GAMIFICATION IN EDUCATION

IGRIFIKACIJA U ODGOJU I OBRAZOVANJU

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Abstract

Today's world is bringing us a "specific weight", especially when we are talking about life and work of kids, students and young. Numerous changes in our environment and various influences of our living environment, such as a fast pace of development of information and communication technology reflect on the growth and development of children, students and youth. New generations of children are actually the generations of video games players who spend a lot of their time on video games. These generations are called *"millennial"* generations. They have been surrounded by fast everyday prosperity and development of information and communication technologies. Therefore, this is the way they communicate with themselves and their environment. According to the above, we emphasize the need to update and integrate a new curriculum which would take into consideration the needs of children, students and youth whose natural environment is, whether we want to admit it or not, the use of information-communication technologies. From that perspective, the gamification is the opportunity to increase the interest in children, students and youth, as well as to motivate them, connect and empower their communication and sharing. Gamification can enable the use of well thought off mechanisms which enable winning of badges, collecting points, going to the new levels or winning the prizes. In order to put it onto the next level, communication platforms such as sharing the tasks, exchange of ideas and expressing of the opinions are used. These type of activities may cause the children, students and youth to take a different view of the educational goals and achievements, as something proactive, dynamic and fun, and not only as dull and obligatory. When we say gamification, we don't always

Sažetak

Ubrzani ritam razvoja informacijsko komunikacijskih tehnologija odražavaju se na rast i razvoj djece, učenika i mladih. Danasšnje generacije su zapravo generacije igrača video igara koje puno vremena provode igrajući se. Takve generacije nazvane su "millennial" generacije. Spomenute generacije su od malena okružene napretkom i razvojem informacijsko komunikacijskim tehnologijama. U skladu s time komuniciraju sa sobom i s okolinom. Prema navedenom posebice je važno potreba aktualiziranja i integriranja novog kurikula koji bi uvažavao potrebe djece, učenika i mladih čije je prirodno okruženje informacijsko komunikacijskih tehnologija. Iz te perspektive igrifikacija (gamifikacija) je prilika za povećanje interesa djece, učenika i mladih, motivacije, povezivanja, te osnaživanja njihove komunikacije i dijeljenja. S igrifikacijom djeci, učenicima i mladima omogućuje se korištenje dobro osmišljenih mehanizama koji omogućuju osvajanje bedževa, sakupljanje bodova, prelazak razina ili osvajanje nagrada. Kako bi to bilo na jednoj značajnijoj razini koriste se nove komunikacijske platforme kao što su dijeljenje zadataka, razmjena ideja i izražavanje mišljenja. Zbog tih bi aktivnosti djeca, učenici i mladi gledali na odgojno obrazovne ciljeve i postignuća kao nešto proaktivno, dinamično i zabavno, a ne kao na nezanimljivo i obvezno. Igrifikacija, odnosno gamifikacija se ne odnosi strogo na stvaranju igre. Ona predstavlja upotrebu mehanizama, dizajna i elemenata igre u ne zabavnom okruženju, a sve to u svrhu promicanja motivacije, truda i lojalnosti. Igrifikacija u odgoju i obrazovanju od velikog je značaja u ostvarivanju ciljeva i zadaća u budućnosti cjelokupnog sustava odgoja i obrazovanja.

strictly think of the creation of the game. It is actually the use of mechanisms, design and elements in a non-fun environment, with the goal to promote the motivation, effort and loyalty. Gamification in education is important to achieve goals and missions in the future of the comprehensive educational system.

Gamification
What is gamification?

Today's world is bringing on various changes, especially when thinking of a life and work of children, students and youth. Numerous changes in our environment and various influences in our life are driving us to adapt to the new things, therefore influencing greatly the development of children, students and youth. New generations are surrounded by fast growth and development of technology which makes them capable of using personal computers. Laptop computers, tablets and mobile pohnes since the early age. Using this technology basically means that they are spending a lot of their time playing the games. Therefore, it is easy to conclude that for the younger generations, the natural surrounding is a frequent or even constant use of technology. From that perspective, gamification is a chance to increase the interest of children, students and youth, their motivation, connection and empowering their communication and sharing within educational system, in their natural environment.

