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# The model for introduction of gamification into e-learning in higher education

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**Abstract**

The following paper presents the model for introduction of gamification into the field of e-learning in higher education. Concepts and differences between techniques and methods of game-mechanics and game dynamics are explained. With proper integration of gamification in the field of e-learning into higher education, a positive impact on the learning process can be achieved, such as higher satisfaction, motivation and greater engagement of students. The importance of clearly defined objectives, rules, techniques and mechanisms of gamification that affect the dynamics of the students is shown. The paper presents a comprehensive view of the gamification concept in higher education. The advantages and disadvantages of introducing gamification in e-learning are described. The paper combines the characteristics of gamification with e-learning and shows the possibilities of use in practical.

*Keywords:* e-learning; higher education; gamification; game mechanics; game dynamics

## 1. Introduction

Widespread use of new technologies, such as the Internet, social networks and mobile phones, affects the processes of education at universities. Technology has an important impact on education, making possible both a better communication and the implementation of the newest information systems, useful for learning and tuition (Bedrule-Grigoruta & Rusua, 2014). There are systems which support individual learning, collaborative learning, learning content management, learning activity management, formal learning, informal learning, and workplace

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learning (Valsamidis, Kazanidis, Petasakis, Kontogiannis, & Kolokitha, 2014). One of the most common educational systems, which are supported by information technology, is e-learning. E-Learning is the use of telecommunication technology to deliver information for education and training (Sun, Tsai, Finger, Chen, & Yeh, 2008). E-learning is being introduced as a fundamental part of the student learning experience in higher education. It is no longer core business only for those universities with a mission for distance education; its affordances are being systematically integrated into the student learning experience by predominately campus-based universities (Ellis, Ginns, & Piggott, 2009). With e-learning, universities are trying to achieve the goals and effects, such as a high degree of satisfaction, motivation, effectiveness and efficiency of students. However, many e-learning systems do not achieve the desired objectives due to non-compliance and lack of knowledge of techniques and methods for the development of online information systems. Information system research clearly shows that user satisfaction is one of the most important factors in assessing the success of system implementation (Delon & Mclean, 1992). Students' satisfaction in an environment of e-learning is influenced by various factors. Various authors (Lewis, 2002; Arbaugh & Duray, 2002; Chen & Bagakas, 2003) have found that there are six factors that have an impact on satisfaction: students, teachers, course, technology, system design and environmental factors. Many authors (Laurillard, 2002; Goodyear, Jones, Asensio, Hodgson, & Steeples, 2005), report about e-learning in higher education and students experience. Little is known about why some users stop their online learning after their initial experience (Sun et al., 2008). There are several reasons for poor efficiency, effectiveness, satisfaction and motivation of students in e-learning, some of them are: poorly managed projects, ignoring the main stages of the development of e-learning (analysis, planning, development, implementation and evaluation), the use of inappropriate motivational techniques, inadequate technical and technological implementation of e-learning, inappropriately selected personnel, incorrect data on demographic and other characteristics of students, and wrong graphical interface. Increasing the efficiency, effectiveness, motivation and engagement of students in e-learning can be achieved by gamification. Gamification applies elements associated with video games (game mechanics and game dynamics) in non-game applications. It aims to increase people's engagement and to promote certain behaviors (Simões, Redondo, & Vilas, 2013). Attending to its technological nature, one of the fields where gamification may have a greater impact is online learning (Dominguez et al., 2013). The use of gamification in the field of e-learning is growing and gaining in popularity. The paper presents a model of e-learning in higher education, which is supported by gamification. The model takes into account modern guidelines for the development of web applications and e-learning, e-learning management and important elements of e-learning. The elements of user experience and phases of development are presented. With certain modifications, the model can also be applied to other areas of e-learning.

## 2. Theoretical background

### 2.1. E-learning in higher education

E-learning is defined as information and communication technologies used to support students to improve their learning (Higher Education Funding Council of England, 2005). Normark and Cetindamar (2005) describe e-learning as the ability of system to electronically transfer, manage, support, and supervise learning and learning materials. E-learning platforms and web-based applications are very popular, allowing users to access information directly via internet (Zamfiroiu & Sbora, 2014). E-learning has its advantages (Draves, 2007). E-learning enables learning from anywhere and at any time. According to Urh and Jereb (2014) there are statistically important differences between the elements of time regarding learning and average grade. Due to advantages of e-learning, such: geographical reach, learner control (in terms of flexibility and convenience), and cost effectiveness in course delivery and management, educational institutions and professional organizations are embracing e-learning by implementing an expanding array of technology enabled platforms (Hu & Hui, 2012). Nevertheless, e-learning has its drawbacks and limitations. According to a significant study by Singh and Hardaker (2014), there are barriers and obstacles in using e-learning.

