Gamification on the edge of educational sciences and pedagogical methodologies

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Abstract

The number of publications and best practices in the field of gamification are explosively growing, however, only a small percentage is linked to pedagogical methodologies. It is a well-known fact, that games are part of educational techniques since prehistorical times. In this paper we aim to explore the role of gamification in pedagogical methodologies, focusing on environmental education.
Keywords: environmental education, gamification

1. 1. A new point of view?

Many of the well-known scholars and researchers are publishing papers on how game-based worldview have evolved, and how games are getting a more powerful role in our society. Richárd Fromann introduced the expression of „Gameful Living", based on the fact that games, and game-like behavior are naturally integrated into human nature (Fromann, 2017).Damsa (Damsa&Damsa, 2014) created a model to link game research and gamified solution for a better understanding of the field.

The well-known publication of Jane McGonigal states that every passed minute what is spent on games without creating new values can be considered as a profit-loss (McGonigal, 2011). According to her, during playtime the player will start to feel free, to believe in himself, and identify with the epic (world-saving) quests. In one hand the player is developing his creative skills, on the other, he is acquiring a problem-solving attitude, which can be used in real-life problems (for example in environmental issues). We need to take only one step from this thinking to admit – gamification is a powerful tool to use in the field of environmental education.

One example of game-like concepts could be the statues on public spaces. In the last decades new statues in urban spaces started to look more game- and playful, some of them representing characters and scenes from tales (boys from „Pál utcai fiúk", „Bagaméri" the ice-cream seller, inspector Columbo; Bp. Práter street; Kisújszállás; Bp. Falk Miksa street).

The evangelist of gamification tries to harvest the potential underlying game mechanisms. The academic definition of gamification is constantly expanding (Németh, 2015), but most of the scholars agree with the principle derived from Nick Pelling. Pelling states that the goal of gamification is to integrate and use the elements, mechanics and dynamics of games (mostly video games) in non-gaming environment (Pelling, N. (2011).

The field of gamification is new enough to create different opinions. Those who are against the idea are questioning the scientific value of game based development. Those who are defending gamification are going further and describes this field not only as a methodology or tool, but as a new approach and point of view, which is required by a new informational era. In this era games are helping society to break through boundaries and think outside of the box (Fromann, 2018).

The hype cycle(often cited in academic publications) refers to the life stages of emerging new technological fields. In the first cycle the new paradigm gets a huge amount of attention, which is followed by a strong decrease, and after that a below-optimal state. Before sinking into oblivion, the paradigm occupies its deserved place within other technologies. As a new trend, gamification was also part of the hype cycle in 2015, now it starts to take its place as an established methodology.

Gamification-related publications are mostly appearing in the field of marketing and business management. This is understandable because gamification is based on a psychologically powerful and marketable trend (Rab, 2012; Gartner, 2015; Zichermann & Linder, 2013). In our daily life we are flooded with bonus coupons from supermarkets and petrol stations, frequent flyer programs from traveling companies, and other game-like advertisement campaigns. One of the best practices is the program developed by NIKE called NIKE+. The user can follow his achievement and goals related to running by using a gamified application.

2. MC Donald'smonopoly

Gamification, as a concept made its appearance in 2002, when Nick Pelling, a well-known video game designer decided to use his skills in non-gaming business environment. The difference between games and gamified solutions can be found within the setting of the goals. In the case of video games, the goal is mostly to generate profit for the developer, while gamified systems usually operate with different settings. Call of Duty and America's Army may seem

similar, but one is for commercial use, and the other was created by the American army to promote military carrier paths. America's Army hit more than 9 million downloads, and it was the most successful recruiting method in the history of the US army (Zichermann & Linder, 2013). These games are often labeled as serious games, referring to the aspects of simulation (Zichermann & Cunningham, 2011).

3. The chicken and theegg

While gamification was a brand new phenomena in the mindsets of marketing and human resource professionals, educators have been applying it for a long time. Teachers are using games and songs to engage children and young people since the first examples of school-like institutions. In our modern society games seems to overlap childhood and appear among adults too (for example in the case of the video game industry).

So, what was first? Learning or playing? We believe the two are somehow similar. As Pukánszky (Pukánszky & Németh, 1996) describes, in the prehistoric times children created toys in the form of adult weapons and tools.

