

GAMIFICATION AND GAMEFUL APPROACHES IN EDUCATION, BUSINESS, AND IT

Andrei Damsa; psychologist; University of Pécs; damsaandrei@gmail.com

Richard Fromann; CEO; NetCoGame GamefulLiving
Research Center Nonprofit Ltd.; richard.fromann@gmail.com

Keywords: Gamification, Education, Game Elements, Game Mechanics, Informatics, Coding, Gamification in Education, Gamification in Business

1. ABSTRACT

Gamification (also known as motivational design) is a powerfully uprising new trend in the field of motivation, usability and learning. It can be a strengthening tool in teaching, simulations, engagement building or activity enhancement. This paper presents an overview on the basic concept of gamification and gamified systems within the field of informatics and coding, with the goal of describing the usage of game elements in the aforementioned environments. Taking into consideration the lack of professionals in the field of IT, the presented methodologies will mainly focus on the possible educational solutions for helping the development of coders and engineers in the domain of informatics. Besides these territories, the paper also introduces other mainstream areas related to gamification, such as business, social awareness, MOOC, PR or marketing.

2. WHAT IS GAMIFICATION?

The definition of gamification (also known as motivational design) goes by many forms, one of the shortest, is the following:

“Gamification is the application of game-design elements and game principles in non-game context [1]”

In other words, gamification is the use of principles from games in a real-life (non-gaming) situation. This motivational design aims to trigger and maintain a higher level of motivation towards a goal and hopefully changing the behaviour for the better. Considering the field of gamification, we can distinguish between game mechanics, game dynamics, game elements, aesthetics, game thinking, game design, and many other, similar terminologies [2].

Game elements, game mechanics and game-design somewhat was used before gamification, as a term appeared, although the word “gamification” was first used by Nick Pelling in 2002 [3], even though it didn’t gain popularity until 2010. The concept was known beforehand, Charles Coonradt wrote a book in 1984 with the title “The Game of Work”, but no one really bothered to name the concept of using game-design and game elements in other than game environment. In 2010 “gamification” began to go viral, because of the increased frequency of social/reward aspects of games incorporated into softwares. The first gamification – specific conference was organised in 2011, taking place in San Francisco. Gamification was already present in many places: business, education, healthcare, IT, etc., and it began to appear in fields such as software application, PR (Public Relations), news, media, politics, communities and many others. The main reason, for why it was needed and worked so well is that, gamification employs game elements and game-design in a non-game context and helps to improve user engagement, organisational productivity, employee recruitment and evaluation; gamification creates a state of flow (an experience well known in positive psychology) and as a result the learning/working process is more joyful.

Gamification motivates the “player” to follow different paths, to participate in activities and solve problems; it helps to ease the use of systems and makes them more friendly, providing and “epic meaning” through the tasks. It can be a strengthening tool in human-computer interactions, simulations or mobile applications.

Gamification platforms began to appear, in 2007, when Bunchball (backed by Adobe Systems Incorporated) started to provide game mechanics as a service. In 2009 BigDoor from Seattle started to implement gamification technology to non-gaming websites, and Badgeville (launched in 2010) provides gamification solu-

tions for sale representatives (integrated in www.salesforce.com).

The focus around the motivational design methodology is growing. *Coursera's* course in gamification is one of the most successful courses in the history of the website – *Kevin Werbach* a professor of University of Pennsylvania is the pioneer of the course.

2.1. Motivation within games – Why do we play?

Gamer's motivation is a preferred research topic among professionals studying videogames [4]. It is a complex and interlinked territory with no black-and-white typologies, but one can distinguish between the basic characteristics of players related to different motivational goals and drives. A classical model in the field, suggested by Bartle[5], describes four different types of players: **Socializers**, **Explorers**, **Achievers**, and **Killers**.

