

Educational Website Conversion Improvement Using Gamification*

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In this paper, we propose a novel approach to e-learning website conversion optimization using gamification. Insight into contemporary trends of attracting, retaining and inviting website users into action, known as conversion, and the concept of applying game elements in non-game context have led us to utilize these concepts in e-learning. In our actual case, gamification has been applied on student conversion rate improvement. Analysis of current website analytics has identified several gaps between expected and present state. In order to improve conversion, website structure has been modified and several gamification concepts have been introduced. Course of computer networking and telecommunications, held on Faculty of organizational sciences was used for evaluation. During the duration of the course, web traffic was monitored. Also, at the end of the course, a survey targeting gamification impacts on learning motivation and outcomes was conducted. Experiment results show conversion improvement, as well as better student motivation and learning outcomes.

Keywords: gamification; e-learning; VLE; website conversion improvement

1. Introduction

Although gamification as a term emerged before a few years, the concept of gamification has a long history of use in large variety of fields. One of the areas where gamification is successfully used is education [1–3]. However, using game concepts in an e-learning platform is still a new area with limited number of published papers on subject [1]. Our approach uses gamification as a tool for improving educational website conversion. Gamification is used to capture students' attention, engage them in learning activities and motivate them to take actions like downloading learning materials [4].

E-learning may be defined as a combination of different applications and processes which are developed to provide education through electronic media. E-learning is defined more precisely in [5] as all forms of electronic supported learning, which are procedural and aim to effect the construction of knowledge with reference to individual experience, practice and knowledge of the learner. At the mention of e-learning, first we think of is learning over the Web. However, there are different ways to utilize electronic means in education. E-learning modalities that are currently frequently used may be summarized into following list [6]:

- Use of technology to enrich classroom learning
- Online instruction for distance learning cost savings
- Blended instruction
- Synchronous: real time, multiple students online, instructor-led

- Asynchronous: students and teachers in intermittent interaction
- Teacher-led group work
- Self-study
- Self-study with subject matter expert
- Web-based tutorials
- Video and audio resources

Depending on the modalities used for e-learning, wide range of terms similar to e-learning can be found in the relevant literature. Some of the terms include multimedia learning, technology-enhanced learning (TEL), computer based training (CBT), computer assisted instruction (CAI), virtual learning environments (VLE), online education, distributed learning and etc. Each of these terms is focused on some aspect of e-learning. One of the terms relevant to this paper is Virtual Learning Environment (VLE).

Virtual Learning Environments (VLE) is popular technology used for enabling e-learning in various settings. They are most commonly used components of modern e-learning, but they can also be used within traditional learning environment [7]. This integration is called “blended learning”. It can be said, without a doubt that implementing VLEs has become very important for higher-education institutions which want to have their own VLE instance and thus innovate their program [8]. VLE is essentially a learning platform that enables a virtual approach to classes, class materials, tests, assessments, grades and other learning resources. Additionally, VLE defines an aspect of a social space in which students can easily communicate with tea-

chers and vice versa. This social space also enables mutual communication between students, thus allowing them to exchange information and experience and learn in an informal way. Given functionalities of a VLE are usually realized using Web 2.0 tools and in order to easily administer the learning environment Virtual Learning Environments are powered by a certain content management system (CMS).

Virtual learning environments are sometimes mixed with managed learning environments (MLE). Although these terms can somewhat be accepted as synonyms, in reality VLE is contained in a MLE and represents its integral part. Actually, MLE refers to the whole range of information systems and processes of an institution that contribute directly or indirectly to learning and management of that learning. On the other hand, VLE refers to the component or multiple components within an MLE that provides various kinds of “online” interactions which can take place between teachers and learners, including learning [9].

There is a vast number of both commercial and open source Virtual Learning Environments currently available. Some of the most popular ones include WebCT, Blackboard and Moodle. Also, it often happens that universities and other institutions develop their own VLE systems. However, each of those virtual learning environments usually integrates following facilities [10]:

- Communication
- Assessment
- Collaboration

Communication facility supports communication between students and teachers, between students and students or between student groups. This communication can be realized in both synchronous manner (e.g., real-time chat) and asynchronous manner (e.g., forum).

