Learning gamification tools for the development of students' cognitive independence

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Ferramentas de aprendizagem de gamificação para o desenvolvimento da independência cognitiva dos alunos

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Herramientas de ludificación del aprendizaje para el desarrollo de la independencia cognitiva de los estudiantes

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Resumo: O objetivo do artigo é uma análise do impacto das ferramentas de gamificação de aprendizagem em instituições de ensino superior na independência cognitiva dos alunos. O estudo envolveu o método de avaliações de especialistas, o método de classificação de escalas de medição e o método de controle sistemático e autocontrole. O método de pesquisa e o método de análise de desempenho acadêmico também foram usados. O coeficiente de confiabilidade alfa de Cronbach foi usado para verificar a confiabilidade dos métodos. Seguiu-se a comparação dos resultados de ambos os grupos por meio dos testes de Cramer-Welch e χ^2. A comparação dos valores empíricos calculados do critério Emp com o valor crítico de 0,05 = 1,96 ao nível de significância de 0,05 mostra que Temp ≥ Tcr para os grupos comparados. Os valores empíricos do critério Emp2 calculados para os grupos controle e experimental após o experimento podem ser comparados com o valor crítico de 0,052 = 5,99 ao nível de significância de 0,05. Os resultados do estudo deram base para afirmar que a aprendizagem da gamificação é eficaz para o desenvolvimento da independência cognitiva dos alunos. Isso se deve ao alcance de um alto grau de envolvimento do aluno no processo educacional.

Palavras-chave: *Ambiente educacional. Didática inovadora. Ensino superior. Processo educacional. Tecnologias de jogo.*

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Abstract: *The article's aim is an analysis of the impact of learning gamification tools in higher education institutions on students' cognitive independence. The study involved the method of expert evaluations, the method of classification of measuring scales, and the method of systematic control and self-control. The survey method and the method of analysing academic performance were also used. The Cronbach's alpha reliability coefficient was used to check the reliability of the methods. This was followed by comparison of the results of both groups using the Cramer-Welch and χ^2 tests. Comparing the calculated empirical values of Emp criterion with the critical value of 0.05 = 1.96 at the significance level of 0.05 shows that Temp ≥ Tcr for compared groups. The empirical values of the Emp2 criterion calculated for the control and experimental groups after the experiment can be compared with the critical value of 0.052 = 5.99 at the significance level of 0.05. The results of the study gave grounds to state that learning gamification is effective for the development of students cognitive independence. This is due to the achievement of a high degree of student involvement in the educational process.*

Keywords: *Educational environment. Educational process. Game technologies. Innovative didactics. Higher education.*

Resumen: *El objetivo del artículo es un análisis del impacto de las herramientas de gamificación del aprendizaje en las instituciones de educación superior sobre la independencia cognitiva de los estudiantes. El estudio involucró el método de evaluación de expertos, el método de clasificación de escalas de medición y el método de control sistemático y autocontrol. También se utilizó el método de la encuesta y el método de análisis del rendimiento académico. Se utilizó el coeficiente de confiabilidad alfa de Cronbach para verificar la confiabilidad de los métodos. A esto le siguió la comparación de los resultados de ambos grupos utilizando las pruebas de Cramer-Welch y χ^2. La comparación de los valores empíricos calculados del criterio Emp con el valor crítico de 0,05 = 1,96 en el nivel de significancia de 0,05 muestra que Temp ≥ Tcr para los grupos comparados. Los valores empíricos del criterio Emp2 calculados para los grupos control y experimental después del experimento se pueden comparar con el valor crítico de 0,052 = 5,99 al nivel de significación de 0,05. Los resultados del estudio dieron pie a afirmar que la gamificación del aprendizaje es efectiva para el desarrollo de la independencia cognitiva de los estudiantes. Esto se debe a la consecución de un alto grado de implicación del alumnado en el proceso educativo.*

Palabras clave: *Ambiente educativo. Didáctica innovadora. Educación superior. Proceso educativo. Tecnologías de juego*

1 INTRODUÇÃO

1.1 RELEVANCE

The relevance of the chosen topic is determined by the global trend in the development of computer technology, which determines the transformational processes in the field of education, both in Kyrgyzstan and in Ukraine. Therefore, the education systems of the two countries are tasked to use modern technologies for building the necessary competencies in future specialists. Gamification of learning, which has been used both in Kyrgyzstan and in Ukraine, is one of the most controversial means of resolving this issue (ADANIR et al., 2022).