If we have to define the gamification, we can do it via definitions from several authors: For example, Gabe Zichermann wrote his *Game-Based Marketing* in which he is defining the gamification as "process of using game thinking and mechanics to engage audiences and solve problems" /**1**/.
Amy Jo Kim wrote Community Building on the Web. She is a renowned designer of social games, and she defines gamification in the following way: "using game techniques to make activities more engaging and fun" /**2**/.

World leading consultinf firm The Gartner Group defines gamification like: "the broad trend of employing game mechanics to non-game environments such as innovation, marketing, training, employee performance, health and social change" /**3**/. Gartner claims that by the end of 2015 more than 50% of organizations with innovative processes will gamify these processes /**4**/.

Wikipedija offers another definition: "Gamification is the use of game play mechanics for non-game applications (also known as "funware"), particulary 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. Gamification works by making technology more engaging, and by encouraging desired behaviours, taking advantage of human's psychological predisposition to engage in gaming. The technique can encourage people to perform chores that they ordinarily consider boring, such as completing surveys, shopping, or reading websites" /**5**/.

Karl M. Kapp /**6**/ defined gamification taking into account various existing defining elements: "Gamification is using game-based mechanics, aesthetics and game thinking to engage people, motivate action, promote learning, and solve problems."

In order to better understand the definitions we will try to explain each defining element. We have concluded that the gamification is based on the mechanics and the easthetics of the game, gamer's thinking, ability of the game to include the people, motivate them for action, improve the learning and problem solving.

One of the first and the most important building elements of gamification is called *game foundation*. The purpose of this element is to motivate the students to get interested in the challenge defined by the rules, interactivity and feedback which are shown as emotional reactions within the quantitative result. Second element is the mechanics of the game which includes the levels, winning the pins, points and time factor. Esthetics is also an important element. It is very important in order to draw students' attention (real environment). Gamer's thinking is an element that can't be avoided in the gamification. It encompasses the guiding skills, acquired through passing the tasks or by accomplishing the missions. Furthermore, among the most important elements

in the gamification is the engagement. Its goal is to mark the intention to draw the people into the process which was created for them in the first place. People, i.e. the individuals are the element without which the gamification will not be possible. They are included in the process that was meant for them and by which they will be motivated for action. It is impossible not to mention the motivation with the activity goal as another very important element. It signifies the process which energizes and provides guidelines, purpose or the sense of the behaviour or a certain action. Improvement of the learning is the element necessary for the gamification so that the gamification can be realised. It is comprised of many elements. These elements are based on the elements of educational psychology and techniques used by the instructors and teacher over the years.
It is impossible to avoid the problem solving either. The nature of every competitive game, or problem solving game is to encourage the people to to their best in order to achieve the goal, i.e. to win.

Furthermore, in order to even better explain the term gamification, it is necessary to say what the gamification is NOT. Marks, points and awards are not part of the gamification or the gamification itself. Gamification encompasses the gamer's thinking, engagement, telling the story, visualisation of characters and situational problem solving. Part of gamification isn't trivialization of the learning, or the illusion on real learning? Gamification is the process of learning and teaching.
Gamed learning isn't easy, it can be stressful and challenging. Well designed games help students to apply the skils, knowledge and abilities, and to get a good feedback. It is important to emphasize that the learning games are not the same as the children games. Gamification is a serious approach to a faster experience of learning, teaching complex subjects and model based thinking. Except for this, gamification is nothing new. For example, military is using the various simulations in order to prepare soldiers for their missions /**7**/. Gamification is nothing new to the educational professionals. It is important to bear in mind that the educational professionals are uniquely qualified for both teaching and development. Gamification is not ideal for every teaching/learning situation, but if we accept gamification as a solution and implement it to every learning situation

it will soon become irrelevant and without impressions. Therefore, it is important to concentrate on the use of gamification for important learning results only. We must emphasize that the gamification is not easy to create. It is indeed very challenging and complex to create a game that is fun, educational and applicable in the classroom. Although we have mentiond the mechanics of the game, gamification is not only about mechanics. Mechanics of the game is the game's foundation, such as points, awards, badges, and they are not efficient unless the gamification is supported by a "story telling" – a background story with the learning goal. If one of the important gamification elements is omitted, the consequences and the results can be desastruous /**8**/.

