Gamification technologies in staff training of Russian and foreign companies

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Abstract. This article examines the feasibility and effectiveness of introducing gamification technologies into the educational process, which is the use of game mechanisms, principles and tools to solve real non-game problems and problems in various areas of public life. The conducted research is a meta-analysis of the current experience of gamification application, obtained from numerous international scientific studies, practical cases and reports of companies. The collected data show an important practical understanding of the application of gamification in the processes of planning and implementing projects, staff education and motivation, customer attraction and retention through loyalty programs. The influence of gamification technologies on the processes of cognition and learning is proved thanks to hardware studies of the brain activity of students during the game exercises using electroencephalography, functional magnetic resonance imaging (fMRI) and functional near-infrared spectroscopy (fNIRS). As a result of the study of the effects of gamification in terms of improving productivity through perceptual learning, conclusions were made that formed the basis for a generalized list of opportunities for using gamification elements in companies. The study systematized the practical results presented by case studies of companies and educational literature, which considered the results of the application of gamification as mostly positive.

Keywords: Gamification technologies, Education system, Neuroscience, Personnel

1. Introduction

In the last decade, the course of transformation of the economies of developed and developing countries is aimed at the transition to the digitalization of business and society as a whole (*Khalimon et al., 2019a)*. The widespread introduction of digital technologies formulates new realities of its functioning (*Khalimon et al., 2021*).

A special role in Russia is played by the development of the education system for the education of specialists in new professions, which implies the application of the network principle of the functioning of educational institutions using all their resources (*Khalimon et al., 2019b; Kuzina, 2020*), as well as the addition of the traditional training scheme with new educational practices and technologies (*Brikoshina et al., 2020*).

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That is why a clear trend in academic communities is to conduct scientific research on the concept of gamification (*Majuri et al., 2018*), which allows combining game functions with cognitive functions. However, the quantitative indicators available for studying based on the obtained practical results are currently insufficient to convince the majority of scientists of the effectiveness and usefulness of gamification in education (*Kwon, Özpolat, 2020*).

Recent research in the field of the gaming sector indicates an increasing number of gamers around the world: at the end of 2019, there were about 2.5 billion people. In particular, in Russia, over 65 million people participate in various computer games (*Sedykh, 2020*). Accordingly, the attractiveness of using gamification technologies to involve students in the educational process is undeniable, but it requires systematization of theoretical knowledge of the main aspects of the functioning of this concept, as well as the definition of the advantages and disadvantages of gamification already identified by scientists (*Kwon, Özpolat, 2020*).

2. Methodology

In this study, the following general scientific methods were used: search, collection, systematization, analysis, comparison of information, testing of the scientific hypothesis about the attribution of the influence of gamification on the student and on the effectiveness of training. In addition, foreign sources of literature, practical cases of domestic and foreign educational institutions were analyzed.

To select the sources, the following selection criteria were used: the scientific nature of the presented study; the presence of a description of the experiment and practically tested effective data.

The results of scientific research conducted using: fNIRS, diffuse optical tomography, fMRI, electroencephalography (EEG) were included in the study. In addition, the technical capabilities of the equipment and the results of their work were analyzed.

3. Results

A variety of brain imaging methods allow us to identify different areas of the brain responsible for cognitive functions at a deeper level than on the basis of behavioral research methods alone (*Sitnikova , 2016*).

The study (*Ninaus et al., 2014*) analyzed current advances in neuroscience research in relation to gaming techniques, where EEG, fMRI, and fNIRS are used to study the brain activity of a learner during a game. The review shows that there are key benefits in using these neuroscience techniques to develop serious learning games, in particular to provide better user feedback and allow developers to better understand the learner's neurophysiological outcomes during training periods and depending on the types of tasks.

Several studies have been conducted using the above hardware methods, which have examined the effects of gamification on performance improvement through perceptual learning (*Biryukov et al., 2021*). Participants' performance was assessed using a number of indicators, and their motivation and engagement were assessed using self-report questionnaires and near-infrared spectroscopy. In the results, the following conclusions were made:

1) Increased productivity. These results are consistent with theoretical hypotheses about perceptual learning (using game techniques), where participants become increasingly effective (*Watanabe et al., 2002; Watanabe et al., 2001*) in contrast to what would be expected in traditional learning (the state of alertness of the student), where performance characteristically decreases over time.

2) Increased attention, which leads to improved performance (*Ossowski et al., 2011*). In addition, the reaction time was faster for those who were in the group play state, compared to those who were not. However, all participants experienced a decrease in internal motivation, which they reported themselves. This may be due to moments that distract from the motivating ability of the training, or perhaps to moments that trivialize the seriousness of the task (one of the possible disadvantages of gamification in serious conditions).