1. **Socializer:** The one who is playing because of the community. This kind of player likes to be in groups, hangs out with his/her friends in the virtual world or creates new friends and relations with the help of games.
2. **Explorer:** The explorer is the one who seeks information and hidden meanings within the game. She/He is the one who explores all the maps, reads all the lore and knows every detail about the game's virtual world and background story. This type of player is often wondering around the virtual realm looking for new adventures.
3. **Achiever:** The achiever is the one who wants to be the first in every aspect of the game. She/He wants to gather all the points, be on the top of the leaderboard and wants to be the one who owns the best possible gear within the game.
4. **Killer:** At first sight, the name “killer” might appear in a dark shade, but as we understand the group mechanics in online games, this type of player is just as important as the others. The killer's motivation lies in competition and winning. She/He doesn't want to be the first by gathering points or finishing quests. The main drive for the “killer” is to win over others and be in competition with the other players from the game.

Gamification as a methodology should take into consideration the psychological aspects of motivation behind gaming and engagement to create personalized systems. As studies revealed [6], gamification can also be an inhibitor, if the system is not constructed with precision and in a goal-oriented way.

3. MAIN AREAS OF GAMIFICATION

Gamification, as a methodology can be used in many areas. In the following section we will present two of the main domains where the motivational design technique can provide a highly useful aid.

3.1. Education

Education is a highlighted area for gamification. Sadly, many educational methodologies are outdated and less desirable for today's students. Therefore, the professionals in this territory are appealing to new solutions regarding motivation and teaching style [7].

Many initiatives exist that use game thinking in order to solve challenges. University of Michigan designed a game in which players compete to manipulate virtual proteins into more efficient structures. Fuelled by crowdsourcing, *Foldit* (the game can be accessed from <https://www.fold.it/portal/>) harvests the time and energy of 57,000 engaged players. As a result, “players gave useful answers that matched or outperformed algorithmically computed solutions” [8]. The game calculates high scores, builds up leaderboards, and provide an opportunity to play in groups, share successful solutions, and post achievement on social media networks.

Another huge success, based on a similar approach is *Ribbon Hero 2*. A Microsoft developed game, which is an add-on to their Office productivity suite to help train people to use the software effectively. The game teaches the user how to interact with Microsoft Office 2007 and 2010 by offering challenges and quests to complete. These features are separated in four major sections: working with text, page design and layout, getting artistic, and quick points. The company described this program as one of the most popular projects that Office Labs division ever released.

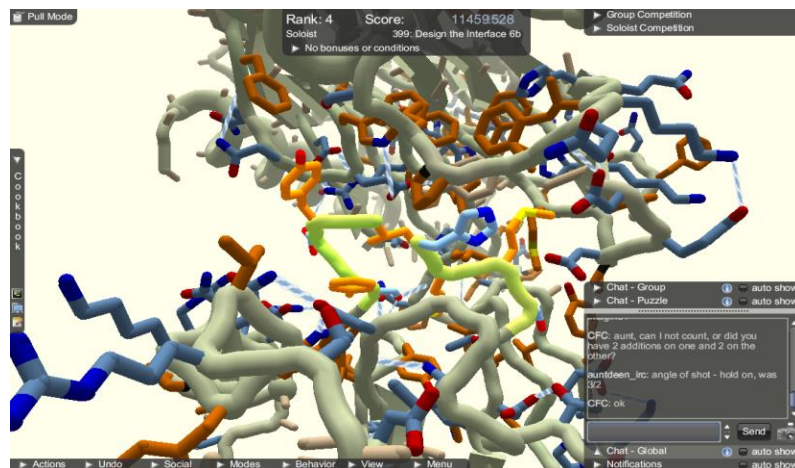


Figure 1.
Screenshot from "Foldit"

The New York City Department of Education, with help from the MacArthur Foundation and the Bill and Melinda Gates Foundation has set up a school named *Quest to Learn* (<http://www.q2l.org/>). This facility is centred around game-based interactive and multi-disciplinary learning, with the intent to make education more engaging and relevant to kids. The school's curriculum is created and updated by game designers, educators, parents, and other professionals related to educational methods. There are other initiatives with the scope of creating a gamely experience around a school material, but this project managed to create a whole system based on this principle.