Kyrgyzstan has extensive experience in introducing advanced educational technologies into the national education system. The country is implementing student-oriented teaching methods in practice and is showing great suc-cess (ADANIR et al., 2020). Along with Kyrgyzstan, Ukraine aims to implement advanced educational technologies in order to modernize its scientific and educational potential. Many researchers note that the use of gamification in education has a positive impact on students' motivation, which ultimately increases the effectiveness of their studies (SADOVETS, et al., 2022).

It is known that there is still no single definition of the game. Researchers of the concept take a certain reality, culture, intuitive awareness, and the place of the game in the life of society as the basis. A person is constantly improving, moving forward, so the game shall not be subject to a final, unequivocal definition. A game is always something more and something different than a person can assume (MANGAROSKA et al., 2022).

Many other definitions of the game are known in scientific circles. For example, Cattaneo Alberto A.P. et al. (2022) claim that "a

game is something that is conceived and done; what the subject thinks about, when he is really engrossed in an activity with a definite attitude towards an obvious result". In their opinion, the game contributes to the development of abilities and skills, psyche, and self-realization. The game can help create a good psychological climate in the team, overcome many personal complexes, for example, indecision or shyness. The game can form independence, initiative, communication, contributes to the creation of equal conditions of activity, erases the boundaries between the student and the teacher (ABOAGYE et al., 2020).

According to the game theory, game is of great importance in a child's world. It is similar to the world of prehistoric man, who endows all living and non-living things with mystical properties. However, a transformation takes place as the child grows up: what the child considers to be his full world, the adult perceives as a game (OLIVEIRA & De SOUZA, 2022).

The change in the size of the immediate development zone is based on two provisions:

a) the immediate development zone is a fairly established and developed characteristic for the subject (as well as actual development);
b) the communication through which the development zone is realized can become an obstacle to the acceptance of help from the outside and, accordingly, affect the size of the immediate development zone (MANZANO-LEÓN et al., 2021).

The procedure for increasing the development zone requires special conditions and is mostly used in individual learning. However, it is very important not only to rely on the student's actual development and his/her development zone, but also to rebuild it and increase its size.

An educational game is a gamification tool, a component of the education system, which allows various ways of demonstrating the cognitive independence of students. It is known that the game as a method of learning has existed since ancient times, and was widely used to transfer experience from the older generation to the younger one. The combination of game and learning elements depends on how the teacher understands the functions of the game and classifies them. This determines the place and role of game technology in the educational process.

1.2 UNEXPLORED ISSUES

The conducted analysis gives grounds to state the main contradiction between the objective need to create a pedagogical system for building students' cognitive independence and the weakly developed scientific and pedagogical conditions for that purpose. This contradiction in the educational systems of Kyrgyzstan and Ukraine is detailed in the following unexplored issues:

a) insufficiently developed methods of learning organization, which maximizes students' cognitive independence;
b) lack of a system for organizing students' independent learning and cognitive activities developed for the implementation of gamified learning technology;
c) the predominant use of traditional forms and methods focused on the development of abilities and skills to complete assignments according to previously developed instructions;
d) lack of organizational and methodical conditions for the meaningful independent work when learning in Higher Education Institutions (HEIs), where the gamified learning technology is implemented.

1.3 AIM

The study of the effectiveness of learning gamification tools in the development of students' cognitive independence in HEIs.

1.4 OBJECTIVES/QUESTIONS

a) Analysis of the dynamics of students' cognitive independence during the educational process;
b) Determination of the impact of gamification

on the dynamics of changes in cognitive independence.

2 LITERATURE REVIEW

According to Ge Zi-Gang (2018), an educational game is a form of educational activity that simulates certain practical situations. The author also considers the educational game as a means of activating educational activities that can contribute to mental development. In its essence, an educational game is a didactic game that is organized at the highest level. In such games, certain actions related to solving specific tasks are performed, on the one hand. On the other hand, activities in the virtual world are conditional, they enable distracting oneself from the real situation, absolving responsibility for mistakes that could lead to certain consequences in the real world. This is stated in the studies of Garett Renee and Young Sean D. (2019) and Aldemir Tugce et al. (2018). Besides, visualization and simultaneous impact on various sense organs activate cognitive activity and facilitate learning of the material.

