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ORIGINAL

Adaptation of digital gamification in professional education amid martial law challenges

Adaptación de la gamificación digital en la educación profesional en medio de los desafíos de la ley marcial

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ABSTRACT

Introduction: the growing interest within the scientific community in the potential of gamification in professional education during wartime drives the relevance of this research.
Objective: identify the significance of positive and negative factors in gamification in professional education and analyse their impact on the educational environment.
Method: the research used scientific literature analysis, statistical data analysis, and generalisation and systematisation to substantiate the main features and positive and negative aspects of gamification in professional education. To justify the feasibility of applying gamification elements in the Ukrainian context, an expert survey of lecturers was conducted, which allowed for the formation of weighted average indicators by criteria using Excel tools and the performance of a correlation SWOT analysis in the JASP program (Classical Correlation tool).
Results: the analysis revealed that lecturers rate the advantages and opportunities of gamification higher than the challenges and threats. Positive effect include of gamification on the development of students' collaborative skills, engagement, and motivation, however, negative consequences the creation of unhealthy competition, reduced learning effectiveness, and the need for enhanced control over game elements.
Conclusions: the research identified that the main aspects that will contribute to the effective integration of game elements into the learning process are an integrated approach, infrastructure reliability, flexibility, and adaptability of educational programmes, which will ensure the further development of approaches to student engagement and the enhancement of their motivation in the process of acquiring professional skills.

Keywords: Digital Technologies; Gamification; Educational Process; Professional Skills; Consequences of War; GPT in Education.

RESUMEN

Introducción: el creciente interés de la comunidad científica por el potencial de la gamificación en la educación profesional en tiempos de guerra impulsa la relevancia de esta investigación.

Objetivo: el objetivo principal de este artículo es identificar la importancia de los factores positivos y negativos de la gamificación en la educación profesional y analizar su impacto en el entorno educativo.
Método: la investigación utilizó el análisis de la literatura científica, el análisis estadístico de datos y la generalización y sistematización para fundamentar las características principales y los aspectos positivos y negativos de la gamificación en la educación profesional. Para justificar la viabilidad de la aplicación de elementos de gamificación en el contexto ucraniano, se llevó a cabo una encuesta de expertos entre profesores, que permitió la formación de indicadores medios ponderados por criterios utilizando herramientas Excel y la realización de un análisis DAFO de correlación en el programa JASP (herramienta de Correlación Clásica).
Resultados: el análisis reveló que los profesores valoran más las ventajas y oportunidades de la gamificación que los retos y amenazas. Los efectos positivos de la gamificación incluyen el desarrollo de las habilidades de colaboración, el compromiso y la motivación de los estudiantes; sin embargo, las consecuencias negativas son la creación de una competencia malsana, la reducción de la eficacia del aprendizaje y la necesidad de un mayor control sobre los elementos del juego.
Conclusiones: la investigación identificó que los principales aspectos que contribuirán a la integración efectiva de elementos de juego en el proceso de aprendizaje son un enfoque integrado, la fiabilidad de la infraestructura, la flexibilidad y la adaptabilidad de los programas educativos, lo que garantizará un mayor desarrollo de enfoques para el compromiso de los estudiantes y la mejora de su motivación en el proceso de adquisición de competencias profesionales.

Palabras clave: Tecnologías Digitales; Gamificación; Proceso Educativo; Competencias Profesionales; Consecuencias de la Guerra; GPT en la Educación.

INTRODUCTION

The modern development of innovative technologies, which directly impacts the global market for goods and services, the labour market, and, consequently, the field of education, necessitates the search for practical tools to improve the educational process. Currently, active discussion within the scientific community is focused on the possibilities of educational technologies and the need to rethink traditional methods of professional education for students to develop the labour potential in various sectors of the economy.