3) In the course of practical experiments, no significant positive effect of game mechanics on work engagement was found. This may be due to the fact that work engagement is a relatively stable and

pervasive state that does not focus on specific behaviors or events (*Schaufeli et al., 2002*). Therefore, gamification cannot significantly affect the stable state.

In the study on the effect of gamification on the perceptual diagnostic task (*Ong, 2013*), it was found that the introduction of points, ratings, and rewards significantly increases the effectiveness of task performance, while storytelling significantly increases internal motivation and prefrontal oxygenation. It was also found that fNIRS scores of frontal activation may be a reasonable objective indicator of cognitive effort. This presents significant real-world applications for objectively measuring motivation.

4. Discussion

The study (*Kwon, Özpolat, 2020*) describes that many teachers of different specialties demonstrated the benefits of gamification in higher education and provided evidence of improved attitudes, engagement, pleasure, motivation, (perceived) learning, participation, practical skills, retention, satisfaction, and student performance (their grades) (*Ossowski et al., 2011*).

The educational literature on gamification in higher education institutions indicates the need to use and develop a specialized online platform or an automated learning management system (G-LMS, gamified learning management system) (*de-Marcos et al., 2017; Villagrasa et al., 2018*).

Studies conducted in the field of education have considered the results of the use of gamification as mostly positive (*Kogotkova et al., 2021; Sycheva et al., 2020*). But there were also negative results, which need to be paid close attention to (*Krause et al., 2015; Hamari et al., 2014*).

Below are some examples of the use of gamification technologies for training employees of various companies:

1) An example of gamification in the company Yota (mobile operator). The company has developed several business games, but the largest game (corporate) project is considered to be Yota Star Wars, held back in 2015 for the game "Star Wars". The share of employees who completed the full program of training and courses was 98%. An anonymous survey among the employees involved in the game showed that 88% of them positively evaluated the idea of the project and were happy to take part in it (*Komok, 2017*).

- purpose of the application: to increase the passion of the company's employees to increase sales and increase knowledge about the products;
- application method: creating an internal corporate game.

2) An example of gamification in the company Netpeak (performance marketing agency for business). The company started implementing a gamification system for its employees in 2012. Two dozen metrics (parameters) were selected with indicators, upon reaching which employees received virtual awards - badges. A track system was also developed. (*Zozulya et al., 2021*) For employees of a number of roles, the main page of the corporate system displays the track on which the vehicle is displayed. The higher the performance in the current quarter, the more "cool" the employee's vehicle is.

- purpose of the application: to increase the interest of employees and their motivation;
- application method: special system of awards "badges" in both virtual and real incarnation; general rating of employees.

3) An example of gamification in Directum (one of the leading Russian content management systems (ECM)). The company developed the game (product) "Directum Ascent" for training and involvement of its employees. It is aimed at increasing the interest of employees. The study of the Directum modules is organized in the form of training quests - a set of goals aimed at performing certain actions by the user. For achieving goals, the employee receives points and virtual rewards, moves from one level to another. The final page shows the overall ranking - the standings. As a result, training employees to work with the new system should be fast and interesting.

- purpose of the application: 1) To increase the interest of employees to independently study the capabilities of the system. 2) To increase motivation and organization of the work process in

companies. 3) To develop useful skills, in particular in working with the ECM. 4) To increase the productivity of employees individually and the team as a whole.

- application method: training quests for training and involving users (employees of companies) in the work.

4) An example of gamification at Zoho Corporation (India's largest multinational IT company specializing in software as a service, software development, and cloud computing). It is best known for its Zoho online office suite. The company added a Gamescope gamification layer to its business services. The developers used this tool to turn routine activities (closing tickets, entering contacts, calling customers, etc.) into an interesting game. The ability to create games has already appeared in Zoho Projects, and will gradually appear in other services. A distinctive feature of gamification from Zoho is that the games can be created by the employees themselves. When employees themselves come up with a game, determine the cost of tasks, the reward – it becomes more interesting for them. (*Shirokova, 2017*)

- purpose of the application: to turn routine activities into an interesting game;
- application method: creating an educational institution designed to find and train students who will become successful employees of the company.

5. Conclusion

Until recently, companies tried to avoid such a concept as gamification, only some companies believed that using different types of games they would help employees, including the company, to be "afloat". After all, with the help of gamification, it is much easier for employees to work in a team, and there is an interest in working. In addition, quests and challenges are very popular with customers, as they stimulate sales and increase brand loyalty. However, we should not assume that gamification is an effective tool for learning that promotes work. Often, with poor game preparation, for example, gamification distracts from work and even divides the team into players and non-players.

The complexity of developing gamified online products for education, and the lack of a unified approach to evaluating the results of such implementations are certainly an obstacle to the wider spread of gamification in education, but they are also a source of new ideas for conducting research in this area. This is also facilitated by the variety of variations in the use of gamification technologies and the presence of already confirmed positive experience.

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