Álvaro-Tordesillas Antonio et al. (2020) note that educational gaming activities can lead to addiction. There is currently no way to treat such addiction. Many specialists believe that this type of addiction is much more difficult to cure than tobacco, alcohol or even drug addiction. However, addiction is not likely to occur in case that the games are used under the teacher's guidance. There can be several reasons for that. One of the reasons is that in the educational process you can play games strictly for a certain time, which is regulated by age and individual characteristics. The second reason stated by Antonaci Alessandra et al. (2019) in their study is that the game should test the student's role in the lesson.

As stated in a study by Bicen Huseyin and Kocakoyun Senay (2018), gamification enhances existing experiences using the same motivational techniques that make people love games. It incorporates elements of game design and general principles, as well as theories that define gameplay and applies them to other contexts.

If we analyse the study by Bouchrika Imed et al. (2019), we can conclude that the concept of gamification has become the most widespread in recent years. To date, there is no single generally accepted approach to this category. There are a number of terms that intersect with gamification in a certain way, but cannot be completely identified with it. The scientific community is string for separation of this term from the world of video games and mobile game applications, translating gamification into the context of business and management tasks, without losing the game elements.

When considering the essence of gamification, Pereiaslavska and Kozub (2021) point out that it is not a process of creating a game, but only a transfer of certain positive elements, mechanisms and characteristics of the game (goal, rules, feedback and freedom of participation) to the non-game sphere. However, there is a lack of unity regarding the game elements and the mechanisms that distinguish them. According to Yanchuk Roman (2021), gamification is most often defined as the partial inclusion of game elements to create an interactive cooperation system without a full-fledged game as the final product.

Timokhova Galina et al. (2022) define gamification in the broadest sense as the process of applying game elements and mechanisms in a non-game context. As a rule, the following types of gamification are distinguished within this approach: organizational and social gamification. Researchers make distinctions by directions of use, rules, tasks, and types of players, while recognizing the commonality of game mechanisms used.

3 METHODS

3.1 DESIGN

The studies on the pedagogical potential of learning gamification were used as the theoretical and methodological framework of the research. Aldemir Tugce et al. (2018), Ertan Kübra and Kocadere (2022) studied the peculiarities of learning gamification.

The study of the development of cognitive independence of the respondents in the pedagogical conditions of learning gamifica- tion was carried out in several stages. The content and terms of implementation are presented in Table 1.

Table 1- Stages of research on the development of cognitive independence through the use of gamification

Research stage	Timing	Description
Preparatory	2021	Preparation for the research: determination of the aim, objectives and tools of the research. Selection of research methods. Preparation for data collection and processing.
Primary	January-June 2022	Conducting a pedagogical experiment. Conducting primary research through input control. Analysis of the dynamics of students' cognitive independence. Carrying out the final control after the end of the pedagogical experiment.
Final	September-November 2022	Analysis of the obtained results, drawing conclusions.

Source: Prepared by the authors (2023).

3.2 PARTICIPANTS

The research methods were selected with a view to the aim and research objectives. Respondents were students of the Municipal Establishment "Kharkiv Humanitarian-Pedagogical Academy", who were asked to answer the questions in order to study the research variables using Google Forms. The research involved students majoring in pedagogy of the Municipal Establishment "Kharkiv Humanitarian-Pedagogical Academy" of the 2nd-4th years of Undergraduate studies and 1st-2nd of Master studies of different specializations. The sample size is 460, of which: 355 bachelors and 105 masters; 400 of them are students from Ukraine and 60 are part-time students from Kyrgyzstan. The age of the respondents is from 16 to 25 years, the majority of respondents (78.5%) were women, 21.5% were men. Sampling is serial, that is, groups were selected randomly, and a continuous survey was conducted within those groups. A group of 30 experts participated in the study. They were pedagogy teachers of the Municipal Establishment "Kharkiv Humanitarian-Pedagogical Academy". So, the sample reflects averaged data on students majoring in pedagogy of HEIs and enables conducting a representative study. Pedagogical conditions for the introduction of gamification elements in the study of such subjects as Pedagogy, General Psychology, Pedagogical innovative technologies, and Theory of Education were created for the experimental group. The control group studied the above subjects under traditional pedagogical conditions.