The pedagogical use of games is not a new invention. At younger age it is a natural part of learning, and ultimately many of the table-top games are also created with pedagogical purposes (for example: Activity, Barchoba, or „Gazdálkodj okosan"). Szászné Eszlényi Judit (2004) highlights those games which are used in the case of older children (referring to creativity, emotional induction, motion, drawing, memory, association, etc.). She also refers to the storyline method, which is a good example in environmental education.

According to the book of Pukánszky Béla – Németh Tamás („Neveléstörténet", Pukánszky & Németh, 1996), in every single era there were individuals who looked at games as powerful learning tools (one exception: there are no citations from the middle ages). We can define three major traits (independent of historical events or eras), which repeat in the context of games: the first one is

- motivation (Marcus Fabius Quantilianus (when) Decroly jeux educatifs,

- learning by doing, (Petersen, Alexander Sutherlan Neill, Kerschensteiner 1908[„the so called book-school should be transformed to work-school, which is based on children's games"]Percy Nunn, 1920, Rosa és Carolina Agazzi, Nemesné Müller Márta

- preparation for adulthood (Karl Groos, 1899, Stanley Hall, Eduard Claparede, Paul Bergemann)

4. Games and Gamification

The definition of gamification is even harder because of the differentiated state of games. We cannot use one determination to categorize such game-related concepts as sports, music, video games, riddles, or gambling. In the Hungarian language there is another difficulty arising from the poor linguistic description of games (same word for a wide variety of activities), while in English there are similar expressions for game-related concepts (game, toy, play, etc.). One of the well-known definition of games is written by Johan Huizinga, in his book„Homo Ludens". The author describes games as a free and voluntary activity, which is happening in a previously specified time and space, by following strict rules. The usual goal of games is to acquire positive emotions and lower tension levels, while creating an alternate reality for the player.

We believe that games (not only video games, but riddles, table-top games, sports, and other game-like activities) should have three major attributes: volunteering, motivation, and self-existence. This is view is reinforced by the studies of Zoltán Aczél (Aczél, 2015), define game-based behavior as a key competency, among other features like goals, symbolism, and idea. The author states that games do not have the goal to create values outside of an alternate reality, even if that happens. If there is no particular experience during playing (only learning), we cannot define the activity as a game. From another perspective: solving a puzzle, collecting stamps, or going for a run in the park can be considered a game, but playing poker for money, running on the Olympics, or playing chess in a championship are another concept.

5. Game elements and game mechanisms

The gamification of in-class and other pedagogical processes does not mean that the given activity would be considered as a whole game. Rather it would mean that the teacher engages the students in the educational process with game elements and mechanisms. The professionals divide the tools of gamification into two categories – game elements and game mechanisms -, however, the two categories are not filled equally. Often an expression is considered an element, while sometimes it becomes a mechanism. In our mind-set: game mechanisms are process theories (rules and principals) and the game elements are tools for the same process. We distinguish the game elements as game process serving and process supporting, also known as motivating elements.

Game mechanisms – process theories – in this sense are the following:

• The game is self-serving. The publications regarding this reach back to Mihaly Csikszentmihalyi's (Csikszentmihalyi 1997) flow theory. He regarded this activity as self-serving where we do a task for the sake of the task, fully immersed without external reward. The activity

is without wondering, by closing off the outside world and losing one's sense of time – well, can a student ever feel this way in school? This is the aim of gamification.

- The game is voluntary. From the previous statement, it naturally derives: the gamers cannot be demanded to enjoy themselves. It is equally true for educational and extracurricular games. Then one of the game's unavoidable attributes is volunteering which requires motivation. (Could this opposition be relieved by the fact that school is mandatory?)

- The game offers success. If there are too many or too difficult tasks the gamer will lose motivation and if they are too simple, it will end up dull.

- The game is relieving. Csikszentmihalyi also mentions closing off the outside world, „the lack of anxiety" as the attributes of flow. His modern followers describe filter negative stress. The attributes of computer and video games that there are only positive and rewarding mechanisms within them. Recognising these benefits many teachers – including the author of this article – apply this as grading method where there is no failing mark, only plus points. Those who perform better get more, those who do worse get less plus points.

- The game has guaranteed/provided time. The time frames are pre-set and in many cases, they must happen in previously arranged times (e.g. Multiple role games, battles, football games).