Also, there are other facilities available which can expand basic Virtual Learning Environments, giving in that way more opportunities to students and teachers. Various statistical or tracking information could help teachers to upgrade their courses. In the similar way, a VLE can link to resources that are not a part of VLE which can be useful for students to find out more about their current learning topic.

The advantages and disadvantages of using Virtual Learning Environments for e-learning may be derived by examining the differences between traditional education and e-learning, but keeping in mind the functionalities of a VLE. First of all, in e-learning teachers manage the source of education whereas in traditional approach, teacher is the main source of the education. Students are forced to e-

learn independently, which implies that they will learn in different ways and based on their own wishes and preferences. On the other hand, in traditional approach all learners learn the same by receiving information from the teacher. Finally, maybe one of the most significant differences between e-learning and traditional education is the social component [11]. In e-learning students are encouraged to work and learn in groups which are not the situation in traditional learning approaches.

From the student’s point of view there are several advantages of using e-learning. A lot of students favor self-paced, flexible method of education as they are able to organize their time for work and learning [12]. Furthermore, students have option to select learning materials that meet their interest and knowledge. They can ignore materials they already mastered and focus on grasping knowledge in other areas. One benefit of e-learning which is also very important is that students can learn in any place, as they have Internet connection and by using different devices—computer, mobile phone, tablet and etc [13]. Nevertheless, joining the discussions, chat rooms, live video consultations and ability to communicate with teachers and classmates at almost any time is a valuable possibility and stimulus for learning.

On the other hand, disadvantages are also based mostly on motivational features. Specifically, students with bad study habits may fall behind or they can get confused with learning activities. Students may feel separated from classmates and also from teachers because their interaction takes places through the VLE system. Sometimes student may end up without timely assistance in learning process because of unavailability of teachers.

One of the methods for increasing student motivation is the use of game elements in a learning environment. Such use is described by a relatively new term [14]—gamification. Gamification is described as the use of game design elements and game mechanics in non-game contexts [15]. Recently, gamification has received most attention in the fields of e-commerce, marketing, innovations, human resources, but it has also received some attention in the field of education [16].

According to [17], applying gamification techniques may result in strengthening learner’s motivation, improving the retention of learners’ attention, better socialization and community building as well as increase in user enjoyment. Game mechanics stimulate students to participate more actively in the learning process. Game mechanics may refer to challenges, competition, cooperation, rewards, or other concepts. In order to effectively implement these mechanics, game concepts such as reward points, progress bars, group challenges are com-

monly used. Research study conducted in [1] shows that gamification can have a great emotional and social impact on students, as reward systems and competitive social mechanisms seem to be motivating for them.

The main goal of our research is to improve learning motivation and engagement of our students. In order to achieve that, several game mechanics are integrated in our laboratory website. These changes transform our traditional content based website into a variant of Virtual learning environment. The new platform aims to increase student engagement and cooperation. Such improvements should result in conversion improvement of our website. Google Analytics and some custom software were used for evaluating conversion improvements. Also, a research study was conducted to measure impact of conversion improvement on student motivation and learning outcomes.

Section 1 of our paper serves as an introduction. In section 2, conversion optimization concepts are described, and short summary of planned site modifications are given. Main topic of section 3 is gamification. Section 4 describes gamification concepts used, given usage analytics of our site, and presents research study for measuring conversion improvement impact. Section 5 gives a short review of paper contributions, research study constraints, conclusions and suggestions for future work.

2. Conversion improvement

Early works on World Wide Web as a marketing medium in late nineties of 20th century [18–20] pointed out efficiency of a website as a critical performance assessment concept. This efficiency is a summary of the conversion process on the web. A one of the most used models of the conversion process on the web is a Berthon, Pitt, and Watson six-stage process [19, 20]. Those stages represent the flow of visitor activity on a website. Transition from one stage to another is described by a specific measure, conversion rate, called efficiency. For example, in the first stage transition from an unaware surfer to aware surfer is described by awareness efficiency. Awareness efficiency is calculated by aware surfers/surfers ratio. Entire conversion process is described by five efficiency measures: awareness efficiency, locatability/attractability efficiency, contact efficiency, conversion efficiency, and retention efficiency. Authors additionally defined sixth or overall average website efficiency as a process summary. Berthon et al. also modified previous model for the application in industrial marketing [18]. In [21], Chaffey et al. presented adapted original Berthon et al. model and proposed four conversion

rates: awareness efficiency, attraction efficiency, engagement efficiency, and conversion efficiency.