Higher education is most often implemented at universities. Students at universities chose a field of study, which is very focused and meets their needs. Individual selection of a study contributes to greater seriousness in the study. Higher education is increasingly being carried out the form of e-learning. E-learning in higher education has its own characteristics. Characteristics of e-learning in higher education which derive from students are: age, demographic

characteristics, field of study, complexity, and more. Research into the student experience of learning in higher education has focused on: student characteristics, such as the conceptions of learning with which they enter courses; course context, such as teaching methods; learning context, such as student perceptions of the quality of teaching and quantity of work; student approaches to learning, what they do and why they approach learning in particular ways; and the quality of their learning outcomes (Prosser & Trigwell, 1999; Ramsden, 2002). Moreover, the features of higher education itself have undergone significant changes in recent years. As it has been previously pointed out, the increasing number of inter- and multidisciplinary programs, and a higher scale of participation in international mobility programs bring about specific learning situations, which can be handled more effectively based on gamification theory (Biro, 2013). The next section features basic concepts of games mechanics, game dynamics, gamification and their use in e-learning.

## 2.2. Game mechanics, game dynamics and gamification

According to Maroney (2001), games can be defined as "a form of play with goals and structure." Entertaining games provide engaging activities, and it would appear that far from waning, interest in games for leisure is still growing. Computer-supported gamified services such as Nike+, Zombies, Run!, Fitocracy, and Runkeeper all aim at structuring, supporting and motivating the exercise activities (Hamari & Koivisto, 2013). It has also been suggested that players of commercial games are develop problem solving and literacy skills, and that good commercial games represent good learning principles that provide opportunities for gamers to engage actively and reflectively during game play (Gee, 2003). According to Grünberg (2014), game mechanics are the agents, objects, elements and their relationships in the game. They define the game as a rule-based system, specifying what there is, how everything behaves, and how players can interact with the game world. Game dynamics are the emergent behavior that arises from game play, when the mechanics are put into use and aesthetics are the emotional response from the players to the game play. Well-known game mechanics elements are (Bunchball, 2010): points, levels, badges, achievements, virtual goods, leader boards, and virtual gifts. Some game dynamics elements are: rewards, status, competition, self-expression etc.. Schonfeld (2010) describes 47 game dynamics elements.

From 2010 onwards, a new trend, designated by gamification, has emerged. Gamification can be defined as the "use of game design elements to motivate user behavior in non-game contexts" (Deterding, 2011). According to (Dominguez et al., 2013), gamification represents incorporating game elements into a non-gaming software application to increase user experience and engagement. Gamification has been applied in many different domains in the recent years (Pedreira, Garcia, Brisaboa, & Piattini, 2015) in an attempt to improve the results of employees in the development of their daily tasks and work (Hugos, 2012). Gartner, Inc. (2011) predicts that more than 50% of organizations will gamify innovation processes by 2015, as gamification provides accelerated feedback, clear goals and challenging tasks. According to Biro (2014), gamification has some common elements with the behaviorist learning theory, like superiority of positive reinforcements, small step-by-step tasks, immediate feedback, and progressive challenges. Educational gamification proposes the use of game-like rule systems, player experiences and cultural roles to shape learners' behavior (Sua & Cheng, 2013).

Properly developed e-learning which uses gamification can increase satisfaction, engagement, effectiveness and efficiency of students. Right combination of e-learning, gamification and balanced tasks and skills can lead students into the so-called state of flow. Csikszentmihalyi (1990) describes the flow as an optimal experience characterized as a state of being fully focused and engaged in an activity. According to (McGonigal, 2011), feeling of flow is triggered by four elements good games have in common: goals, rules, feedback, and voluntary participation. If the difficulty of tasks is correctly balanced, it can drive the players to a flow state which is highly motivating (Csikszentmihalyi, 2008). According to Jackson and Eklund (2002), flow is an important part of challenging activities where a person's concentration and skills are important for an outcome.