3.3 INSTRUMENTS

Google Forms were used for the survey. Data entry and processing was carried out using SPSS Statistics 16.0. All data are given in relative values.

3.4 DATA COLLECTION

a) The method of systematic control and self-control was used in the study of the learning trajectory in order to identify the effectiveness of the learning gamification. Systematic control and self-control contribute to the building the ability to self-organize the development of cognitive independence when studying subjects in the created pedagogical conditions of gamification (Appendix A). The survey method and the method of analysing academic performance were also used.

b) In psychological and pedagogical research, the classification of measurement scales proposed by Stevens S. S. (1946) is used: nominal, ordinal, interval, and ratio (Figure 1). In the study, the number of correctly completed assignments during learning with the use of gamification was taken as a student characteristic.

Figure 1- Stevens' measurement classification
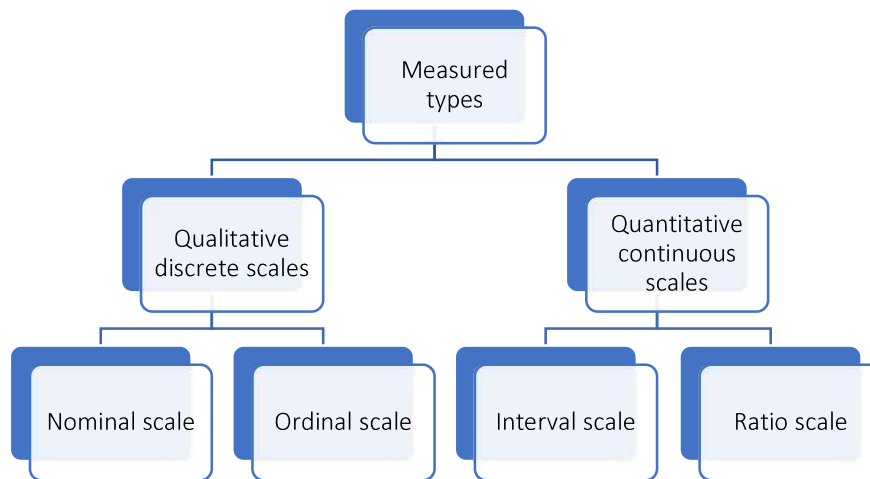
Source: Developed by the authors based on Stevens (1946)

Statistical hypotheses were formulated: null (H_0) about the absence of differences and alternative (H_1) about the significance of differences. The significance level was α = 0.05.
3. Method of expert evaluations. It was used to analyse the results of students' educational activities. The expert group also studied the level of students' cognitive independence.

$$\frac{N}{N-1}\left(\frac{\sigma_x^2 - \sum_{i=1}^{N}\sigma_{Y_i}^2}{\sigma_x^2}\right),$$ (1)

where σ_x^2 – total test score variance;

$\sigma_{Y_i}^2$ – variance of i element.

b) Experimental and control groups were chosen to conduct an experiment to determine the impact of gamification on increasing the level of cognitive independence. The results of both groups were compared using the Cramer-Welch and χ² tests (ALI & BHASKAR, 2016).

3.6 ETHICAL CRITERIA

The methods used comply with the academic principles of professionalism, integrity, verifiability, absence of contradictions, respect for general human rights and freedoms. The respondents gave their informed consent for the processing of personal data and the publication of research results in academic publica-

3.5 ANALYSIS OF DATA

a) The Cronbach's alpha reliability coefficient indicates the internal consistency of the test assignments. The Cronbach's alpha is calculated by the formula:

tions. The tools and techniques were tested for reliability and validity and are beyond doubt.

