Raising engagement in e-learning through gamification

Cristina Ioana Muntean

Cybernetics and Statistics, Babes-Bolyai University, Romania Strada Mihail Kogălniceanu, Nr. 1, Cluj-Napoca, Romania E-mail: cristina.muntean@econ.ubbcluj.ro

Abstract

Games are part of day to day life, entertaining users, but at the same time modelling behaviors. By applying game mechanics and dynamics to tasks and e-learning processes we can increase user engagement with an e-learning application and its specific tasks. While having multiple uses in commercial practices, gamification implies well established techniques similar to those found in games. We will take a closer look at the ones that are appropriate to the learning process and moreover to e-learning and analyze relevant examples.

Keywords: gamification, e-learning

1. Introduction

The idea of using games for learning is not new. This is customary especially in the case of direct interaction between teacher and student. Transposing this into a digital form of teaching and learning might become an issue. Our proposed solution when confronted with this problem is attempting to gamify the e-learning process.

Gamification (Deterding *et al*, 2011) is the use of game-play mechanics for non-game applications. Any application, task, process or context can theoretically be gamified. Gamification's main goal is to rise the engagement of users by using game-like techniques such as scoreboards and personalized fast feedback (Flatla *et al*, 2011) making people feel more ownership and purpose when engaging with tasks (Pavlus, 2010).

Gamification is used in several different contexts mostly business and marketing, but we further wish to demonstrate its utility and importance in the educational environment as well. By incorporating game elements into work activities we wish to raise motivation (Shneiderman, 2004) but, in order to do so, we need to pay attention to the integration of tasks and exercises within the game design (Von Ahn and Dabbish, 2008).

Creating gamers for learning employ costly resources. A simpler yet still efficient approach is to use gamification in order to make the content more attractive and engage users.

By using gamification in e-learning we wish to trigger a more efficient and engaging learning behavior. B.J. Fogg argues that people respond to computers as they were persons, especially when gaming (Fogg, 2002). In order to change or trigger a certain behavior students need to be motivated and at the same time have the ability to solve the challenges.

Gamification also implies a social game and interaction with other participants. Fogg explains that when people perceive social presence, they naturally respond in social ways and have feelings like empathy or anger, or following social rules such as taking turns (Fogg, 2002).

2. Persuasive Technology And The Fogg Behavioral Model

The limitations of e-learning from a pedagogical point of view are the fact that it cannot transmit emotion or engage the student as a teacher could. For this lack of *feeling* or emotional interaction, an e-learning system must compensate and try and stimulate learners with other means.

JB Fogg studied the concept of persuasive technology (Fogg, 2002) and how we can design systems that impact the user also on an affective level. He proposes a model Fogg's Behavior Model (FBM) (Fogg, 2009) that studies the factors that can generate a certain behavior. This model has a high applicability in the case of a human-computer interaction.

The model comprises 3 main elements: motivation, ability and triggers, which occurring at the same time can determine a target behavior.

We further try to view how we can apply this model to an e-learning system and its users. As mentioned before, in order to effectively go over course and learn, the student must be at the same time motivated, capable and triggered in order to accomplish a desired action or a target behavior. He must reach the behavior activation threshold in order to read, learn or solve. The desired state for the student is referred to as flow, an optimal state which translates into concentration, when we believe the students interacts most effectively and the actual learning takes place.

Motivation, at its core, can be caused by couples of opposites like pleasure/pain, hope/fear, and social acceptance/rejection. If for example a student is able to solve a problem but has no motivation to do it, he will not do so. Once his social reputation is at stake or he is conscious of the fact that he might get a small grade, the motivation, either positive or negative will determine him to solve the problem.

On the other hand *ability* is also a factor that influences the occurrence of a behavior. Even if a person is highly motivated, a behavior cannot occur if he does not have the ability. On the other hand a high motivation can determine a subject to find the means to accomplish a task, thus gain the ability

Fogg also states that motivation and ability alone are not enough to determine a behavior. A certain behavior needs a *trigger*, something to tell the user to complete the action in a certain moment; it is also referred as a call to action. Triggers are connected to motivation. They can be a spark – this tends to motivate a user, a facilitator – tends to offer ability to highly motivated users, and lastly a signal – when users have both ability and motivation, but it functions as a reminder.

Examples of target behavior can be: donate money, buy a product or share with a friend. Computers and the use of technology enable us to act instantly to triggers. A future trend is moving technology towards mobile and thus e-learning can become m-learning, and courses can also be context aware and supporting multiple formats (Morar, 2010). Because of the size limitations of mobile phones we must adapt the structure of courses and evaluation to fit to these smaller environments, but nevertheless achieve the desired goal.

3. Games In Real Life And In E-Learning

Games are part of everyday life. Americans spent over \$25 billion on video games in 2010. Their main goal is entertainment, but their universal applicability gave games extra functions in various aspects of everyday life. Games are used not only for leisure but also by industries like defence, education, scientific exploration, health care, emergency management, city planning, engineering, religion, and politics. They are also called serious games and their main purpose is to train, investigate, or advertise.