Although, conversion is not new concept according to previous research, some authors emphasize that conversion is the weakest of all key online marketing activities [22]. On the other hand, authors underline the importance of conversion. Hunt [4] notes that for a website to achieve goals and to be successful it needs to get the right number of people to visit it and, importantly to get as many as possible of those people to take action. In other words this means that both traffic and conversion rate are critical for website success. Saleh and Shukairy in [23] agree that it is critical to convert users from visitors into leads and consumers.

As previously stated, conversion is commonly measured by conversion rate. Conversion rate is defined as percentage of visitors exposed to a campaign who take the desired action of that campaign [23]. Conversion could be macro and micro. One site can have multiple macro conversions, because most websites have more than one conversion goal. One macro conversion can have more than one micro conversion. A micro conversion is a smaller conversion visitor must take to achieve macro conversion. The relationship between micro and macro conversion can be seen on the Fig. 1. A term funnel is used sometimes to describe a series of pages through which visitor must pass before reaching the conversion goal [24].

Hunt [4] proposed a three-step process of conversion optimization:

1. modeling site's funnels
2. analyzing funnels
3. optimizing funnels

The first step of optimization encompasses site's funnels modeling, which means visualization of every possible path from the landing page to a site goal completion. As we have already said, conversion rate is percentage of users who enter the funnel and complete the goal. The step begins with identification of goals, because they help us measure conversion rates. The next optimization step includes mapping out the actual flow of traffic, to see whether the site, as Hunt says, "is leaking . . . visitors". Visitor can decide to continue with the next step of the actual flow, or to go somewhere else

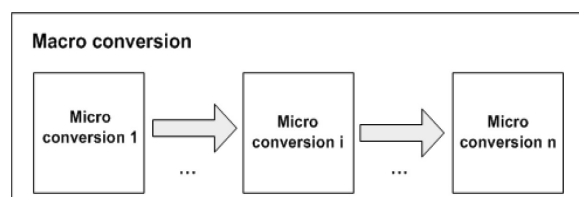


Fig. 1. Relationship between micro and macro conversion.

on the site or to quit the site visit. The third step is funnel optimization. This step is carried out through four simple stages: identification of leaks, alternative ideas generation, testing and repeating the process. Saleh and Shukairy offered similar three-step conversion optimization process in [23]. A process steps are: establishing an initial baseline, analysis, and optimization process.

Eisenberg [25] summed up years of his practice into several factors of successful conversion rate improvement, or “conversion trinity”, a three step formula: relevance, value and call to action. To improve conversion, content first needs to be relevant to users, then to offer solution to user problem and at the end to convince them to take action. Put in another way, three critical elements of conversion are [4]: get visitors attention, keep them engaged and call visitors to action. For a website to be ready for successful conversion, developers should place greater emphasize on design. A new approach is required, different from building a single home page, single pages for product and services, and other generic pages [4]. New approach will rely on a range of specialized landing pages, designed to be found by a specific group of visitors with their specific needs. The landing page is the first webpage that a visitor lands on as a result of traffic acquisition efforts [22]. Those pages are entry points into new conversions.

Everything written so far about conversion improvement and optimization referred to e-commerce or online marketing literature. But conversion can also be applied in other areas than e-commerce and online marketing. Idea of the paper is to improve conversion of higher education website, specifically a course section of educational website. Several articles that have appeared recently report about conversion optimization in higher education [5, 8]. Due to the fact that three critical elements of conversion are: get visitors attention, keep them engaged and call visitors to action, in order to carry out our idea we will use gamification (a gamified landing page) to improve conversion of educational website. We find support for our decision to apply gamification in Werbach and Hunter book “For the Win: How Game Thinking Can Revolutionize Your Business”, since engagement is a one of the main reasons why to use gamification [26]. Gamification is successful in user engagement because it uses fun to motivate people to do something. Zichermann and Cunningham’s [27] focus on engagement and problem solution in defining gamification (presented later in the paper) is another supporting fact.

3. Gamification

As we said earlier, gamification is relatively new term [14]. But since the dawn of mankind, it is in our nature to play. Early purposes of the games were fun and entertainment [28]. Today, games are used to advertise, to train employees, to build relationship, to increase experience, to educate. It is useful first to define games and then to proceed with defining gamification, in order to identify differences between those concepts.