4 RESULTS

The results of the input (initial stage of the experiment) and output control (the final stage of the experiment) show the results of measuring the level of training in the ratio scale. The comparison of the calculated empirical values of the Emp criterion with the critical value of 0.05=1.96 at the significance level of 0.05 made it clear that $T_{emp} \geq T_{cr}$ for comparing groups at the significance level of 0.05. The sample mean and sample variance were used when finding Emp (Table 2).

Table 2- Values of sample means, sample variances before and after the experiment

| The number of completed tests	CG		EG	
	Before	After	Before	After
Sample mean	5.877	5.760	5.800	6.800
Sample variance	1.100	2.447	1.287	1.567

Source: Calculated by the authors (2023)

Therefore, the reliability of the differences in the indicators of the compared samples is 95%. It was experimentally confirmed through the use of the Cramer-Welch criterion that the development of the ability to self-organize the independent work of students of HEI with the help of gamification technology gives different results than with the use of traditional learning technologies. The compared groups were tested for "equality". The empirical values of the Emp2 criterion calculated for the control and experimental groups after the experiment can be compared with the critical value of 0.052=5.99 at the significance level of 0.05. For all compared groups, $\chi_{emp}^2 \geq \chi_{cr}^2$ at the significance level of 0.05. So, the reliability of the differences in the characteristics of the compared samples is 95%, that is, the development of students' self-organization ability through gamification changes the learning outcomes.

Independent works, which was evaluated by experts for content, effectiveness and independence, were a qualitative assessment of the level of student activity. The level of students' independence in learning and cognitive activities was determined by the presence or absence of independence as a phenomenon: complete independence, partial independence and lack of independence.

The analysis of statistical data showed a noticeable increase in the average indicator of the level of activity and efficiency in the experimental groups compared to the students of the control group. Although the learning and cognitive activity increased among students in the control group, it happened much more slowly, which confirmed the effectiveness of the influence of the selected set of organizational and pedagogical conditions. The results are presented in Figure 2.

Figure 2-The results of verifying the effectiveness of the influence of organizational and pedagogical conditions on the level of students' learning and cognitive activities
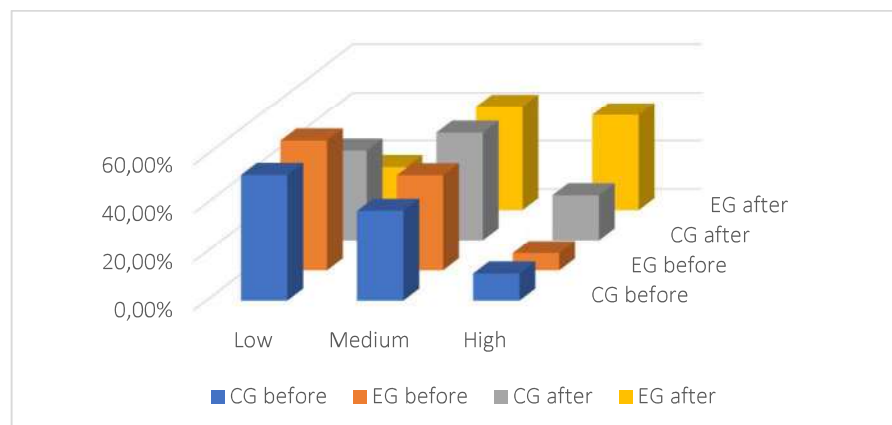
Source: Developed by the authors (2023).

The difference in the results obtained in the experimental and control groups indicates that the process of activating learning and cognitive activities with the help of gamification is more successful. Moreover, the results obtained in the experimental group gave grounds to determine a general trend: activation of the learning and cognitive activity of students is more successful where gamification of the educational process is implemented. In other words, the effectiveness of using pedagogical conditions of gamification is higher than traditional pedagogical conditions.

The analysis of students' answers (Table 3) regarding the traditional system of education "As it is" shows that students of three years of study — 1st, 3rd, 4th — are ready to study as they are taught. They consider class attendance (8.00) and in-class tests (7.25) very important.