## 2.3. Gamification and e-learning

Games typically allow players to restart or play again, making mistakes recoverable. This freedom to fail allows students to experiment without fear and increases student engagement (Lee & Hammer, 2011). Gamification must

not be mistaken for programmed learning or computer-based learning, even though some of the interpretations suggest the latter, only underlining the compatibility of the theory with the new technologies (Biro, 2014). The essence of gamification does not lie in technology, but the diverse learning environment and the system of decisions and rewards, all aimed at increasing motivation and reaching higher levels of engagement in the learning process (Kapp, 2012). Well-designed educational games offer continuing opportunities for player improvement, massive amounts of feedbacks, tasks too complex for any one individual to solve alone, and environments that change in response to learners' actions (Garris, Ahlers, & Driskell, 2002; Barab, Gresalfi, & Ingram-Goble, 2010). In literature and in practice several attempts of introducing of gamification into blended learning and e-learning can be found (Landers & Callan, 2011; Muntean, 2011; Hickey & Rehak, 2013), but research on gamification is still in its infancy (Filsecker & Hickey, 2014). Since video games began to be used in learning environments, several frameworks have been proposed for their use and design (Simões et al., 2013). Wouters, Van der Spek, & Van Oostendorp (2009) proposed a model of four kinds of learning outcomes that games might have: cognitive learning outcomes which they divided into knowledge and cognitive skills, affective learning outcomes and communicative learning outcomes. Another significant observation is that if we wish to incorporate games into learning environments, it is essential to develop a better understanding of the tasks, activities, skills and operations that different kinds of games can offer, and examine how these might match the desired learning outcomes (Pedreira et al., 2015).

The following part of the article presents a model of e-learning, which includes gamification, and is designed to be used in higher education. It describes the main elements of the model, how the model works and its impact on students.

## 3. The model for introduction of gamification into the field of e-learning in higher education

According to Shea, Pickett and Pelz (2003), effective online learning environment should encourage: contact between students and faculty members, reciprocity and cooperation between students, prompt feedback, time on task, active learning techniques, communication of high expectations and respect diversity and ways of learning from each student. There are some recommendations for teachers and organizations to organize contents in platform guidelines (Lee & Hammer, 2011; Simões et al., 2013): rapid and positive feedback, adapting tasks to skill levels, experimentation and tasks repetition, main goal is divided into smaller goals, different paths to the goal, use of different game mechanics, and encouraging activities despite the current failure. The main objective of e-learning is high efficiency, effectiveness, engagement, satisfaction and motivation of students. These objectives can be achieved through the use of game mechanics and gamification.

Management of e-learning must create the conditions under which students are motivated, satisfied, effective and efficient. Management of e-learning is an important part of the model. The model is presented in Fig. 1, and consists of the following main elements: management of e-learning, important factors in e-learning, elements of user experience, phases of development (analysis, planning, development, implementation and evaluation), game mechanics, game dynamics, gamification elements in e-learning and their effects on students.
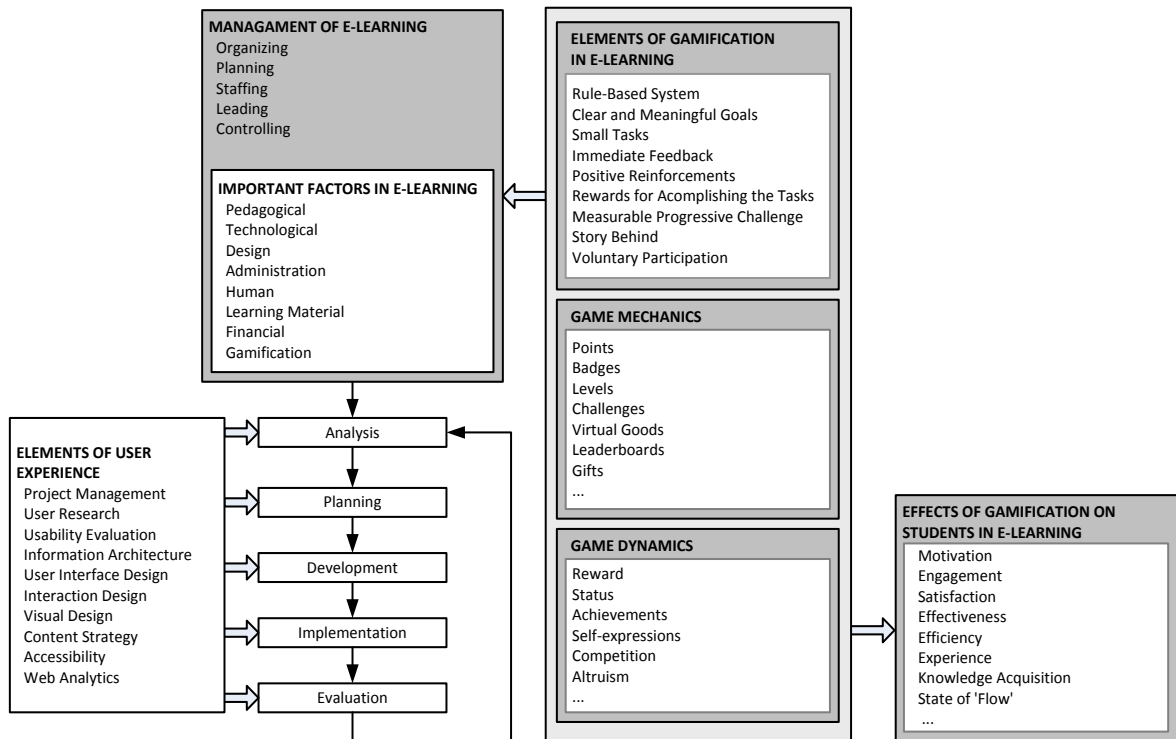
Fig. 1. The model for introduction of gamification into the field of e-learning.