- The game is transparent. The results can be seen ahead of time, the rules are always obvious and they do not change in progress. The gamer can continuously see how they are doing.

- The game is a social space. Online communities arrange around games where the gamers communicate, can get ranked, exchange and help each other with advice and resources. In many games co-operation with other members is the basic key of success.

The gamified processes can reach their goal by achieving the aforementioned game mechanisms. And the tools of these achievements are the game elements.

The elements representing the process of the game are the following:

- Epic story – this is the main storyline, character or avatar that proceeds on their own path towards their aim. The game has to have an attractive, well-understandable and reachable final aim. („Free the princess"). The field uses the expression of storyline, however, they rather understand it as the learning process (such as the knowledge elements) organised around one tale.

- Visualisation – during its lifeline the character walks through a path that can be followed-up and which will be the of transparency.

- Atomization, or modularization (where the task is always small and never consists of too difficult or simple elements. All the solution of task particles provides individual success experiences. This requires a point system and to the final, summarised points the results can be

added (higher level or even school grades). The atomization of the tasks can mean that the individual testing of the acquirable knowledge in educational settings. It is easy to imagine that it can be used in the case of definitions, dates, topography but even with poem-analysis or country introduction bullet points. In all these examples knowledge atomization has previously been tested.

- Continuous and immediate feedback

- Quest – these are the side-lines, an action which will be rewarded but the character or avatar is not derived from its epic story. The quest provides added bonus points. Bonus can be given to the individual for the community's achieved and shared good result of which pedagogical result does not require further explanation (although we can mention that in the world of workforce such as trades teams this motivational, inspirational element also exist).

- Points, rewards (points, badges, leader boards; the literature often uses them as PBL)

- Levels - where the accumulated number of points take the gamer to a higher quality level. Its aim is to provide that point collection does not become inadequate, therefore, dull. In many cases, this quality jump is not number but visual-based such as a badge, trophy or other symbols.

- Leader boards (display of success)

6. Theory and practice

We present three examples from the aforementioned theory.

1.   In 1998, there were different coloured, funny cows on the streets of Zurich. On the same shapes, they painted different funny, surreal shapes those who deserved them. The idea was adopted by many other cities, in 2006 the cows arrived in Budapest. (In reality, the innovation arrived not the original statues, because they were made and auctioned locally.) The activity surrounding the playful statues – where all the civilians could apply to paint then the statues were auctioned as performance piece. This still was not interactive and the object sent a one-sided message. Therefore, we could call it playful, however, definitely not gamified.

In 2015, one level higher/up, a truly gamified statue group appeared in London which activated the civilians. In this performance, there were 120 performers dressed in funny costumes as lost sheep. One of these performers, Shaun was the character of the silly sheep. They (him, in 120 copies) were standing in an 8 km long path on the streets of London. Their whereabouts could be found by the help of an app which led and motivated everyone to move and find the next one, "hunt down" the whole herd. Whole families followed. The download of the app cost a small amount of charitable donation. This activity made the whole family move, provided

charitable profit and physical exercise. The city walks as undervalued tools of the environmental education. Their popularity is on the rise (Rigoczki 2015,2016) and they can be gamified really well (Rigoczki 2015, 2016).

2.   Parts of the environmental education are biological, internal, personal (mental-hygiene) environments as well (Magyar, Sandor, Gaal, Mogyorosi, 2008). Our following example offers an international practice. In 2013, a Utah elementary school created a game for the fruit and vegetable intake of children where they experimented with 251 students. They have gathered the children to whom they introduced FIT GAME. According to the story line, a hero is trying with all their might to stop the intergalactic evil, but they require some help. The support points can be collected if the children will eat fruit or vegetables. More precisely, if they eat more than they have in the previous ten days, they will receive the points. Firstly, the groups had to be accredited and they had to race to be the supporters, as other schools were in the competition to become the support team of the hero. These "other schools" were fictional, therefore with difficulty, they always won the competition. Every day they read the previous day's results in one minute.

The competition lasted for seven days when they have received a funny badge for the victory, but what is more, they became the support team of the hero. In the following 22 days, before lunch the teachers – if the children have reached the set amount – read a chapter of the story in three minutes. This always began that the hero congratulated and thanked their previous achievements. Then the hero with the strength of their support team reached victories over the evil power. If the children did not reach the given amount, then instead of the next chapter they received a motivating and support requesting letter in the envelope of the teacher in which they explained that there is great danger ahead and they need their help. According to the results, the children ate 38.7% more fruit and 33.3% vegetables.