Table 3. Comparative analysis of the answers of students of the 2nd, 3rd, and 4th years of study

"As it is"		"As it should be"	
Class attendance	8.00	Class attendance	8.33
In-class knowledge tests	7.25	Correction of mistakes in the in-class knowledge test	8.26
Intermediate attestation	7.17	Verbal response at the desk	8.01
Speech with reports at the blackboard	7.08	Verbal response at the desk	7.94
Work at the blackboard	7.03	Speech with reports at the blackboard	7.88
Verbal response at the desk	6.98	Intermediate attestation	7.87
Home knowledge tests	6.65	Presentation at scientific conferences	7.85
Correction of mistakes in the in-class knowledge test	6.61	Making student's portfolio	7.68
Presentation at scientific conferences	6.65	Correction of mistakes in the homework knowledge test	7.57
Publication of articles	6.11	In-class knowledge tests	7.56
Correction of mistakes in the homework knowledge test	6.00	Home knowledge tests	7.58
Research assignments	5.99	Research assignments	7.50
Making student's portfolio	5.39	Publication of articles	7.28
Colloquium	5.01	Colloquium	6.13

Source: Developed by the authors (2023).

As Table 3 shows, students want to study in the future as they study now, because a different approach to their studies is unfamiliar. All types of activities increased the average score. Consequently, students are self-critical and ready to improve traditional indicators. They need a fairly high level of general intellectual development to successfully study at the HEI.

The obtained results of the experiment indicate that the traditional system of teaching & learning in HEIs pays insufficient attention to the activation of students' learning and cognitive activities. The level of students' learning and cognitive activities in the control groups changes little compared to the experimental groups, where the organizational and pedagogical conditions were implemented. Qualitative assessment of the process was carried out using the non-parametric chi-squared test. The calculation results showed that the data: $x^2_{exp} = 7.103 > x^2_{crit} = 5.991$. The null hypothesis was rejected at the 5% level of significance and the alternative hypothesis was accepted. This enabled concluding that the level of students' learning and cognitive activities of the experimental group is significantly higher than that of the students of the control group.

5 DISCUSSION

Speaking about the role of gamification in the educational process, the main task is worth noting: game mechanics are able to help improve and optimize the educational process,

as Çağlar-Özhan Şeyma and Arkün-Kocadere Selay (2020), Hursen Cigdem and Bas Cizem (2019) noted in their studies. According to researchers, the main goal of gamification is to involve students in managing their own education as quickly and easily as possible. However, Zhang Qi and Yu Zhonggen (2022) and Swacha Jakub (2021) raise concerns about the feasibility of using gamification elements to build specialized competencies. Researchers note that such educational technologies as simulation, virtualization and augmented reality show more significant efficiency in building technical competences. At the same time, studies do not deny the effectiveness of gamification technology in building such competencies as readiness for independent cognitive activity of students of HEIs.

Kotukh Olena (2021) studied the peculiarities of preparation for the development of students' cognitive independence. The authors note the high effectiveness of the methods of active involvement of students in the formation of individual trajectories of the educational process. The studies conducted by Mechus H. and Smotr O. (2021), Shaw Rabi and Patra Bidyut Kr. (2022) on the specifics of using gamification to solve various pedagogical problems are worth noting. The authors express the opinion that cognitive independence in education is formed through the use of technologies and means capable of increasing the level of learning motivation. Among Kyrgyz studies, the works of Dicheva Darina et al. (2022) and UN.ESCAP (2022) should be noted, which provide a detailed analysis of the effectiveness of gamification of the educational process. The authors note the high efficiency of the method for the development of students' professional competences, including cognitive independence. The elements of gamification can help students overcome resistance to independent learning by increasing interest in the process of acquiring knowledge.

The literature review shows that the methodical aspect of content development and organization of students' independent work during the performance of the educational assignment is sufficiently studied in practice-

oriented research. The development of cognitive independence as a system-forming core of professional training is considered in the works of Rashidov Anvarjon (2022) and Shutenko Elena et al. (2021). Orientation of the students' learning towards the development of their cognitive independence requires changes in all components of professional training. It is especially important to take this into account when introducing innovative pedagogical technologies into the educational process, which in the theoretical justification are specifically focused on improving the quality of the educational process.

The theoretical significance of the study is that it clarifies the phenomenon of cognitive independence as a basis for improving the quality of professional training of a modern specialist. The possibilities of strengthening the educational potential of education gamification technology, focused on the development of students' cognitive independence in HEIs, are analysed. The pedagogical system of the development of cognitive independence proposed in the study and the conditions for its implementation can be used to extend the didactic theory of developing students' cognitive independence.