The concept of gamification still needs a unified interpretation among researchers. However, the variability in definitions indicates the potential for expanding this direction and developing new standards for its implementation in various fields of professional education. In this context, Tkachenko[4] defines gamification as the application of games or game elements in a non-gaming context, particularly in obtaining education, to engage end-users in problem-solving. On the other hand, Petrenko[5] views gamification as a phenomenon of human activity that enhances the organisation of the educational process and the efficiency of managing educational efforts. In turn, Luo[6] emphasised in his study that gamification involves using elements or mechanisms of game design in non-gaming contexts to promote expected behaviour. He also noted the ambiguous research results regarding gamification's effectiveness in educational practice. Among the advantages of gamification in the educational process, many contemporary scholars highlight the increase in student motivation, communication and collaboration skills, the creation of healthy competition, and the active participation of all participants in the educational process in professional education.[7,8,9,10] In this context, Massman[11] notes that the implementation of game-based learning elements will ensure accessibility and safety, mainly through contextual learning, fast feedback, and the provision of opportunities for collaboration among participants in the educational process.

Moreover, the author emphasises the potential of gamification to increase student engagement, stimulate critical thinking, processing and analysis skills, and activate the learning process based on the cultivation of teamwork skills. According to Moseikina et al.[12] the implementation of digital gamification includes integrating game elements into online platforms, which allows for the expansion of access to professional education. The work of Lopes et al.[13] highlights the flexibility of game elements, which allows them to be adapted to both classroom and distance and blended learning formats. Another significant advantage of digital gamification is the possibility of integrating innovative technologies, such as Big Data, machine learning (ML), artificial intelligence (AI), and others, to create intelligent systems that enable teachers to create personalised assignments and curricula tailored to the individual needs of students.[14] In gamification, artificial intelligence technologies, such as OpenAI, GPT, Google Cloud AI, IBM Watson, and others, allow teachers to analyse pedagogical methods, conduct comprehensive competency assessments, and create a foundation for using game elements in their activities.[15] However, the disadvantages of gamification include the lack of technical support, low awareness among teaching staff about the possibilities and basics of working with gaming technologies,[16] increased dependence on technology, insufficient control over the use of game elements,[17] and increased stress levels

due to the formation of unhealthy competition among students.[18] The relevance of the skills formed through game elements is confirmed by the conclusions of Koval et al.[19] regarding the need for a high level of student engagement in the learning process to ensure their resilience and adaptation in the face of changing external conditions. In turn, Petrenko[5] emphasises that the implementation of gamification in pedagogical practice involves creating appropriate conditions for modelling subject curricula based on the internal laws of subject study in various fields. The author also noted that a feature of game-based activity in education is spontaneity and the absence of a clearly defined goal and structure, which requires improved self-management of behaviour and the creation of opportunities for collaboration among participants in the educational process in messengers, chats, and social networks. The importance of virtual communication is also highlighted by Boyko[20] who, given the effectiveness of creating connections through chats and social networks, suggests creating contests, quizzes, polls, and tests as gamification elements within educational programmes.

Given the growing interest in the gamification of education, this direction is relevant in addressing the issue of engaging students in the learning process to stimulate their cognitive and creative activity further,[1] the development of professional skills,[2] and ensuring a high level of motivation for learning.[3] In this context, the relevance of the research lies in determining the specific features of adapting digital gamification to the realities of professional education amidst war and the development of negative political, economic, and social phenomena in the country.

The purpose of this scientific article is to reveal the advantages and disadvantages of using game elements in the process of students obtaining professional education, as well as those faced by educational institutions during the long war, and to analyze their impact on the educational environment.

METHOD

Type of Study: the study followed a structured approach, combining qualitative analysis through a literature review and quantitative methods, including statistical and correlation analysis. In particular, literature analysis was utilized to identify the main advantages and disadvantages of digital gamification in the process of obtaining professional education; statistical data analysis was used to determine the volume of the global game-based learning market and its growth prospects in the long term; the method of systematisation was applied to identify the critical obstacles to the adaptation of gamification in the context of Ukrainian educational institutions, which face difficulties due to the ongoing war and associated challenges for the education sector; the generalisation method was used to analyse the positive and negative effects of adapting digital gamification to professional education needs; SWOT analysis method was applied to determine the positive and negative factors of digital gamification in vocational education; correlation analysis was conducted to identify the significance of positive and negative factors in the process of vocational education gamification in Ukraine.