Combining elements from eight different definitions, Salen and Zimmerman [29] proposed following definition of the game: a game is a system in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome. Similarly, Adams [30] states that the game is a type of play activity, conducted in the context of a pretended reality, in which the participant(s) try to achieve at least one arbitrary, nontrivial goal by acting in accordance with rules. Schell [31] simply defined game as a problem-solving activity, approached with a playful attitude. On the other hand, Bartle [32] defined gamification as taking techniques from games and applying them to non-games. Werbach and Hunter [26] definition says that gamification is use of game elements and game-design techniques in non-game context. Gamification as Zichermann and Cunningham [27] defined it is process of game-thinking and game mechanics to engage users and solve problems. The aforementioned definitions of gamification indicate that result doesn’t have to be a game at all. Rather it can be a process that uses game elements [26]. Bartle [32] argue that gamification must include game elements, but not gameplay. If gamification includes gameplay, than it is a “serious game”.

The simplest way to gamify something is to employ points, badges, and leaderboards [33, 26]. But effective gamification does not imply adding only PBL (points, badges, and leaderboards). PBL could be the initial strategy [26]. Wider list is suggested by Zichermann and Linder [34]: points, badges (achievements), levels, leaderboards, and rewards. A more complex approach proposed Zichermann and Cunningham [27], a so-called MDA framework: mechanics, dynamics, and aesthetics. Mechanics are functioning elements of the game. Dynamics are player’s interaction with the mechanics. System aesthetics are how the game makes players feel during interaction. Another set of game elements, comprehensive as previous, relevant to gamification offered Werbach and Hunter [26]. Set is composed of three categories: dynamics, mechanics, and components. Dynamics are elements at the higher level of abstraction, such as

constraints, emotions, narrative, progression, and relationship. Ten mechanics (for example: challenges, competition, feedback, transaction, reward) and fifteen components (for example: avatars, badges, combat, content, leaderboards, levels, points, teams) at the lower level of abstraction complete the taxonomy. All those game elements can be embedded into something that isn't game [26]. In our case game elements are embedded in educational website landing page.

Points are the heart of any gaming system [27]. This most used mechanic can track behavior, keep score, and provide feedback [34]. Points can also [26] determine win state, display progress, and provide data for game designer. In creating player experience it is possible to use one or more of the five types of point systems [27, 34]: experience points, redeemable points, reputation points, skill points, and karma (earned for helping others) points. The most important and one designer needs to begin with, is experience point system, based on the user interaction in the system. Badges represent achievement of particular goal. Terms badges and achievements are often used as synonyms [26]. Five primary functions of badges are [35]: goal setting mechanism, provide instruction about system possibilities, provide information for reputation assessment, motivate as a status symbol and provide personal affirmation, and increase group identification. Badges are popular because they provide opportunity for players to display their accomplishments. Unlike negative effects of bragging, badges allow discrete boasting [34]. Leaderboard shows the players rank. Rank is calculated using some sort of score, combined from points obtained for accomplished activities. This mechanic is powerful motivator if used properly, but on the other hand it could be very demotivating one. Players wish to know where they stand relative to other players, and if it is too far from leaders it can cause stop trying [26]. But, players want always to score, and appropriate type of leaderboard is needed [34]. Two types of leaderboards are available [36]: indirectly competitive leaderboards—based on player relative progress through the game, and directly competitive leaderboards—that call players to take actions against others. In practice, designing leaderboard requires great sensitivity. Despite all hurdles, leaderboards are the best initial tool for gamelike experience [34]. Games usually operate through a series of steps, called levels, stages, rounds, and so on [30, 37, 26]. Levels indicate player progress. They are useful in long-term player's motivation. Players continue with playing in order to reach higher status [34]. Best way to design levels is to make them logical, extensible, and flexible [27]. A way to model user action in gamified systems is through

activity cycles of two kinds: engagement loops and progression stairs [12]. Engagement loops represent what user does on a micro level, and progression stairs give macro view of player status. Rewards are benefits obtained for some action or achievement [12]. Rewards can be intrinsic and extrinsic [27], and a goal for gamified system, as authors writes, "is to offer a set of rewards that activates the users' intrinsic desires, while leveraging external incentives and pressure where appropriate." Elements of reward program could be [27]: status, access, power, and stuff. Challenges give player direction in the gamified experience, and depth and meaning [27]. They are one of the core pleasures of the game [31]. Challenges are efficient in engaging players [14]. Players are motivated because they always have something new and interesting to accomplish. In designing challenges, it's essential to keep in mind how many challenges players might want to play, and that they must be achievable.