3.   The love of collecting is in the genetic programme of almost all humans. Its subject can be anything there is only one condition it needs to bring joy to the collector and to involve them (referencing the above-mentioned flow-attributes) in order to create personal connection to the object. This is not far from the gaming attitude (Bernstein 2011; Harvey 2007; Ritchie 2013). The professionals of the science of marketing know this very well. In Hungary, the most successful (the most authentic from the perspective of the environmental education) collecting mission is the Spaar Company's at least quarterly offered sticker-collecting loyalty promotion. The aim is to collect stickers into a colourful album that the parents and grandparents can get after a certain amount of shopping (they can be bought separately as well). In the album, Garfield himself presents, for example, one creature's habitat alongside interesting educational sentences. According to Spaar's release, hundreds of thousands albums and millions of stickers about the

ocean reached the collectors and even though the results of the research of their success are not public, there were many families collecting the stickers, on the internet exchange-clubs were organised and on the flea-markets separate sticker stalls were installed. This promotion definitely increased the customers' loyalty and connection. The collecting game fits into the area of gamification and the expectations of environmental education.

7. Gamification and education

So far, we have moved from gamification to gamified education. Now lets see how much pedagogical relevance it has got.

It is widely accepted, that pedagogy has both scientific and or profession-like meaning, "pedagogy is not only a science, but a kind of practice, that is connected to our everyday life". (M. Nádasi Mária; Ollé 2017). The first we call pedagogy the second is often called pedagogicum (practice-teach).

Kapp, Blair and Mesh (2014) differentiates two branches of gamified learning: the gamification of the content, or gamifying the curriculum (with a storyline for instance), and structural gamification, that assigns game elements and game mechanism to the curriculum. To see how this works, lets check out two examples from the realms of the practice-teach. Both of these examples gamify classical pedagogical content.

The first one is a well known educational practice, where the kids ask questions about a chapter of the book. If we make two teams, and the teams start asking each other questions while collecting points, the task becomes a game. New media tools like an online test creating platform (even as e-learning) or quiz making app can help make this process more appealing.

Our example for the second case is simple. Placing dots on an outline map is usually not the favorite task of students. The Seterra topographical game is still popular. Its pretty simple, the participant gets a random name for a location that they have to pin on the map. After every guess, they see their score in percentage and they create a ranking based on time and precision. On a digital board of smart board this is learning and playing at the same time. The whole class is excited (and of course wants to help), and the player is a hero.

So far we have seen a dozen of examples of gamification, that mostly connect to the pedagogicum. At the end of our article we can verbalize a question about the conclusion, how do we interpret this in a learning environment? To help us look for the answer, lets see two vital parts of pedagogical literature.

In the view of István Nahalka "The learning environment has become one of the main concept of pedagogy. The modern educational theories write about the student-environment relation as an interaction" (Nahalka 1998). In Benő Csapó's words, we find something similar: "only right interaction with our environment can help to learn efficiently. The forming of the learning environment has one the greatest impact on learning. If we follow this train of thought, we find "planning learning environment" as a direction for research and innovation" (Csapó, 2004, 32.o.)

The everyday life of kids is fast, colorful, challenging and playful. The classroom experience is the opposite of this. The difference between personal and work environment can cause a decrease in the efficiency of learning.

According to Zoltán Báthory "the essence of teaching is planning, organizing, regulating and rating or evaluating"(Báthory, 1987). If we accept this, when we speak about the gamification of the learning environment, we have to look past planning the activity, and start to put it in the context of learning and teaching. After planning and organizing, we do need to check the effectiveness of the activity.

References

Aczél Z. (2015): A játékosság mint kulcskompetencia. Taní-tani Online. goo.gl/WexpnW (2016. 03. 02.)

Bernstein M. R. (2011): Collecting: A Connection between Playing and Learning. In psychology today. goo.gl/6YSNKg (2017.01.20)

Báthory Z. (1987): Tanítás és tanulás. Tankönyvkiadó, Budapest

Csapó B. (2004): Tudás és iskola. Műszaki Kiadó, Budapest

Csíkszentmihályi M. (1997): Flow: Az áramlat; A tökéletes élmény pszichológiája. Akadémiai Kiadó, Budapest.