Universe and Sample: the target population of expert survey method included 30 lecturers from various higher educational institutions in Ukraine. The lecturers assessed the criteria identified through the previous SWOT analysis of digital gamification in professional education on a scale from 1 to 10 points. Inclusion criteria include educators with experience using or evaluating digital gamification tools and digital education technologies, while exclusion criteria logically exclude educators without relevant experience. To ensure the representativeness of the sample, respondents were chosen by random sampling. The sample size (30 people) is considered sufficient to achieve the research objectives, as the number of respondents adequately covers the key institutions involved.

Study Variables: the key variables examined in this study included:

Strengths: increased motivation and engagement (S1); Curriculum adaptability (S2); Improving the assimilation of knowledge (S3); Development of collaborative skills (S4).

Weaknesses: the need to attract additional resources (W1); Creating unhealthy competition (W2); Increased dependence on technology (W3).

Opportunities: expanding the learning environment (O1); Ensuring interactive learning (O2); The need for precise control over the use of game elements (T2); Personalisation of learning programmes (O3); Ensuring a healthy learning environment (O4).

Threats: threats caused by war (T1); The need for precise control over the use of game elements (T2); Personalisation of learning programmes (O3); Ensuring that curricula are constantly updated (T3); Ethics of gamification in education (T4).

Data collection involved three stages: first, the questionnaires for the survey were given to the target group, which made it possible to form the initial data of the study. Secondly, a weighted average estimate of the significance of the influence of gamification factors on the educational process was calculated using the "Average" function of the Excel analysis package. Next, a correlational SWOT analysis of digital gamification in vocational education was conducted using the Classic Correlation tool in the JASP statistical program.

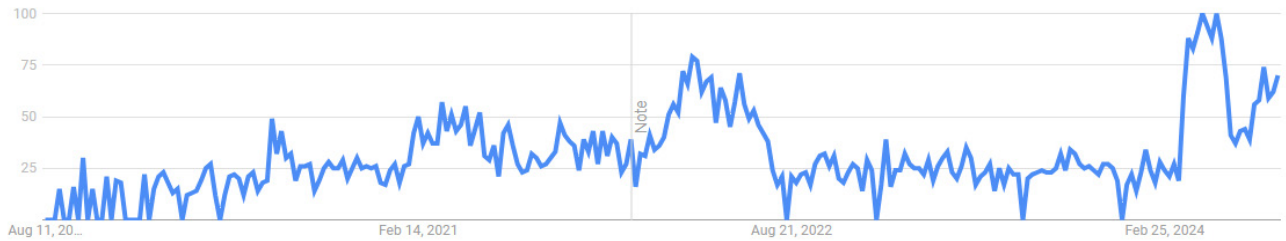
Statistical techniques and procedures: the weighted average significance score of the gamification factors was calculated using the "Average" function in the Excel analysis package. A correlation SWOT analysis was

conducted in the JASP statistical software, utilizing the "Classical Correlation" tool to determine the relationships between gamification factors. A confidence level of 95 % was set for the analysis, with a corresponding critical p-value of 0,05 for statistical significance.

Ethical Parameters: the study adheres to ethical principles, ensuring that the personal data of the participants remains confidential. All respondents participated in the survey voluntarily, respectively, by giving informed consent.

RESULTS

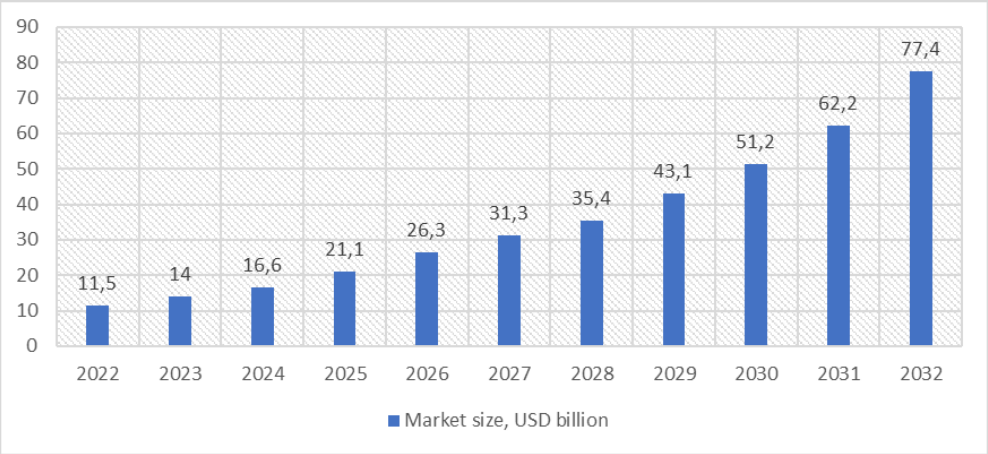
Today, digital gamification, as a component of the global trend towards integrating innovative technologies into the learning process, is a solution that facilitates the adaptation of professional education to the demands of modern society, which is primarily oriented towards digital solutions in all spheres of activity. Global trends in the development of this direction are characterised by the increasing influence of information and communication technologies (ICT) on the overall process of student learning and the acquisition of professional skills in the educational environment. According to Google Trends, interest in issues related to gamification peaked at the beginning of 2024 (see figure 1).