Model of e-learning in higher education, which includes elements of gamification must be based on appropriate management. Good e-learning management means organizing, planning, staffing, leading and controlling all important elements of e-learning. Important elements in e-learning are: pedagogical, technological, design, administration, human, financial and gamification elements.

## 3.1. Important factors in e-learning

Pedagogy - Pedagogy is the method and practice of teaching, especially as an academic subject or theoretical concept (Oxford Dictionaries, 2014). E-pedagogy might broadly be defined as learning design that incorporates educational quality, values and effectiveness of teaching, learning and assessment activities supported by technology (Warwick, 2007).

Technology - Technology is a basic infrastructure that enables the implementation of e-learning. The use of digital technologies and social networking has grown rapidly over the last decades, and these technologies are increasingly being incorporated into the teaching of higher education (Laurillard, 2005; Garrison, 2011). Educational technologies can be interpreted as applications that take place both aided by technological skills and educative expertise of instructors. Only in this manner they can improve the involvement of new technologies in the educational system and can ease the process of harmonization of necessary knowledge (Bedrule-Grigoruta & Rusua, 2014). It is important to select the optimal technology, which will allow reliability of e-learning.

Design - The lack of user profile analysis, appropriate design methods, and gamification schemas which are too simple, can lead to applications achieving results below their expectations (Pedreira et al., 2015). While it is clear that gamification has produced some promising results, the design approach does come with a significant risk (Browne, Anand, & Gosse, 2014). According to Gartner, Inc. (2013), about 80% of all gamification apps will fail to

meet their objectives due to poor design. According to some recommendations (Usability.gov, 2014), good design must provide information which is: useful, usable, desirable, findable, accessible and credible.

Administration - Administration of e-learning requires knowledge of technology and people. Administration of technology and people is easily performed by using Learning Management Systems (LMS). LMSs offer various tools, each of which supports the performance of one or more specific instructional tasks, defined in this article as activities performed by instructors that relate to students' performance of learning activities. Some LMS tools are used for instructional tasks that are performed to enable or prepare student's learning activities (Schoonenboom, 2014). The other, and the most important, is to enable teachers to set up gamified and personalized learning activities, using different learning contents, stored in the platform itself, in a LMS or in the internet cloud (Simões et al., 2013). In addition to these systems, there are other requirements for the administration, which are an essential precondition for the reliable implementation of e-learning.

People - The main purpose of e-learning is to provide knowledge through technology. E-learning must be organized in such a way that students are satisfied with it. For good organization of e-learning it is necessary to know the user characteristics, such as: level of education, area of expertise, age, occupation, gender, culture, skills, etc. Various experts should be involved in the process of the organization and implementation of e-learning, for instance: project managers, usability experts, accessibility experts, software developers, educators, learners, knowledge engineers, educational support officers, designers, pedagogical experts, editors, multimedia experts, etc.

Learning material - According to its content, the design of the electronic version of materials does not differ significantly from traditional printed materials. Materials must be based on the same principles, which means that objectives must be clearly set. The material should be divided into separate sections or learning units and should be properly designed in terms of content and didactics (Gerlic, Debevec, Dobnikar, Smitek, & Korže, 2002).