Similar to this approach, the storyline method is a pedagogical strategy originated in Scotland around 1970 [9]. It was pioneered by the staff of the *Inservice Department of the Jordanhill College of Education in Glasgow*, now the *University of Strathclyde*. It is an active learning tool, mainly used in primary schools (Scotland, the United States, Scandinavia, Hungary, and the Netherlands), but also functional in the higher educational levels, such as colleges or universities.

The system can be adapted for use in adult education as well, taking part of the Life Long Learning (LLL) program. The basic principle behind the methodology is to create a narrative storyline along the teaching process with rules taken from storytelling and writing. A storyline structured class contains a trigger question, episodes, different scenes, characters (for each participants), challenges, and a final (closing – celebration) event. Also, traditional status of the teacher changes into a mediator-like role, the teaching method takes into consideration the

previous knowledge and logical thinking of the students.

Another interesting project started in the August of 2009, when Gbanga launched the educational location-based game Gbanga Zoon in cooperation with Zurich Zoo (see <https://gbanga.com/gameography/gbanga-zoon/> for more details). The game asked the participants to actively save endangered animals in a virtual environment based on the player's current geo-location. The application featured elements, such as trading goods, exploring maps and collecting items. As stated by previous researchers, the blended environments can trigger real-life behaviour in the benefit of the user, which is used not only in the entertainment area, but also, in healthcare and social responsibility.

3.1.1. Gamified evaluation systems

Gamified systems play a very important role in terms of feedback and evaluation processes. As it has already been outlined by Lee Sheldon [10], the simplest point and level systems can have a very strong impact on participating students and teachers.

One of the big advantages of the point systems is that these structures focus on progression, accumulation and data collection. As long as the traditional mark-based assessment calculates averages (results collected over the years), the accumulation of gaining points provides an opportunity to experience development and progression by using visualization. In such an environment, after getting a bad grade, the student will not keep in mind the failure, but the fact that She/He still is getting closer to the next level.

As part of the training in the Psychology Institute of the University of Pécs, we managed to implement point systems in the cases of several courses. Experience demonstrated the results outlined by Sheldon, the feedback became more positive, and it presented more meaningful forms. As a result, students could monitor their own activities in a transparent manner and they could define the goals to be achieved (final marks). However, the points system can be motivating not only for students, as it gives a detailed and weighted continuous image about the students' activities during the semester to the teacher too, which could provide a basis of a personalized feedback. Accordingly, such a structure can serve the interests of both the students and the teachers through motivation, transparency, and playfulness.

Of course, gamified valuation methods do not refer only to the simple point systems. The points can give a very effective basis concerning feedbacks, but it is necessary to extend the system with such elements that are able to keep the feeling of progression in the longer term. Therefore, it is recommended to integrate for example levels, badges, or different tasks to be achieved ("quests") into the evaluation system. The points provide continuous feedback as they appear after every (scoring) activity. The levels will be activated only after reaching a certain amount of points, so this element represents a delayed or medium-term feedback. On the other hand, the certificates or badges support a particular event. For example, if the student completes a specific task, or reach a certain level, the system can reward her/him with a special badge.

Using points, levels, or badges, a complex, yet transparent evaluation and feedback system can be built, which is based on developments and collections, while it forms and maintains the essential traits of motivation for learning.

3.1.2. *Gamified interfaces and systems in education*

A variety of methods and interfaces in gamification has been used for many years in international pedagogy, but also in Hungary there are teachers who can report on the introduction and use of gamification tools on their own experience. Below some practical examples can be seen about what kind of gamification systems and interfaces exist to support learning, which are now considered good practice.

1. ClassDojo – digital classroom

The ClassDojo is already a classic, well-proven digital class management system that gamified the teaching process. The ClassDojo involves both the students and the teachers, and the parent community into a unified system that provides opportunity to create different challenges, rewards, and real-time feedback. The students make avatars, and then they develop it with their own activity. Available at:

<https://www.classdojo.com/>

2. GoalBook

The GoalBook is an application that facilitates interactions between students with particular emphasis on teamwork. It gives opportunity to the teacher-parent-student communication, and the monitoring of the development of the student. The instructor may impose challenges for the student, and She/He can monitor the student's performance with the help of a profile surface. It facilitates the administration of data and it provides an interface for fast and efficient messaging.