Gamification can eneble children, students and youth to be educated by elaborate mechanisms of winning bedges, collecting points, passing the levels or winning the prizes which is very similar to the games they are playing when using modern technologies. In order to put it on the next level, new communication platforms are used, such as sharing of tastks, exchange of ideas, expressing opinions… These activities may prompt the students to view educational goals and achievements as something proactive, dynamic and fun, and not only dull and mandatory. Gamification is not only the game creation. It is also the use of mechanisms, design and gaming elements in a non-fun environment.

History of Gamification

History of Gamification in education

Kapp /**9**/ claims that there are several thousands of books, articles and reports on the impacts of video games and gamification. Many of these are based on the theoretical hypothesis, and majority. History of research of efficiency of gamification on learning and teaching will be devided into two parts. First part is relative to the research of analysis methods, and the second part is related to the researches based on the games' elements. These type of researches is what Kapp /**10**/ emphasises as important for gamification: "This examination of research is in no way exhaustive. It is presented to show that games and game elements can be effective in promoting learning and achieveing desired outcomes. Games and gamification are tools that, when applied

correctly, result in the desired learning outcomes" /**11**/.

In order to better understand researches mentioned, we will shortly explain their significance and their results. Research of analysis methods are the researches based on collecting the data, or results from other studies and researches relevant for the subject. *Elements of games* are researches which deal with individual researches of specific game elements and their interconnection and/or differences. Specific elements can be a structure of contests, gamer's perspective and similar.

One of the first relevant researches is Randel's research of analysis methods. During this research Rendel's team /**12**/ analysed 68 research studies. Researches have established that 56% of the results show that there were no difference between games and conventional instructions within the classroom materials. 36% of the results show that the ispitanici prefer the games while 5% prefer conventional lesson instructions. According to these data games are more interesting than conventional lesson instructions. Research of analysis methods was done and published in 1992. Randel's team was comparing the efficiency of the games and simulations with the effects of tradicional classroom teaching. Time frame of the research was 28 years, ending with 1991. Between 68 analysed researches, 38 didn't show any difference, and in 27 games were more favourable, and in three traditional classrooms teaching was more favoured than the games. Games found in these researches were not related to the work or simulations (military and similar). These were mathematic games, science, logic, linguistic games, as well the games related to physics and biology. Researches also showed that mathematic games were among the most popular ones and these were the games with the best results in raising one's success rate.

Second importan research is Wolfe's research of analysis methods. Authors analysed seven research studies and have established that the bases of each game is one of the approaches. Research analysis reached the following conclusion: "Every study examined indicated that the game-based approach produced significant knowledge-level increases over the conventional case-based teaching methods" /**13**/.

Furthermore, one of the most important researches is also Hay's examined 105 research studies and reached 4 conclusions. Conclusions are relevant to the instructive/classroom games which will be more efficient only if it is designed in such a way that it contains specific learning goals and if it is used only for its purpose. Second conclusion is also relevant to the instructive/classroom game for which we have a recommendation that it should be built in the evaluation programs. Third conclusion talks about instructive/classroom games which should be a support to the students helping them to understand the content better, the way to use the game, and to increase student's gaming experience. Fourth conclusion talks about how instructive/classroom designers could participate in game creation. These conclusions were published together with meta analysis in 2005.

Robert T. Hays examined the literature with the emphasis on empiric research /**14**/ in which there's a proved efficiency of games in the classroom. He actualy examined 274 researches related to design, usefulness and game evaluation. He eliminated 169 researches from the total number because these researches were founded solely on the subjective opinions, and not on the statistical data.

Next chronologically important research was Vogel's research by analysis. In this case the number of analyzed studies was 32. Research reached the conclusion that those subjects who used interactive simulations or games had better cognitive benefits in comparison to traditional learning methods. Visual level of image reality of computer program is totally irrelevant and had not had any influence on learning results. Research was published in 2006. In 2009, a new study showed up, so called *Ke's Qualitative Meta-Analysis*. Ke's method of analysis examined more than 65 research studies. Research hypotheses was confirmed with the conclusion that game learning efficiency was reached in 52% of all examined studies' subjects.