Damsa, A, Damsa, D. (2014). GamificationimplementationModel. An approach of linking psychology and game thinking. WorkshoponApplication of RoboticsforEnhancedSecurity, June 13-14, pp. 20-23, Budapest

Fromann R. (2017): Homo Ludens Társadalma Küszöbén. PhD értekezés. Témavezető Dr. habil Siklaki István, Eötvös Lóránd Tudományegyetem

Fromann, R. (2017): JátékosLét- a gamifikáció világa. Budapest, Typotex Kiadó

Harvey (2007): Children&Collecting – Part 2 – TSWBATs and How to Inflict Themon Your Kids. goo.gl/v9VTpf (2017.01.20.)

Huizinga, J. (1990): Homo ludens Kísérlet a kultúra játék-elemeinek meghatározására. Universum Kiadó, Szeged.

Kapp, K. M., Blair, L., és Mesh, R. (2014): The Gamification of Learning and Instruction Fieldbook. Ideasinto Practice. Wiley, San Francisco.

goo.gl/juQmFr (2017.01.20)

Magyar I., Sándor J., Gaál G., Mogyorósi Zs. (2008): Az iskolai nevelés alapjai. EKF, elektronikus dokumentum,

Eger.
goo.gl/4LVjKw (2017.01.20.)

McGonigal, J. (2011): Reality Is Broken: WhyGamesMakeUsBetter and HowTheyCanChangethe World. The Penguin Press, New York, US. 373. o

McGonigal, J. (2010): Gamingcanmake a betterworld. TED-előadás (videó).
goo.gl/adXt4B (2016. 01. 10.)

M. Nádasi M. (2006): Pedagogikum a hétköznapokban in A gyakorlati pedagógia néhány alapkérdése. sorozatszerkesztő: M. Nádasi Mária, Kiadó: Bölcsész Konzorcium

Németh Tamás (2015): English Knight: Gamifying the EFL Classroom (szakdolgozat). Pázmány Péter Katolikus Egyetem Bölcsészet- és Társadalomtudományi Kar, Budapest.

Nahalka I. (1998): 5. fejezet - A tanulás. In Didaktika, szerk. Falus I.. Nemzeti Tankönyvkiadó, Budapest

Ollé J. (2017): Az iskola világának narratívái: elmélet és gyakorlat a pedagógiában. Videoelőadás,
goo.gl/QLvqVN (2017.01.20.)

Pelling, N. (2011): The (Short) Prehistory of "Gamification"
https://nanodome.wordpress.com/2011/08/09/the-short-prehistory-of-gamification/
(az utolsó
megtekintés időpontja: 2016.01.31.)

Pukánszky B., Németh A. (1996): Neveléstörténet. Nemzeti Tankönyvkiadó, Budapest,

Rab Árpád (2012): A gamifikáció lehetőségei a nem üzleti célú felhasználások területén, különös tekintettel a közép- és felsőoktatásra. Oktatás-informatika. 1-2. sz.
 http://bit.ly/1CLNeLj (2016. 04. 12.)

Ritchie, M. (2013): Children and Collecting. In Child Research Net,
goo.gl/Q2vY6e (2017.01.20)

Rigóczki Cs. (2016): Városi környezeti nevelés a gamifikáció eszközrendszerét hasznosító tematikus sétautakkal. EDU 6. évfolyam 2. szám, 99-115. o.

Rigóczki Cs. (2015): Játékosított környezeti nevelés - tematikus városi sétaút. Környezeti nevelés: célok és eszközök konferencia,2015. nov. 23-24. Eger.
goo.gl/QcZxW5 (2017.01.20.)

Szászné E. J. (2004): Új módszerek a tanórai környezeti nevelésben in: Környezeti nevelés a középiskolában, szerk Schróth Ágnes, Treford Kiadó Budapest

Zichermann,G. és Linder, J. (2013): Gamification – Az üzleti játékok forradalmasítása. Z-Press Kiadó

Zichermann, G., Cunningham, C. (2011): Gamification by Design: Implementing Game Mechanics in Web and Mobile Apps. O'Reilly Media, Sebastopol (USA).

Gartner Says By 2015, More Than 50 Percent of Organizations That Manage Innovation Processes Will Gamify Those Processes. (2011)
goo.gl/HgSrYa (2016. 03. 02.)