As Adams [30] pointed out, goals are critical for the game. In the context of conversion optimization goals are essential, too. Goal is something that players strive to achieve, a players motivator and a fun generator. The goals will be given special attention, in order to ensure their best match. In gamification the goal is not to enable player to escape into virtual world, yet, to engage deeply with project [26]. In our case we want to engage students more with course website. Motivation plays important role in gamification, and much effort has been invested in the construction of taxonomy of player types. Richard Bartle's taxonomy [32] is one of the most cited. Bartle identified four types of players:

1. Achievers—players who are motivated by achieving the goals of the game;
2. Explorers—players who like to get to know details of the game;
3. Socializers—players who are interested in relationship with other people;
4. Killers—players interested in competing and defeating others.

Achievers, socializers, and explorers respectively, are the types we expect to prevail, among the students population we target. For achievers, our largest target group, primary pleasure of the game is challenge [31]. Playing a game is not a solitary activity, and it is usually described as inherently social activity [37]. Even if a player is alone with computer, his experience in playing isn't isolated, and he can share experience and learn from others. In designing phase it is important to take this into consideration, because socializers will be one of the largest groups. Explorers like to discover new things, and gamified experience is exciting to them.

Gamified approach can drive engagement and

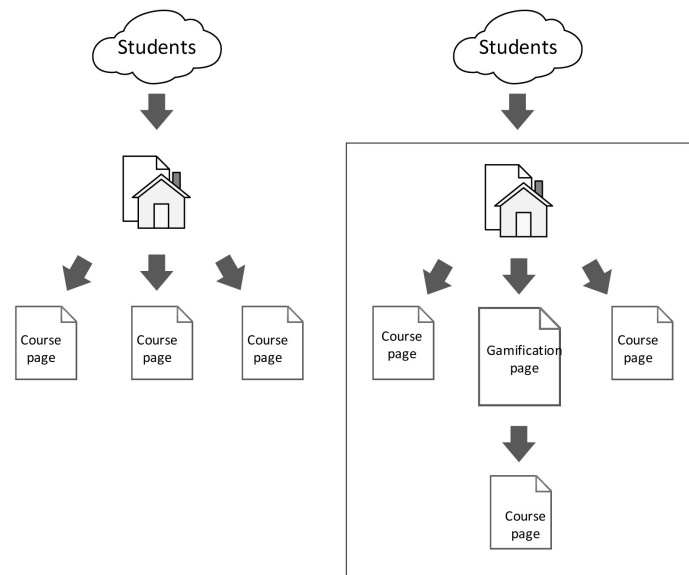


Fig. 2. New and old site structure.

solve problems in different ways. There are six types of gamified approaches [14]: grand challenges, rapid feedback system, simulation-discovery, status marathon, commercial/negotiation, expressive. They can be used individually or together. For example, we can use together grand challenge and status marathon. Rapid feedback system and status marathon approach are best suited for our project.

Gamification could be very useful when it is applied to websites. Werbach and Hunter [26] reported about Record Searchlight increase of time spent on the site by 25% per session, and rise in comment volume by 10%. Authors also [26] reported about 130% increase of TV program Psych official website pageview, after introduction of gamified website Club Psych. Hugos [33] and Zichermann and Cunningham [27] presented some of the most successful application of website gamification on foursquare, Yahoo! Answers, Quora, and Samsung Electronics (Samsung Nation game).

4. Research

In the first stage of our research, current state of web analytics was analyzed. Google analytics service was used to calculate website bounce and exit rates, as well as variations in the number of user sessions during the semester. Analysis of the gathered data has shown several problems where conversion optimization could be applied. Page of obligatory course of Computer networking and telecommunications was chosen for our experiment. Course conducts in fifth semester (studies duration is 8 semesters) on University of Belgrade, Faculty of

Organizational Sciences. Course has 350 students enrolled each year, mainly with engineering background.