Serious games are complete games with serious intentions and designed accordingly whereas in gamified application only certain elements from games are used.

Learning through games is not a novel approach. Elisabeth Corcoran (Corcoran, 2010) claims that there are at least 3 types of games used in education: the classic edu-tech games, games developed by students themselves like Scratch and the last approach gamified courses, meaning adding game mechanics to various applications, tasks, etc. Whether offline or online, games have helped scholars reach their educational goals in a more engaging way. Nevertheless we must note the difference between the so called "educational games (serious games, simulators)" and the gamification of e-learning. While the first employs a bigger quantity of resources, game design knowledge and graphics, the second one does not engage as many resources or a special design.

4. The Gamification Of Education

There is little research however regarding the usefulness of gamification in education. In (Lee and Hammer, 2011) the authors start by explaining the meaning of gamification, what it is and how it can be used, while also pointing out the possible disadvantages in case of misuse. They define it as the use of game mechanics, dynamics and frameworks to promote desired behaviors. Returning also to the point made by Fogg we can use gamification to determine certain behaviors or correct others and we can thus see the utility of using gamification in learning, and even more in elearning. There might be possible dangers if the gamification design does not suit the purpose of motivating students to engage and offer support to teachers and on the contrary for example it might teach students that they should learn only when provided by an extrinsic motivation.

Authors of (Kapp, 2011) notice a large increase in the gamification of learning and instruction. Due to the user of game elements like time, accuracy, point systems integrated intro all types of training programs encourage users to achieve their desired goals.

5. Gamification

Gamification is the use of game play elements for non-game applications, particularly consumeroriented web and mobile sites, in order to encourage people to adopt the applications. It also strives to encourage users to engage in desired behaviors in connection with the applications (http://en.wikipedia.org/wiki/Gamification). This definition is related to similar pre-existing concepts such as serious games, serious gaming, playful interaction, and game-based technologies (Deterding *et al*, 2011).

Mundane activities especially for a longer period of time are not appealing but by combining these activities with simple games we can create a more effective way to motivate people (Chrons and Sundekk, 2011). Turning useful activities into games is called gamification and it has found its way into many uses such as education.

Gamification is a quite recent concept, on the market as well as in research, but it has a big potential. It has been added to the Gartner Hype Cycle for 2011. Gartner Group predicts gamification will be a key trend that every CIO, IT planner and enterprise architect must be aware of as it relates to business (Gartner Group, 2011).

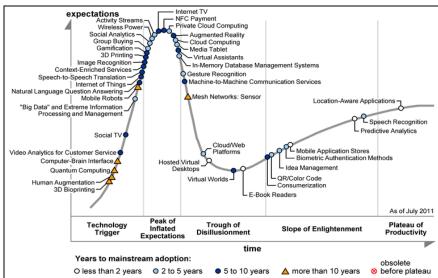


Figure 30. Gartner Hype Cycle for 2011

Gamification is recently successfully in websites in order to create loyalty, brand awareness and effective marketing engagement (Foursquare, Stack Overflow) (Daniels, 2010), but according to our observations it can successfully be used also in the educational environment.

There are several successful gamification examples like ZeroEmission from Nissan used for its ecological model Nissan Leaf. Kobo Reading Life is an application that tries to gamify reading, Nike ID is an e-commerce gamified application allowing users to design they own shoes and the most popular designs gather points. Various application of gamification can be found in the industry of health and wellness: Keas, FitBit, Lose It. Motivation and learning also offer examples like: Stick.com, MindSnacks, and EnglishAttack.

Gamification desires to combine intrinsic motivation with extrinsic one in order to raise motivation and engagement. Intrinsic motivations come from within, the user/actor decides whether to make an action or not, some examples are: altruism, competition, cooperation, sense of belonging, love or aggression. Extrinsic motivations, on the other hand, occur when something or someone determines the user to make an action for example: classifications, levels, points, badges, awards, missions (Viola, 2011).

In Figure 2. we can see which intrinsic motivation can be generated through existing game mechanics.

	AESTHETICS					
	Reward	Status	Achievement	Self Expression	Competition	Altruism
Points						
Levels						
Challenges						
Virtual Goods						
Leaderboards					0	
Gifting & Charity						

Figure 31. The relation between game mechanics and aesthetics [Bunchball.com]

When trying to gamify an application there are some key components that need to be taken into consideration and that build up a coherent overview of the entire functionality (utility) of an application/website. Game mechanics and features are comprised in the game design in order to create gameplay (http://gamification.org). Game mechanics are a set of rules and feedback loops that create the gameplay. They represent the fundamentals of any gamified context. Each game mechanic is characterized by three attributes:

- Game mechanics type: Progression, Feedback, Behavioral
- Benefits: engagement, loyalty, time spent, influence, fun, SEO, UGC, Virality
- Personality types: explorers, achievers, socializers and killers.