Source: compiled by the author based on Google trends[21]

Figure 1. Dynamics of growing interest in gamification of education in the world

The systematic implementation of gamification elements based on adaptive learning, grounded in big data analysis technologies and artificial intelligence (AI), contributes to the personalisation of the educational process, considering students' individual needs. Moreover, the priority of international cooperation between educational institutions underlines the importance of improving communication tools and digital platforms for creating joint educational projects, experience exchange, and developing innovative approaches to professional education. Given the current state of the field, mainly the increasing investment attractiveness of Game-Based Platforms and the growth of the Game-Based Learning Market (see figure 2), the prospects of gamification in professional education will shape a new learning paradigm that focuses on the integration of innovative technologies to ensure creativity and adaptability in the educational process.



Source: compiled by the author based on[22]

Figure 2. Global game-based learning market

The significant growth of the Game-Based Learning Market in recent years has been driven by the increase in the quality and quantity of game elements offered for various subjects and age groups. In particular, gamified learning platforms, educational programmes based on virtual reality (VR) and augmented reality (AR), and

game-based assessment tools have become widespread. Moreover, the growth of the broader EdTech market has contributed to the increased accessibility of digital devices and the creation of a favourable educational environment for implementing innovative solutions in Game-Based learning.[23]

Table 1. SWOT analysis of digital gamification in vocational education

Strengths	**Weaknesses**
Gamification elements create a new educational environment characterised by interactivity, flexibility, and relevance, ensuring a continuous increase in student motivation and engagement in the learning process. The adaptability of game elements is noted for its effectiveness due to the ability to consider the preparedness level of each student. Interactive elements help activate cognitive processes, thereby improving the assimilation of learning material, which allows for the formation of robust and long-lasting knowledge. Gamification provides flexibility in the learning process because it is applicable in traditional classroom settings and distance or blended formats. Including individual game elements that involve teamwork in the educational process ensures the development of communication and collaboration skills among students. These skills will enhance the competitiveness of future professionals in the market by enabling them to acquire key professional skills.	There is a need to attract additional resources to ensure the appropriate technical infrastructure. The involvement of many game elements can contribute to unhealthy competition among students, leading to superficial assimilation of learning material. Despite the overall effectiveness of the gamification method in motivating students to learn, low-quality or monotonous game elements can lead to uneven engagement and the loss of the technology's uniqueness in the long term. Implementing digital gamification will increase educational institutions' dependence on technology, requiring constant curriculum updates and adapting the teaching staff to innovations.
Opportunities	Threats
Integrating game elements into online platforms for professional education expands the learning environment and engages a more significant number of students in specialised education, including upskilling or reskilling. The interactivity provided by gamification enables innovative technologies, such as virtual laboratories, simulators, and interactive modules, to enhance the quality of professional education. Digital gamification technologies create the precondition for developing personalised curricula tailored to student's individual needs, thus contributing to the development of professional and soft skills. Gamification is an effective tool for maintaining motivation and reducing stress levels among students when completing assignments and taking exams.	The impact of harmful external factors, such as military actions and political and economic instability, on the educational process significantly complicates the implementation of innovative solutions. In particular, educational institutions face difficulties integrating game elements into curricula due to a lack of financial resources and infrastructure. Excessive gamification, low-quality gaming platforms, and unsuccessful integration of game elements can negatively affect educational participants' productivity and psycho-emotional state. To achieve a positive effect from gamification, educational institutions must focus on creating a system of regulation and control over the use of technologies. Otherwise, the emphasis on deep learning of material may be replaced by excitement and unhealthy competition among students. The rapid development of new technologies requires educational institutions to constantly update them and make additional investments, leading to risks associated with technological dependency and financial resources. In the long term, ethical issues may arise regarding the application of digital gamification, given the nature of this technology, which is based on manipulating student behaviour through game elements.