Finance - Finance is an important part of the entire e-learning. Financial calculations must take into account various factors of e-learning. According to Gerlic (2000) some of them are: how many hours are needed for educational work; how many hours can be implemented with the assistance of external resources; location of the educational work; what teachers need for their work; which media will be required for independent work of students; what instruments will be needed for examinations.

## 3.2. Phases of e-learning development

The most important phases in e-learning development in higher education with gamification are: analysis, design, development, implementation and evaluation. The area of expertise for which e-learning is being developed, is also very important.

Analysis - The first development phase of e-learning in higher education is the analysis. The analysis should cover the fields of pedagogy, technology, design, administration, people, learning materials, finance and gamification. The analysis must contain data from the aforementioned fields. The analysis, as well as data collection, data management and data processing must be properly planned. Properly collected and analyzed data enable efficient and effective of e-learning design.

Planning - Planning of e-learning must be done on the basis of good preliminary analysis. The obtained results of the planning instruct us, what, why, when and how to develop e-learning. The cost of the design compared to the actual development costs is relatively low. Relatively low costs of the planning phase allow experimentation with different e-learning alternatives.

Development - E-learning is most often developed and implemented in the online environment. The most commonly used tools for the development of e-learning and web-based applications are: Ajax, ASP, ASP.NET, CSS, ColdFusion, Java EE, JavaScript, Perl, PHP, Ruby on Rails, CGI, Django, Wt–Web toolkit, WebObjects and others. It is very important to write the project documentation about the process of making e-learning. A well-documented process of developing e-learning can assist us when dealing with repairing, adjusting and maintaining of e-learning and the overall project. Testing the e-learning operation is partially carried out during this phase. Testing should be done by people who are familiar with web applications and e-learning.

Implementation - In the phase of implementation, e-learning is introduced to the general public. At this stage systematic monitoring of users is needed. Optimal performance of e-learning is achieved by collecting feedbacks from users, and by constant adaptation of e-learning. It is important to quickly adapt to the needs of students,

professors, mentors, tutors and administrative staff who appear in e-learning. Implementation is one of the most difficult phases.

Evaluation - Evaluation of e-learning is a process where the achieved objectives of e-learning are determined. Through evaluation we get the information about students' satisfaction, motivation, efficiency and effectiveness. In general terms, e-learning is a sort of web application, and a very important element of web applications is usability. According to Nielsen (2012), usability can be defined by five components: learnability, efficiency, memorability, errors and satisfaction. Data obtained by students are used for e-learning adaptation. When collecting data about e-learning we have to use special information systems. Some of them are: Learning Content Management System (LCMS) and Learning Management Systems (LMS). Other data about e-learning are acquired through students' complaints, compliments and their observations. Data obtained from the evaluation are used for adapting and changing of e-learning.

## 3.3. Elements of user experience

Satisfaction of students in e-learning depends on good user experience. During e-learning development phase, we need to consider elements that have the greatest impact on the user experience. The most important elements of the user experience are (Usability.gov): Project management focuses on planning and organizing a project and its resources. This includes identifying and managing the lifecycle to be used, applying it to the user-centred design process, formulating the project team, and efficiently guiding the team through all phases until the project completion. User research focuses on understanding user behaviours, needs, and motivations through observation techniques, task analysis, and other feedback methodologies. Usability evaluation focuses on how well users can learn and use a product to achieve their goals. It also refers to how satisfied users are with that process. Information architecture (IA) focuses on how information is organized, structured, and presented to users. User interface design focuses on anticipating what users might need to do and ensuring that the interface has elements that are easy to access, understand, and use to facilitate those actions. Interaction design (IxD) focuses on creating engaging interactive systems with well thought out behaviours. Visual design focuses on ensuring an aesthetically pleasing interface that is in line with brand goals. Content strategy focuses on writing useful content by planning the creation, delivery and governance behind it. Accessibility focuses on how a disabled individual accesses or benefits from a site, system or application. Web analytics focuses on the collection, reporting, and analysis of website data.

## 3.4. Elements of gamification in e-learning and users

Model of e-learning with gamification for higher education is designed to maximize students' satisfaction, motivation, effectiveness and efficiency. This model takes into account modern theories and practices of education and e-learning. Modern theories of effective learning suggest that learning is most effective when it is active, experiential, situated, problem-based, and provides immediate feedback (Boyle, Connolly, & Hainey, 2011). Muntean (2011) made a theoretical analysis of gamification as a tool for increasing the engagement in e-learning platforms. Gamification in e-learning platforms seems to have a potential to increase student motivation, however, it's not trivial to achieve that effect, and tremendous efforts are required in the design and implementation of the experience for it to be fully motivating for participants (Dominguez et al., 2013). According to Simões et al. (2013), new and appropriate frameworks and models are needed for the design of gamified learning contents.