Fengfeng Ke is a researcher who based his research on digital learning with the emphasise on the computer assistance in collaborative and simulation learning for the classroom use. Research is conducted on the 89 research articles which contain empirical data in use and efficiency of computer-classroom games /**15**/.

He eliminated 167 out of 256 total because they did not contain empirical research. Although he had 89 left, not all of them were able to answer all of his questions.

Next study is *Sitzmann's Meta-Analysis*. This research shows that game confidence rose for 20%. Understanding? Rose for more than 11% in persons who were new in simulation games. Procedural knowledge was 14% higher in simulation gamers. Retaining of content was 9% higher in simulation games.

In 1997 United States Department of Defense (DoD) formed a department of so called wide strategies in order to develop the power of learning and information technologies with the aim to standardize and modernize the education. Strategy was named *Advanced Distributed Learning Initiative (ADL)*. Since than ADL has been cooperating with university and business groups with the goal to develop education software /**16**/.

They have conducted a study in which they were trying to get several questions answered: Are simulation games better learning material than the classical? Their research encompassed 55 research studies, including 39 published reports, 12 disertations and 4 unpublished papers. Report on which the study was based encompassed 65 samples and 6476 trainees. Trainees were 77% undergraduate students, 12% graduate students, 5% employees and 6% military personel. Average age was 23. There were 52% man and 48 % women. Majority of research on the benefits of meta analysis was in the fields of education (25%), psychology (25%), work (12%), educational technology (11%), medicine (9%), information science, math and ingeneering (6%), science (5%) i 7% other fields. (Sitzmann, 2011)

Results have shown that simulation games were efficient in learning in many disciplines and fields, and the research study was publised in 2010.

Gamification today!

Trend of gamification is rising. According to Karl M. Kapp /**17**/ there are no signs that the gamification is about to stop. Moreso, the span of use and success of gamifiction results is growing on almost all continents. Karl M. Kapp says: "Collegs and universities through audience response system, online simulations and interactive storytelling are quickly integrating game-thinking into to the curriculum. The influence of games and game elements is growing at a rapid pace." /**18**/

Researches /**19**/ show that the number of people playing games is getting higher. 26% of people playing games are people older than 50 and that number is getting higher constantly since 1999. Average todays player has been playing games since 12 years ago. Data show /**20**/ that only in America the computer and video games softwares selling records are growing bigger, 10.5 billion US dollars annualy. That means that more than 67% of homes are playing computer and/or video games. Approximately 62 million American internet users /**21**/ are playin an on line social network game at least once a month. There's an increase in buying and selling of masive multiplayer online games (MMORPG). Some of the best known are *World of Warcraft*, *RuneScape*, *Disney Toontown, Eve* /**22**/ which are sold annualy for 4 billion US dollars more than the previous year. Great Britain is spending million of dollars annualy on video games, and France is spending approximately 220 milion dollars only on MMORPG games. Japan is among the biggest users of video games. In Japan, 2.2 billion dolars are spent annualy on game devices and other devices used for playing the games. Estimated value of computer and video industry /**23**/ is around 105 bilion dollars. In accordance, it is estimated that video and computer game industry will continue to grow, as well as the gaming content and gamification. It is estimated that 50% of organizations will gamify /**24**/ their innovation processes until the next decade, and the demand for gamified services will grow for 1.6 billion dollars /**25**/ – compared to the 100 million dollars growth in 2011. Gamification will become a very important part of the every day life because there are signs that i twill grow in popularity in the next five years such as Facebook, Twitter or Amazon nowadays. Note that more than 70% of Global 2000 organizations /**26**/ will contain at least one gamified application.