Despite the global trend towards the increased use of digital gamification in education, the implementation of such innovations is often accompanied by local challenges. For instance, with the onset of Russia's full-scale invasion of Ukraine and the intensification of hostilities, the effectiveness of technological progress in the field of education has slowed, and the need for developing new solutions to ensure equal access to education and safety during classroom and distance learning has significantly increased. Ukrainian educational institutions require substantial socio-economic changes to adapt the learning process to new realities in such conditions. The effectiveness of professional education development amid the war requires a quick response from educational institutions to the demands of the labour market. It changes in production technologies and service provision.[24] Therefore, measures to update educational programmes should address the skills gap caused by the imbalance between skills and enhance students' competitiveness in the global market, considering the consequences of prolonged war.

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Most Ukrainian educational institutions did not return to offline learning formats after the quarantine restrictions were lifted due to the high risk of shelling, the occupation of some territories, and the inability of some educational institutions to ensure uninterrupted learning amidst power outages or Internet disruptions. This situation requires the development, quality integration, and adaptation of new technological solutions to ensure an adequate level of education. Among the most popular solutions currently are Learning Management Systems (LMS),[25,26] the integration of virtual reality (VR) and augmented reality (AR), and so on.[27,28] It is worth noting that gamification of the learning process, which uses game elements to stimulate motivation and engage students in learning, is a practical direction for increasing student motivation, creating healthy competition, and ensuring active participation in interactive educational programmes. In this context, the role of gamification in obtaining professional education lies in adapting game elements, such as leaderboards, achievements, and badges, to the requirements of modern educational institutions. Game learning elements can be applied in various formats, including learning platforms, programmes, websites, and social networks.[6]

Based on the analysis of modern scientific literature on education and innovative educational technologies, the most significant advantages and priority ways of applying gamification in obtaining professional education by students have been identified. The positive outcomes of adapting game elements to existing learning standards are developing teamwork skills, stimulating healthy competition, and improving interaction between participants in the educational process. However, integrating such innovations is accompanied by several threats, such as Russia's military aggression in Ukraine, the lack of necessary resources, and students' characteristics. These factors contribute to developing such adverse consequences of gamification as dependence on technology, poor infrastructural support, and unequal student engagement in the learning process. A detailed study of the positive and negative effects of adapting digital gamification to the needs of professional education was conducted using the SWOT analysis method,[29] as presented in table 1.

In the context of the current challenges and prospects for the development of gamification, it is essential to assess the appropriateness of adapting game elements into Ukrainian educational programmes. A survey was conducted among 30 lecturers from higher educational institutions across different regions of Ukraine, evaluating the significance of defined criteria on a 10-point scale. Based on the survey results, a weighted average significance score for the impact of gamification factors on the educational process was calculated using the Excel analysis package (the "Average" function). The summary ratings obtained are presented in table 2.

Table 2. Assessing the significance of positive and negative factors in the process of vocational education gamification in Ukraine

Strengths		**Weaknesses**	
Factor	**Evaluation**	**Factor**	**Evaluation**
Increased motivation and engagement (S1)	8,267	The need to attract additional resources (W1)	7,1
Curriculum adaptability (S2)	8,3	Creating unhealthy competition (W2)	7,13
Improving the assimilation of knowledge (S3)	8,167	Increased dependence on technology (W3)	6,967
Development of collaborative skills (S4)	8,367		
Opportunities		Threats	
Factor	Evaluation	Factor	Evaluation
Expanding the learning environment (O1)	8,83	Threats caused by war (T1)	9,067
Ensuring interactive learning (O2)	8,53	The need for precise control over the use of game elements (T2)	8,1
Personalisation of learning programmes (O3)	8,63	Ensuring that curricula are constantly updated (T3)	7,03
Ensuring a healthy learning environment (O4)	8,7	Ethics of gamification in education (T4)	7,53