Based on conversion optimization process presented in [4], we have defined goals which will be used in measuring conversion rate. Goals for obligatory course Computer networking and telecommunication are: more uniform distribution of number of page views during the semester, increase of average time on page, more uniform distribution of course materials downloads (textual files in .pdf format and .ppt presentations), redirection on additional content, and bounce rate decrease.

According to Hunt in [4], critical conversion elements are: attract user attention, keep users engaged and call users to action. In order to achieve conversion optimization, a gamification approach is used. Current website was modified with regard to the new approach of website design. A new gamified page was inserted between home page and Computer networking and telecommunication course page. Page was customized for its target group, and it acts as hub for different game mechanic used.

On the gamified page, students were given periodic challenges, related to topics covered by the Computer networking course. For example, students had to use nmap application [38] to discover target machine operating system and open ports. In another challenge, students had to send customized HTTP request via Postman plugin. If they successfully constructed and sent HTTP request, HTTP response contained validation code. By redeeming codes, students collected experience points. Experience points also could be earned by downloading learning materials.

Gamified page contains a leaderboard showing

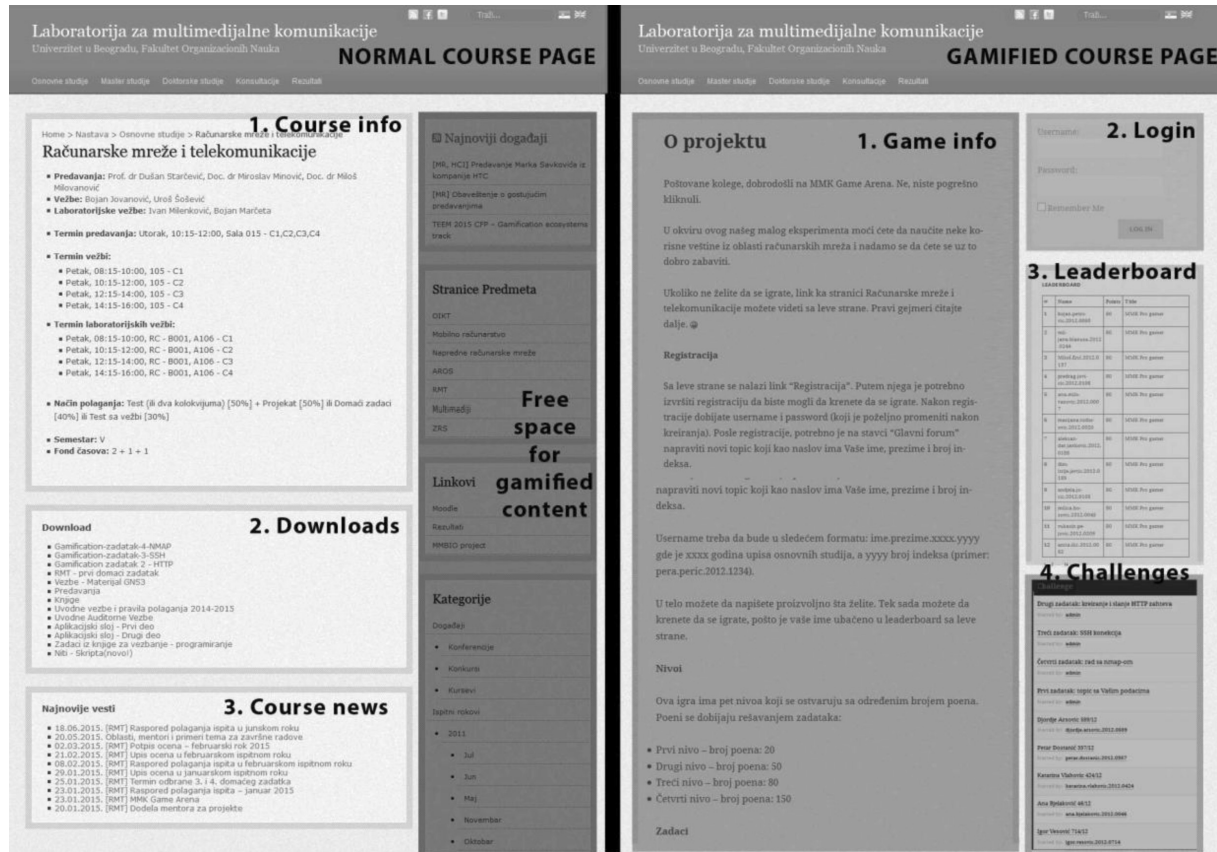


Fig. 3. Old (normal) course page and gamified page.

experience rankings for all users. Another purpose of experience points is leveling and collection of achievements. After earning a predefined number of experience points, user advances to a new level, and gains an according title (Apprentice, Experienced gamer, etc). Also, special achievements (badges) can be unlocked. By downloading several course materials within the time limit of 24 hours after upload, students can earn a special achievement badge. Achievement badges are displayed on user profile.

