the fact that the episodes of the Star Wars saga follow a specific sequence. Hence, to allow users having a personalized experience, we introduce the possibility of choosing a character to personify. In this respect, users can decide to act as one of the following: Han Solo, Luke Skywalker, or Leila Organa. As a consequence, for each module, we have realized a different version for every character. In this way, users can consume personalized contents. Through the adoption of this solution we have meant to exploit the power of storytelling. In fact, an excessive degree of modularity would weaken the narrative aspects, forcing to build each section/movie too

generally. We therefore favored the possibility of creating a fascinating history from the perspective of three different characters who are the stars of the original trilogy.

As an example of how we introduced story elements in the course, let us consider the fictional character Ben Kenobi, which assigns to the Jedi specific tasks to be accomplished (see Fig. 2). The video-lesson that we can play to follow the instructions of Ben Kenobi comes from the previous course, but now it is fully embedded in the Star Wars-based narration.

Fig. 2 - An example screenshot where Ben Kenobi introduces the use of the Word word processor. The title is in Italian and is the equivalent for "Ben Kenobi and the world of Word".

In fact, the six units of each topic are arranged in a new story, recalling the original plot of the Star Wars saga. Users consuming the Star Words video-course will act as one of the characters of the story, which goes across the narration in six steps. Specifically, in the presented example, the learner acts as Luke Skywalker, under the tutorship of Ben Kenobi. While in the movie Ben Kenobi drives Luke Skywalker on the road to become a Jedi Knight, in the course each user is accompanied on the road to become an "Office Jedi". Analyzing this example, it appears clear how we used gamification elements. In particular, making reference to the concepts introduced with Figure 1: (i) we focus on ***dynamics*** going through an engaging *narration* in which the learners make progressions which result in advancements in the plot as they (ii) solve quests, which represent the ***mechanics*** of *challenge*, *win state*, and *resources acquisition*, where the resources are (iii) specific ***components***, such as *badges*,

and dark side *points*.

Based on the same principle, when users are assigned some specific tasks to verify the acquired competences, in the Star Words version, exercises are contextualized and follow the narration flow, making reference to specific scenes or quotes. In this respect, the already mentioned initial test is called «*How the Force is strong with you?*», which takes learners in the magical atmosphere of the Star Wars, "*in a galaxy far, far away*" from the traditional online courses. As another example let us consider the assignment for the Word unit n. 3, which is about non-text elements. The assigned homework recalls the moment in which Han Solo and Chewbacca write a letter to Jabba, to convince him to save their lives. Relying on the previous lessons given by Ben Kenobi, now Luke is proficient in Word and he will be able to help Han Solo and Chewbacca in formatting the letter they are writing, which must include some tables, pictures, and other non-text elements, as requested. The exercise requires the application of acquired skills in a funny situation, yet it is very rigorous.

4.3 Open issues

During the creation of the video-course, some criticisms have emerged with the mechanism used by Moodle for the badge appointment. It is triggered by the completion of activities, such as, e.g., posting in a forum, consigning an assignment, which are useful from the educational point of view but not so significant for the gamification aspects. Moreover, in this respect, unlocking a badge when a test fails should be made manually by the tutor who is in charge of monitoring results. Such a rule is hard to implement. This has prevented us from the possibility of instantiating a "dark side" points mechanism, which, in our idea, should be associated to the request of hints and helps during the execution of the tests. Recalling a quote from the original movie:

> *Luke: «Vader…. is the dark side stronger?»*
> *Yoda: «No, no, no. Quicker, easier, more seductive.»*

According to a traditional learning methodology, the possibility of getting some helps would facilitate passing the test and this is not good. Instead, it is our opinion that this can empower learning for the newly attained knowledge will be associated to a positive emotion, reinforcing the acquisition of that notion, rather then being associated to an automatic score increment to gain a higher placement in a rank. Clearly, this does not mean that collecting dark side points will have no consequence and this is true in games as in real life. Currently, in Moodle it is not possible asking hints in a single attempt quiz, as it was in the original design and this may reduce the engagement. However,

we are forced to use the University platform and we are not allowed to make some modifications for the improvement of functionalities by adding the needed capabilities.

In alternative, one could choose a suited gamification platform but the ones available for free offer only limited features and would not take any advantage if compared with Moodle. Hence, we used the functionality for the appointment of badges included therein and we concentrated on the narration.

Conclusion

Starting from Fall semester 2012 the video-course "The fundamentals" has been intensively used along three academic years by students of non-technological degrees, i.e., "health professions" and "communication science", for a total amount of about two hundred professionals and three thousand students. More precisely, we have statistics relevant academic years 2013/2014 and 2014/2015, when 824 and 797 health professions graduate students were involved. They achieved a completion rate of 73% and 72% respectively, within an average duration of 2 months. We can consider these results as good figures, with reference to typical MOOCs, but, considering motivation and the fact that the completion of the course is mandatory for graduate students to pass from first to second year, we are aiming at reaching at minimum a percentage of 95% of success.

With the application of gamification principles, we have redesigned a course, still based on some old contents but instantiating a brand new methodology. While writing, this new academic year has not yet started and the new release will not be consumed before the end of the Fall semester, when enrolled students will be asked to choose between the traditional course or the Star Words remake and this will give us the possibility of observing two distinct groups and to compare their results at the end. Moreover, we can rely on results collected in the past three years, to have a long term analysis in the future.

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