Use of gamification

Gamification is aplicable almost everywhere. It is used by various organizations to edcuate their employees, train people for different activities, solve problems, generate new ideas and concepts for further progress and development. These are various government organizations, business schools, military, pharmaceutical companies, political and software companies etc – gamification can be used everywhere. Examples of learning,

inovations and/or problem solving can be found almost in every industry. For example, «The Binary Game» is a game similar to Tetris. This game's idea was to educate people on binary numbers. Kapp /**27**/ says that gamer doesn't have to know the binary numbers in order to play this game, but he will learn binary number due to the game's concept. IBM created the game INNOV8. The game is aimed for the teachers who will have the opportunity to learn how to develop complex ideas related to the business management process. The game is used in many schools all over the world who have business and information technology programs. Gamification has been used in the military training for a long time /**28**/. US military train and educate its soldiers on how to generate their ideas. For example, the game is how to overpower Somaly pirates, without using the massive multiplayers' game. Game was created by the *Office of Naval Research (ONR).*

Conclusion

Education experts have to be awar of the fact that the teaching trends are changing. Generations are changing, but the learning stiles are changing too. Therefore, educational professionals, as well as the sustainable development experts have to follow the trend or they will fall behind. This, in turn, will create an unefficient learning/teaching experience. To support this hypothesis is the fact that it is obvious that traditional teaching methods are no longer interesting. This fact is showing us that there is a need for change of teaching trend. Indeed, it is cruel to teach in a traditional way somebody who has played computer and video games for 12 years. Teaching methods should be adjusted to this person and help them learn, instead of being an obstacle and a novelty blocking him. It should be his springboard. In this sense Kapp says /**29**/: "Learning professionals must understand the growing trend of applaying game-based sensibilities to the development of instruction through creating time-based activities, leveling up of learning experiences, storytelling, avatars, and other techniques. Yes, points and leaderboards will be a part of that, but thay are not the main focus; all elements of games need to be brought to bear intelligently and carefully." Educational professionals, scientists, professors and teachers will have to merge different game strategies with the learning content and the curriculum in order to achieve efficient and satisfying results. This also means that all educational employees will have to be educated on techniques of gaming teachin in order to improve their teaching skills and to maintain the quality of learning content. New educational technologies in education stimulate and create educational environment within which it is possible to use the gamification methods. Educational professionals, professors and teachers are really in a unique position to create interactive experiences in employees and students by using gamification.

Future studies in Croatia and in the world will show what is the direction in which the gamification methods are developing.

Notes

/1/ Zichermann, G. (2010). Fan is future: Mastering gamification. Google Teach Talk. http://youtu.be/601gNVeaE4g

/2/ Kim, A. J. (2011). Gamification 101: Designing the player journey. Google Teach Talk. http//youtu.be/B0H3ASbnZmc.

/3/ Gartner Group, (2011) in http://www.gartner.com/it/page.jsp?id=1629214

/4/ www.gartner.com/it/page.jsp?id=1629214

/5/ http://en.wikipedia.org/wiki/Gamification.

/6/ Kapp, K. M. (2012).The gamification of learning and instruction: game-based methods and strategies for training and education. United States of America: Pfiffer, A Wiley Imprint

/7/ Bepi Entertainment. A brief history of wargaming. Preuzeto 10 srpnja 2010 sa www.faculty.virginia.edu/setear/students/wargames/page1a.htm.

/8/ Kapp (op. cit.).

/9/ Kapp (op. cit).

/10/ Kapp (op. cit). p. 77.

/11/ Kapp (op. cit,). p. 77.

/12/ Randel, J.M., Morris, B.A., Wetzel, C.D., Whitehill, B.V. (1992). The effectivness of games for educational purposes: a review of recent research. Simulation & Gaming, 23(3), 261-276.

/13/ Wolfe, J. (1997). The effectiveness of bussiness game sin strategic management course work. Simulation & Gaming, 28(4), 360-376.

/14/ Hays, R. T. (2005). The effectiveness of instructional games: A literature review and discussion.

/15/ Ke, F. (2009). A qualitative meta-analysis of computer games as learning tools. In R.E. Ferding (Ed.), Effective electronic gaming in education (Vol. 1, pp. 1-32). Harshey, PA: Information Science Reference.

/16/ Sitzmann, T. (2011). A meta-analytic examination of the instructional effectiveness of computer-based

simulation games. Personnel Psychology, 64(2), 489-528.

/17/ Kapp (op. cit).

/18/ Kapp (op. cit).

/19/ Entertainment Software Association. Game player data. http://www.theesa.com/facts/gameplayer.asp.

/20/ Kapp (op. cit).

/21/ eMarketer: Digital Intelligence. (2011). Social gaming market to surpass$1 billion. http://www.emarketer.com/Article.aspx?R=1008166.