The practical significance of the study in consideration of specific methods of analysing the pedagogical system, which forms and further develops the cognitive independence of students in various types of educational and extracurricular activities. The reliability of the results is ensured by relying on modern methodology, comprehensive use of adequate goals and tasks of research methods. This is provided by the combination of theoretical analysis of the problem with the generalization of empirical data, relying on the author's many years of personal experience in pedagogical and managerial activities.

The main limitations of the study were, first, the inadequately developed methodology for studying the effectiveness of the impact of gamification on the development of cognitive independence. Second, there is a lack of direct methods for measuring the effectiveness of pedagogical conditions for the development

of cognitive independence. There are difficulties in conducting a representative study of the level of cognitive independence of students from Ukraine and Kyrgyzstan within the scope of the study in view of the Russia's military aggression. Despite this, technical capabilities of remote monitoring enabled approaching acceptable results based on the validity and impartiality criteria.

6 CONCLUSIONS

The relevance of the study is determined by the need to find effective methods of developing students' cognitive independence in view of the change in the educational paradigm. Modern education is aimed at implementing the "teaching to learn" principle as the main task of the educational process in HEI. Research findings. Upon summarizing various definitions and opinions, it can be concluded that gamification is the use of game approaches for non-game processes. This enhances the involvement of students in solving applied problems. The study showed the high effectiveness of gamification for the development of students' cognitive independence. Gamification is necessary to make any object or process exciting enough to make youth pay attention to them, and also memorize them for quite a long time. Applications. Conclusions and proposals which are based on the research findings can be used in the course of training and retraining of specialists in the system of secondary, higher and additional professional pedagogical education. The results of the study will be of interest to all participants in the educational process who are involved in the implementation of the latest educational technologies. Prospects for future research. Further research should be aimed at finding effective methods of forming cognitive independence in the context of a digital educational environment among Kyrgyz and Ukrainian students. A study on the strengths and weaknesses of the gamification of learning are considered will also be relevant.

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APPENDIX A

Activity Threshold Test

Purpose of the technique: Identification of the respondent's cognitive activity in solving life problems.

1. Before doing something important, I make up my mood for a long time, pluck up my spirits.

2. If I am faced with a difficult problem, I will not rest until I have tried all the ways to solve it.

3. It seems to me that my friends dare to do things more easily than I do.

4. I prefer to work alone in order to interact less with other people.

5. Sometimes I think I can move mountains.

6. In my opinion, it is a waste of time if thinking does not end with a real thing.

7. I often refuse interesting and useful things if it is related to organizational difficulties (delivery of tickets, collection of certificates, standing in line)

8. I rarely feel cheerfulness, a surge of strength, a desire to be active.

9. I am not afraid to make mistakes when I do something, because mistakes are inevitable if you want to move forward.

10. When I am around people for a long time, I physically feel the need to be alone.

11. I don't like people who constantly doubt instead of acting.

12. It seems to me that if I do something wrong everyone will immediately notice it, and I will look silly.

13. I preferred such a job where you have to think more than do.

14. If I made a decision to do something, I will definitely implement it.

15. I feel good only when I am active.

16. I prefer to relax by reading a book or watching TV than going on a visit or a country walk.

17. I am ready to wake up well before dawn and wait in line all day to get to an interesting performance or exhibition.

18. I often put things off until later.

Interpretation of the results:

1 point is assigned for an answer that matches the key, while 0 points is assigned for the answer that fails to match the key. A total score is calculated, which is compared with the test norms. 0-5 points indicate a low activity threshold. An active life position, not inclined to think about actions and consequences for a long time. Confident when active, persistent in achieving a goal, not inclined to reflect and admit own mistakes, difficult to correct. 6-10 points — the medium activity threshold — reflects a balanced and harmonious combination of real activity and inner experiences and thoughts. 11-18 points — high activity threshold, the respondent is inert, slow-starter, more prone to "inner life" than to external activity. Postpones necessary actions until the last opportunity. Does not like to interact with other people, prefers to work and rest alone. Worries about the problems for a long time, likes to go in for self-analysis.