New site structure was in production on 20th of January. Period from 20th of January to 20th of February was compared to similar time interval previous year. Data gathered from Google analytics in Table 1 show difference between gamified and traditional approach. Gamified approach has resulted in significant improvement of total pageviews, which has risen by 32,98%. Unique pageviews have increased only by 14,6%. However, users spent 80% more time average on page. This implies that

user had explored page content more thoroughly. Also, download count increased significantly. Average number of downloads per course material increased from 270,6 to 320,8 downloads.

Figure 4 shows that number of page views has risen for most parts of the observed period. However, there is still an evident spike several days before the exam. It shows that deadlines still have a large impact on page visits and download of materials. Small difference between dates of exam resulted in somewhat earlier peak of page views in second experiment.

Our secondary goal was to study if gamification led to improvements in student motivation and learning outcomes. Therefore, we have conducted a study to determine possible impact. Group of experiment participants consisted of 40 male and 39 female subjects. Subjects were split in two groups. Experimental group of students who participated in gamification experiment had 44 subjects,

Table 1. Google analytics for gamified and traditional approach

Date Range	Pageviews	Unique Pageviews	Avg. Time on Page(sec.)	Entrances	Bounce Rate	% Exit
Jan. 20, 2015–Feb. 20, 2015	4294	2668	173.89	1489	39.83%	38.78%
Jan. 20, 2014–Feb. 20, 2014	3229	2328	96.74	876	40.07%	35.83%

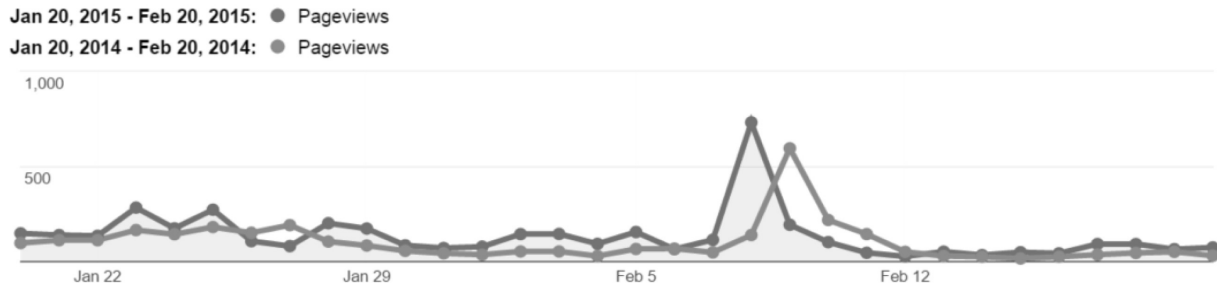


Fig. 4. Pageviews for Computer networking and telecommunications page.



Fig. 5. Questionnaire used for evaluating learning motivation.

while the control group of 35 subjects used traditional learning approach.

In order to evaluate effects of conversion improvements on intrinsic factors, such as learning motivation, our hypothesis was: “There is a difference in learning motivation between students who participated in gamification experiment, and those who learned using traditional methods”. At the end of the course, participants from both groups were asked to fill out the questionnaire. Content of the questionnaire is given in the Fig. 5. Questionnaire uses 7th degree Likert’s scale, and average values for each question are given on the figure. Each degree describes level of agreement with given statement.

For evaluation of difference between experiment groups, we have used mean value of questionnaire results as a quantitative measure of participant motivation. In order to test our hypothesis, we used independent samples t-test. Results of Shapiro-Wilk test show that collected data has normal distribution.

For t-test grouping factor was group affiliation, and test variable mean value of questionnaire results. Mean for gamification group was 4.6491, while mean for traditional group was 3.8616. This is a significant difference between groups. Possible difference between variances of the samples was investigated with use of Levene’s Test for equality of Variances. Test results show F value of 0.619 with significance of 0.434. Since significance is greater than 0.05, it can be concluded that equality of variances is assumed. As our two tailed significance is lower than 0.01, we cannot reject our hypothesis. Therefore, there is significant difference in motivation between two groups.