<https://goalbookapp.com/>

3. Course-hero

The CourseHero is intended to facilitate the teacher-student interaction. Basically, the program describes an online portal that acts as a knowledge-sharing and communication interface. The site categorizes and arranges the charged materials that can be easily and systematically available. The program provides an opportunity to compile personalized learning "packages" and it rewards the progress with badges.

<https://www.coursehero.com/>

4. Classcraft

This half gamification, half-edutainment-based teaching method was invented by Shawn Young high school teacher in 2014. He wanted his lessons to be more interesting for his students. The online platform for educational purposes based on the elements and actions of the best known game (World of Warcraft) of the mass multi-player online role-playing games (MMORPG). In WOW everyone (all students) can choose a character (eg. a wizard, a warrior or a healer), in which the master of adventure is practically the teacher himself. The choice of roles and challenges for the story is also gamified, which means that traditional marks are replaced by the XP (experience points) system well-known from the online games.

<http://www.classcraft.com/>

3.2. Business

In the business area, motivational problems occur in a variety of situations. In many cases the employees need an extra trigger to perform better. The users demand a feedback system to be active on a website, and the customers choose based on uniqueness and social values, while the companies are reaching out for a new and effective system of recruitment, PR and marketing. In the following cases we will review some of the successful gamification projects within the aforementioned areas.

One of the well-known companies which used games and gamification to educate their employees is SAP. Besides gamification, the company also developed the Design Thinking methodology, which is one of the mainstream development tools in (and not only at) the IT sector. SAP's gamification projects involve goals like community building, knowledge sharing, and forum activity enhancement [11]. As one can see, even the most simple game elements, such as points and levels can provide a helpful feedback system with a positive effect on the desired behavioural changes [12].

In the gamification of website, one of the best practices can be found at Samsung's project, called Samsung Nation. The company wanted to build up an active community with the scope of helping each other by answering product and service related questions, generate content, watch videos and review products. They created an online platform, where users can get points and badges for different activities, can compete with each other and can track their progression.

Beside the private sector, the US military have also used gamification in their training and recruiting program. On their webpage (<https://www.americasarmy.com/>) one can virtually join the U.S. Army and get familiar with the army's mechanism. The first version of the game was released in 2002, and by 2008 the army managed to implement their knowledge into a recruiting and simulation game.

4. GAMIFICATION IN THE IT SECTOR

Well-known IT companies also started to look towards new solutions regarding engagement and motivation – without any doubts, gamification is one of them. SAP, Microsoft, IBM, Ericson, Samsung and many others use gamified systems.

Not only companies are likely to use gamification in IT, community forum www.stackoverflow.com is also rewarding member's behaviour and activi-

ty on the website. The registered users can contribute to the community by answering questions regarding to IT problems. In function of the question's rate, the user gets points, which will represent his/her reputation on the website. As studies show [2], creating statuses is a great way to motivate activity within a specific community.

There is a shortage of IT professionals, which makes education in this field an even more important issue. Fortunately, there are many platforms that foster learning in IT, from the youngest to the professionals. Gamification can be a highly powerful aid to the teaching of coding from multiple points of view. First of all, it is promoting active learning, which is very important in the process of acquiring a language in informatics.

CodeCombat (<https://codecombat.com/>) is one of the most game-like gamified system one can find based on teaching coding languages and principles for (and not only) children and teenagers. The game's atmosphere is quite similar to the famous Dungeons & Dragons world. The user can pick a character and have to fight its way through different dungeons and realms. The character's movement, attacks, spells and other skills can be controlled by typing commands into a syntax window. To accomplish the challenges, the player needs to learn the basics and the logic of the chosen language.