To design a model of e-learning to be used in higher educational institutions that use gamification, we have to know our users are and their needs. The majority of students in higher education have formed personal goals and career orientation. Severity of study at the university is, in most cases, greater than in the lower levels of education. Students in higher education are more aware of the importance of education they have chosen. Motivation of students in the described model is increased even more by the use of gamification. Some terms such as game mechanics, game dynamics and gamification are described in the previous sections. Gamification must be integrated into the model in a way that reinforces students' feeling of the importance of education for the future. With the use of gamification we can connect students' personal goals with e-learning objectives. The objectives of e-learning must be completely clear and unambiguous. The objectives of e-learning must be very precisely presented, as well

as rules, guidelines, time frames, requirements and limitations of e-learning. Gamification emphasizes displaying visible objectives that motivate students. According to the theory of gamification, the main objectives of e-learning should be divided into several smaller objectives. It is easier to achieve a small objective, which can result in increased student motivation and satisfaction. Progress and current status of students' activities must be clearly and graphically displayed. The feeling of progress gives students the motivation for further work. Good balance of learning materials and student skills can lead into the state of 'flow'. Learning in a state of 'flow' is the most efficient and effective way of learning. Each success of a student, which is a result of activities, must be properly rewarded in the form of a positive feedback. Positive feedback which is the foundation of gamification, raises the users' self-esteem and motivation. According to Kljajic-Borstnar, Kljajic, Skraba, Kofjac and Rajkovic (2011), individual information feedback contributes to individual learning. Students must be clear about what they will gain through e-learning, and how this knowledge can be applied in practice. E-learning is designed in a way that can be used at anytime and anyplace. This kind of work gives students full autonomy over their work. Autonomy at work reduces the fear of using e-learning. Poor performance and termination of learning are part of any educational process, by e-learning being no exception. The purpose of gamification in e-learning is to encourage students to continue working despite the current failure. During the process of e-learning we need to collect data about students and their activities in e-learning. Adequate data provide a basis for analysing and adapting e-learning to achieve optimal state of the entire system.

## 4. Conclusion

The process of making e-learning is most often a kind of project task and it is related with software design. All e-learning types are not equally accepted, effective and efficient. Most common factors contributing to a failure of a software project are: unrealistic or unarticulated project goals, inaccurate estimates of the requires resources, badly defined system requirements, poor reporting of the project's status, unmanaged risks, poor communication among customers, developers, and users, the use of outdated technology, inability to handle the project's complexity, sloppy development practices, poor project management, stakeholder politics, and commercial pressures (Charette, 2005). The model of the introduction of gamification into the field of e-learning in higher education includes methods for managing e-learning. The model includes important elements in e-learning. The causes of errors in the e-learning are mainly related to elements described in the model. E-learning should be developed according to the modern development of web applications, and should include elements of gamification. The main phases of the development are: analysis, planning, development, implementation and evaluation. Throughout all the phases of e-learning development, elements of user experience are very important.

A key component in the model of e-learning is gamification. The described model of e-learning in higher education differs from others by using gamification, and it is adapted to users' characteristics. In the future we can expect even greater use of gamification in education. Progress in technology and software, and the knowledge of gamification will bring an even a higher degree of personalization in e-learning. Personalization is the customisation of content and services based on a prediction of what users wants. Common examples of personalization can be found on websites that recommend news items or products based on the past behaviour of users or the similar behaviour of other users (Karpinskyj, Zambetta, & Cavedon, 2014). Personalization of e-learning allows optimal adaptation to users' requirements, which increases their satisfaction. We believe that the development of e-learning in the future will bring about greater involvement of personalization. Personalization of e-learning should be supported by artificial intelligence. However, using artificial intelligence demands relevant information. Great amount of information can be obtained through learning management systems. Artificial intelligence allows professors to find specific actions, patterns, major mistakes and other behavioural characteristics of students in e-learning. Such information allows the adjustment of e-learning to the student's personal needs through gamification. In the future, we can expect greater integration of personalization, artificial intelligence and gamification into e-learning.

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