/22/ Caoili, E. (2010). Study: U.S. gamers spent $3.8 bilion on MMOs in 2009.Gamasutra http://www.gamasutra.com/view/news/27581/Study_US_Gamers_Spent_38_Bilion_On_MMOs_in_2009.php.

/23/ Goldman, T. (2010). Videogame industry worth over $100 bilion worldwide. The Escapist. http://www.escapistmagazine.com/news/view/1030 64-Videogame-Industry-Worth-Over-100-Bilion-Worldwide.

/24/ Gartner Group (op. cit.).

/25/ eMarketer: Digital Intelligence, (op. cit.).

/26/ Gartner Group (op. cit.).

/27/ Kapp (op. cit.).

/28/ Ungerleider, N. (2011). Wannable SEALs help U.S.Navy hunt pirates in massively multiplayer game. Fast Company. http://www.fastcompany.com/1752574/the-us-navys-massively-multiplayer-pirate-hunting-game.

/29/ Kapp (op. cit.)

Literature

1. Bepi Entertainment. A brief history of wargaming. Preuzeto 10 srpnja 2010 sa www.faculty.virginia.edu/setear/students/wargames/page1a.htm.
2. Caoili, E. (2010). Study: U.S. gamers spent $3.8 bilion on MMOs in 2009.Gamasutra http://www.gamasutra.com/view/news/27581/Study_US_Gamers_Spent_38_Bilion_On_MMOs_in_2009.php.
3. eMarketer: Digital Intelligence.(2011). Social gaming market to surpass$1 bilion. http://www.emarketer.com/Article.aspx?R=1008166.
4. Entertainment Software Association. Game player data. http://www.theesa.com/facts/gameplayer.asp.
5. Gamification. (2011) in http://en.wikipedia.org/wiki/Gamification.
6. Gartner Group.(2011) in http://www.gartner.com/it/page.jsp?id=1629214
7. Goldman, T. (2010). Videogame industry worth over $100 bilion worldwide. The Escapist. http://www.escapistmagazine.com/news/view/1030 64-Videogame-Industry-Worth-Over-100-Bilion-Worldwide.
8. Hays, R. T. (2005). The effectiveness of instructional games: A literature review and discusion.
9. Naval Air Warefare Center Training Systems Division (No 2005-004).
10. Kapp, K.M. (2012).The gamification of learning and instruction: game-based methods and strategies for training and education. United States of America: Pfiffer, A Wiley Imprint
11. Ke, F. (2009). A qualitative meta-analysis of computer games as learning tools. In R.E. Ferding (Ed.), Effective electronic gaming in education (Vol. 1, pp. 1-32). Harshey, PA: Information Science Reference.
12. Kim, A.J. (2011). Gamification 101: Designing the player journey. Google Teach Talk. http//youtu.be/B0H3ASbnZmc.
13. Randel, J.M., Morris, B.A., Wetzel, C.D. i Whitehill, B.V. (1992). The effectivness of games for educational purposes: a review of recent research. Simulation and gaming, 23(3), 261-276.
14. Sitzermann, T., i Ely, K. (2010). A meta-analytic examination of the efectiveness of computer-based simulation games. ADL Research Lab.
15. Sitzmann, T. (2011). A meta-analytic examination of the instructional effectiveness of computer-based simulation games. Personnel Psychology, 64(2), 489-528.
16. Ungerleider, N. (2011). Wannable SEALs help U.S.Navy hunt pirates in massively multiplayer game. Fast Company. http://www.fastcompany.com/1752574/the-us-navys-massively-multiplayer-pirate-hunting-game.
17. Wolfe, J. (1997). The effectiveness of bussiness game sin strategic management course work. Simulation & Gaming, 28(4), 360-376.
18. Vogel, J.J., Vogel, D.S., Cannon-Bowers, J., Bowers, C.A., Muse, K., i Wright, M. (2006). Computer gaming and interactive simulations for learning: A meta-analysis. Journal of Education Computing Research, 34(3), 229-243.
19. Zichermann, G. (2010). Fan is future: Mastering gamification. Google Teach Talk. http://youtu.be/601gNVeaE4g