Table 2. Descriptive statistics (Motivational questionnaire)

Group	N	Mean	Std. Deviation	Std. Error Mean
1 Gamification	44	4.6491	0.54759	0.08255
2 Traditional	35	3.8160	0.51260	0.08665

Table 3. Independent samples t-test (Motivational questionnaire)

Levene's Test for Equality of Variances		
F	0.619	
Sig.	0.434	
t-test for Equality of Means		
t	6.908	
df	77	
Sig. (2-tailed)	0	
Mean Difference	0.83309	
Std. Error Difference	0.12059	
95% Confidence Interval of the Difference	Lower	0.59296
	Upper	1.07322

Table 4. Descriptive statistics (Final test)

Group	N	Mean	Std. Deviation	Std. Error Mean
1 Gamification	44	75.1495	9.4141	1.1221
2 Traditional	35	69.0778	7.8194	0.8992

To evaluate effects on learning outcomes, we have studied student's marks. At the end of the course, all students have taken final electronic test in order to evaluate their knowledge. Maximal score on test is one hundred points. Table 4 shows results of both groups. Independent samples t-test, shows that there is a statistically significant difference between test performance of two groups.

5. Conclusion

Insight into contemporary trends of attracting, retaining and inviting website users into action, known as conversion, and the concept of applying game elements in non-game context have led us to utilize these concepts in e-learning. In our actual case, gamification has been applied on student conversion rate improvement. We used three-step process suggested by Hunt: modeling site's funnels, analyzing funnels, and optimizing funnels. Because there is already a running website with preset goals, an analysis was performed before modeling phase in order to define a new set of goals.

Analysis of existing data has shown that content download and student engagement are not on a satisfactory level. As a response to identified problems, new goals were set in order to improve conversion rates. Moreover, we have decided to use game mechanics as a conversion improvement backbone. Some of the game concepts that will be used are call to action which should result in greater content download, extra learning materials as reward for students who accomplish set goals, group challenges, student achievement ladders, etc.

Evaluation of set goals was performed during the winter semester of 2014/2015 academic year. New

goals for obligatory course Computer networking and telecommunication are: more uniform distribution of number of page views during the semester, increase of average time on page, more uniform distribution of course materials downloads (textual files in .pdf format and .ppt presentations), redirection on additional content, and bounce rate decrease. Current website was modified with regard to the new approach of website design. A new gamified page was inserted between home page and Computer networking and telecommunication course page. Page was customized for its target group, and it acts as hub for different game mechanic used. This landing page presents the basis for applying gamification.

Gamified approach has resulted in significant improvement of total pageviews, which has risen by 32.98%. Unique pageviews have increased only by 14.6%. However, users spent 80% more time average on page. This implies that user had explored page content more thoroughly. Also, download count increased significantly. Average number of downloads per course material increased from 270.6 to 320.8 downloads.

We were also interested if gamification led to improvements in student motivation and learning outcomes. Therefore, we have conducted a study to determine possible impact. Group of experiment participants consisted of 40 male and 39 female subjects. Subjects were split in two groups. Experimental group of students who participated in gamification experiment had 44 subjects, while the control group of 35 subjects used traditional learning approach. At the end of the course, participants from both groups were asked to fill out the questionnaire. Results show that gamification resulted in improved learning motivation and better learning outcomes. However, our research had some constraints. Participation in gamification experiment was voluntary, and there is possibility that experiment attracted academically better and more highly motivated participants. Also, the number of participants was somewhat limited. To resolve these issues, a more extensive research study is planned in the future.

The experiment has given us an insight into possible applications of gamification on educational websites. Based on conclusions, we identified several areas of further research in this topic. First of all, by introducing gamification elements we obviously received positive results and managed to improve our educational website conversion. Therefore, introducing new gamification concepts should be considered and also their impact on conversion improvement should be examined. It is also important to find new ways of monitoring the impact of gamification on educational website con-

version. In the future period we plan on applying gamified approach presented in this paper on other courses realized on our department. In that way we will also have an opportunity to implement new ways for monitoring educational website conversion.

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