6. How to gamify an e-learning application?

In the following section we try to exemplify how gamification can be applied in the context of an e-learning course. E-learning courses are usually linear courses. This kind of content structure can allow us to easily gamify the content. The basic idea is to uncover content progressively, put more

focus on exercises while offering the theoretical means for them to be solved and offer points for correctly solving them.

When designing the gamification of the course we try to answer the following questions: why do we gamify a service, what are the goals and what are the benefits expected. It is important to take into consideration the subject we are addressing. In game psychology there can be identified several personality types. These types are: achievers, explorers, socializers and killers (Bartle, 2004).

We will start on discussing an e-course example studied by Bamber (Henrich and Morgenroth, 2007), a course in information retrieval. We do not have access to the contents of such a course but by studying the example we try to come with some propositions for system improvement.

The purpose of any e-course application is to share knowledge to the users and in most cases offer means of evaluation and feedback. The main goal is to motivate students to learn the available information as best as possible in order for them to perform well during evaluation and advance through the course with success.

By using this application we wish to motivate users to study, rise engagement of students with the systems. By spending more time with the system we expect that the users get better results, advance through the course faster and perform better on final tests.

In (Henrich and Morgenroth, 2007), the authors present an Information Retrieval e-learning course divided into two different modules IR1 and IR2 that have been used for five years for students enrolled in distance learning and which present different characteristics. The didactic concept is presenting the course content two 4 different types of users:

- Presence learning supported by e-learning materials
- Distance learning with physical on-site presence for discussion
- Distance learning with supervision
- Distance learning without supervision

The informative material varies from the first category to the last one. The information presented regardless of each form should be complete, but the fact that for example the first group can benefit from constant supervision and assistance the e-learning system should compensate this for the last group and create support mechanisms for students with questions. The first group benefits from teaching and exercises during the course but also from materials provided by the e-learning application like scripts, self assigned tests and mid-terms. While the first two groups have contact with the teacher on a regular basis, the last two use forums, emails or chat.

In addition to the information already included in the course we propose the following gamification elements:

- Any student needs an account where they can edit their personal profile, in game
 mechanics known as *avatar* and customize it according to their preferences. They select
 preferences and courses followed and passed, thus focusing on positive the positive
 results). They can belong to groups and have access to an activity feed where
 notifications, news and updates are received.
- The course is divided into main *chapters* or sections. By applying the *cascading information principle*, we divide the course into smallest bits of coherent content. The content should be synthetic, but should offer link to more detailed information (links, graphics etc.). Each piece of content should be followed by exercises and an evaluation step. By doing the exercises at the end of each section the student accumulates *points*. At the end of each chapter the student advances a *level*, this being a valuable *achievement*. This has a direct effect on his *status*. A relative positioning between his peer can be presented in a *leaderboard* but also *top scores*.

- They must be constantly offered feedback and be informed of their progression within the course, for this it is important to use progression bars.
- Offer the ability to create periodical physical or virtual *appointments* or curfews and deadlines in order to motivate them to return periodically to the application.
- The system should be made as *social* as possible (Farzan and Brusilovsky, 2005) in order to simulate the familiar environment of a classroom and a classroom community. This is important for achievers that need recognition from peer but also to motivate students through peer pressure or comparison with other students.
- For accomplishing difficult tasks or exercises the students receive special bonuses.
- The system should compensate students not only for their academic achievements but also for proper behavior and social engagement like helping peers, commenting, and adding value to the application etc. by offering *badges*.
- Offer the possibility to convert points or badges into *virtual goods* or even get discounts for the tuition fees. Students will engage more with the application and will be motivated to earn more points in order to benefit from these advantages.
- While advancing within the course the student should be informed of the next step so as to know what to expect. *Anticipation* is a strong motivator which can get users excited and engage for a longer period of time and maintain the *flow* of learning.

7. Conclusions

Gamification does not imply creating a game. It means makes education more fun and engaging, without undermining its credibility. Gamification helps students gain motivation towards studying, and because of the positive feedback they get pushed forwards and become more interested and stimulated to learn. Gamification can constitute a powerful boost to determine them to study/read more.

According to (http://gamification.org/wiki/Encyclopedia) engagement is the important metric for success in gamification. There are several metrics to analyze engagement which due to technological advancement in analytics can be included into such a web application. These metrics are: page views per visitor, time spent on site, total time per user, frequency of visit, participation and conversions.

In our future work we wish to implement the gamification elements proposed on an e-learning course and follow the above mentioned metrics. It is however intuitive that gamification can improve motivation and engagement of users with such a system.

By gamifying an e-course we do not wish to replace the intrinsic motivation of student, which is stinger and more long term, with the extrinsic one, but offer a combination of the two for a better performance. Gamification offers the proper tools to generate positive change in behavior as according to Fogg. We can use this mean to create more effective and engaging e-learning applications.

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