As a result of the evaluation by lecturers of the positive and negative factors identified through a SWOT analysis in the process of gamification of professional education in Ukrainian higher educational institutions, it was found that, overall, the significance of strengths (8,28) and opportunities (8,68) in adapting game elements outweigh the existing challenges (7,07) and threats (7,93). However, it is also essential to identify the nature of the impact of negative factors and the further development of positive gamification trends. In this context, it is appropriate to apply the method of correlation SWOT analysis, which uses an existing data set to determine the

degree of interrelationships between factors. The "Classical Correlation" tool in the JASP statistical analysis software[30] was used to conduct this analysis. The full version of the correlation analysis obtained using the JASP statistical analysis software is presented in table 3.

Table 3. Comprehensive correlation analysis using JASP statistical software

		Pearson's Correlations												
Variable		**S1**	**S2**	**S3**	**S4**	**W1**	**W2**	**W3**	**O1**	**O2**	**O3**	**T1**	**T2**	**T3**	**T4**
S1	Pearson's r	—													
	p-value	—													
S2	Pearson's r	-0,062	—												
	p-value	0,745	—												
S3	Pearson's r	0,155	0,256	—											
	p-value	0,415	0,172	—											
S4	Pearson's r	0,214	0,091	-0,096	—										
	p-value	0,256	0,632	0,616	—										
W1	Pearson's r	-0,026	0,172	-0,106	0,063	—									
	p-value	0,890	0,365	0,576	0,743	—									
W2	Pearson's r	0,322	0,332	0,188	-0,039	0,061	—								
	p-value	0,083	0,073	0,320	0,839	0,750	—								
W3	Pearson's r	0,092	-0,205	0,264	0,423	-0,182	-0,354	—							
	p-value	0,630	0,277	0,159	0,020	0,335	0,055	—							
O1	Pearson's r	0,298	-0,050	-0,228	0,317	0,338	-0,093	-0,044	—						
	p-value	0,110	0,795	0,225	0,088	0,068	0,626	0,817	—						
O2	Pearson's r	0,182	-0,130	0,051	0,226	-0,292	-0,190	0,109	0,102	—					
	p-value	0,337	0,493	0,790	0,230	0,117	0,316	0,565	0,592	—					
O3	Pearson's r	0,057	-0,261	-0,276	0,170	0,010	-0,467	0,016	0,354	0,136	—				
	p-value	0,763	0,163	0,141	0,370	0,957	0,009	0,933	0,055	0,473	—				
T1	Pearson's r	-0,011	0,173	-0,176	0,109	-0,154	-0,030	$9{,}612\times10^{-4}$	0,040	0,089	-0,176	—			
	p-value	0,952	0,362	0,352	0,566	0,418	0,876	0,996	0,832	0,640	0,351	—			
T2	Pearson's r	-0,127	0,195	0,078	0,054	-0,012	0,058	0,224	-0,092	0,249	-0,328	0,101	—		
	p-value	0,504	0,303	0,682	0,776	0,950	0,761	0,235	0,630	0,185	0,077	0,595	—		
T3	Pearson's r	0,196	-0,273	-0,094	-0,014	0,246	0,126	0,182	0,371	-0,006	-0,089	0,136	0,173	—	
	p-value	0,300	0,145	0,621	0,942	0,190	0,506	0,335	0,044	0,976	0,638	0,473	0,361	—	
T4	Pearson's r	-0,134	-0,248	-0,353	0,176	0,163	-0,031	-0,077	0,265	0,090	0,258	-0,118	0,073	0,089	—
	p-value	0,482	0,186	0,056	0,352	0,389	0,869	0,684	0,157	0,638	0,168	0,533	0,702	0,640	—

This analysis examines the Pearson correlation coefficients between the variables analyzed in the SWOT analysis presented in table 1. Each cell displays the Pearson's r value and the corresponding p value, indicating the strength and statistical significance of the relationships between variables. The results make it possible to identify positive and negative correlations, helping to identify significant patterns in the data and paying particular attention to the associations between the various variables included in the study. The results of the analysis are summarized in table 4.