A not so game-like, but widely used website for learning how to code is Codecademy (<https://www.codecademy.com/>). They are providing challenges for the user, this way the "player" can learn through the process of active learning. Codecademy also uses badges and completion bars to help the user visualize the progression within a specific course or material. With a database of 25 million registered users, the initiative of providing an interactive and free leaning tool for everyone, proved to be a powerful idea.

Similar to Codecademy, Khan Academy is another gamified learning platform. With the focus not only on coding, but other territories too (biology, algebra, arts, etc.), this web-based solutions can provide free and game-based education for everyone. Khan academy also uses badges and progression bars for monitoring the development in learning, but also implements an avatar system, which represents the player. In function of the learning process, this avatar can be customized and reflects the acquired knowledge.

5. GAMIFICATION, AS WE KNOW IT

As one can see, gamification is a multi-disciplinary tool, which can be used in multiple situations. IT is one of them, focusing on the teaching and development of lacking professionals. One of the key moments of gamification, and game-based learning was when researchers [13],[14] observed that playing and learning is basically acquires the same mechanisms, but somehow, the standard educational systems managed to take the fun out of learning. To be more specific on the afformentioned gamified systems, an example comparioson table can provide information on the classification based on complexity or simplicity (Table 1). By simple systems we define structures containing basic game elements, like points, levels, or leaderboards. A compelx system is equipped with more diverse game mechanics and dynamics, which are based on storylines, avatars, or group activities.

Simple Gamified Systems	Complex Gamified Systems
Codecademy	Foldit
Khan Academy	Classcraft
Duolingo	CodeCombat

Table 1.
Example of comparison between simple and complex gamified systems.

Gamification tries to create a motivating, engaging and emotionally positive context for learning, and other processes which are in lack of intrinsic drives. This can be achieved in several types of areas, by using different levels of complexity.

6. REFERENCES

[1] Huotari, K., & Hamari, J., Defining Gamification – A Service Marketing Perspective. *Proceedings of the 16th International Academic Mind-Trek Conference 2012, Tampere, Finland, October 3–5, 2012*

[2] Fromann, R., Basics of a gamification based motivational structure. *Workshop on Application of Robotics for Enhanced Security*. Budapest, Hungary, June 13-14, 2014

[3] Marczewski, A., “Forward”. *Gamification: A Simple Introduction (1st ed.)*. Retrieved on 2015 12. 20., 2012

[4] O. Beza, “Gamification – How games can level up our everyday life?” Amsterdam, VU University, 2011

[5] Bartle, R., *Designing Virtual Worlds*. New Riders Publishing, 2003

[6] Hamari, J., Koivisto, J., Sarsa, H., “Does Gamification Work? – A Literature Review of Empirical Studies on Gamification”. *47th Hawaii International Conference on System Sciences*, Hawaii, USA, January 6-9, 2014

[7] Ken R., & Lou A., *Creative Schools: The Grassroots Revolution That’s Transforming Education*. Viking, 2015

[8] Markoff, J., *In a Video Game, Tackling the Complexities of Protein Folding*. The New York Times. Retrieved on 2015 12. 22., 2010

[9] Mitchell-Barrett, R., An analysis of the Storyline Method in primary school; it’s theoretical underpinning and its impact on pupil’s intrinsic motivation. *Durham Theses*, Durham University, 2010

[10] Sheldon, Lee. 2012. *The Multiplayer Classroom: Designing Coursework as a Game*. Boston, Course Technology PTR

[11] Lusher, C., *Case Study: Gamification at SAP Community Network*. OVUM, 2013

[12] Damsa, A., Damsa, D., Gamification implementation Model – An approach of linking psychology and game thinking. *Workshop on Application of Robotics for Enhanced Security*. Budapest, Hungary, June 13-14, 2014

[13] Lee J. J., Hammer, J., Gamification in Education: What, How, Why Bother?. *Academic Exchange Quarterly*. 15, 2011

[14] Gee, J. P., Learning by design: Games as learning machines. *Interactive Educational Multimedia*. 8, pp. 15-23, 2004