The main trends identified during the correlation analysis include the possibility of expanding the learning environment by enhancing students' collaborative skills (r = 0,317 at p = 0,088). However, such expansion may necessitate the involvement of additional resources, particularly improvements in the technical aspect of the gamification process (r = 0,338 at p = 0,068). On the other hand, the excessive use of game elements, which causes unhealthy competition, significantly impacts the personalisation of educational programmes (r = -0,467 at p = 0,009). Furthermore, the threat of unethical use of gaming technologies leads to a decrease

in the effectiveness of these technologies in the assimilation of knowledge among students (r = -0,353 at p = 0,056). Therefore, the prospects for developing digital gamification in professional education currently require providing high-quality technical infrastructure and access to modern technologies and ensuring that educational institutions are adequately prepared to adapt gamification platforms to current curricula.

Table 4. Correlation SWOT analysis of digital gamification in vocational education

		Pearson's Correlations						
Variable		**S1**	**S2**	**S3**	**S4**	**W1**	**W2**	**W3**
O1	Pearson's r	0,298	-0,050	-0,228	0,317	0,338	-0,093	-0,044
	p-value	0,110	0,795	0,225	0,088	0,068	0,626	0,817
O2	Pearson's r	0,182	-0,130	0,051	0,226	-0,292	-0,190	0,109
	p-value	0,337	0,493	0,790	0,230	0,117	0,316	0,565
O3	Pearson's r	0,057	-0,261	-0,276	0,170	0,010	-0,467	0,016
	p-value	0,763	0,163	0,141	0,370	0,957	0,009	0,933
T1	Pearson's r	-0,011	0,173	-0,176	0,109	-0,154	-0,030	$9{,}612\times10^{-4}$
	p-value	0,952	0,362	0,352	0,566	0,418	0,876	0,996
T2	Pearson's r	-0,127	0,195	0,078	0,054	-0,012	0,058	0,224
	p-value	0,504	0,303	0,682	0,776	0,950	0,761	0,235
T3	Pearson's r	0,196	-0,273	-0,094	-0,014	0,246	0,126	0,182
	p-value	0,300	0,145	0,621	0,942	0,190	0,506	0,335
T4	Pearson's r	-0,134	-0,248	-0,353	0,176	0,163	-0,031	-0,077
	p-value	0,482	0,186	0,056	0,352	0,389	0,869	0,684

DISCUSSION

The results of the research show the potential to expand the learning environment through the development of students' collaborative skills (r = 0,317, p = 0,088), which is consistent with the opinion of Titova[16] regarding the possibility of promoting cooperation between participants in the educational process through the use of tools for a personalized approach in education. However, López (2024) identifies the technological training of students and teachers as the most important factor, ignoring collaborative skills. Instead, the shortcomings are highlighted by Titova;[16] in particular, the low level of awareness of the teaching staff about the possibilities and basics of working with game technologies was not found in our study; instead, the absence or need to improve the technical component of the gamification process (r = 0,338, p = 0,068) is a significant factor in the modern development of gamification in education, which is also confirmed by the findings of Petrenko et al.[5].

In addition, such negative effects as the excessive use of game elements and the formation of unhealthy competition between students (r = -0,467, p = 0,009) are confirmed in the studies of Sánchez-Mena et al.[17] and Yang et al.[18], who draw attention to the increase in the level of stress among students due to the formation of unhealthy competition between students. The threat of unethical use of game technologies and the reduction of their effectiveness (r = -0,353, p = 0,056) determines the importance of raising the level of awareness among teachers regarding work with gamification. Similar conclusions were reached by Koval et al.[19], which emphasize the role of active involvement of students and teachers in the learning process to adapt to a rapidly changing environment, and Petrenko et al.[5] who described the benefits of spontaneous and unexpected application of game elements during learning.

Thus, the research has made a significant contribution to the general scientific basis of this topic. Given the current trends in the development of education, in particular the growth of the global Game-Based Learning market,[23] the results of this study make a significant contribution to understanding the ways of adapting gamification platforms to Ukrainian educational needs, emphasizing the need to modernize the technical infrastructure and increasing the level of digital competence of teachers. The obtained results can serve as a basis for further research in the field of digital transformation in education, as well as for the development of recommendations for the implementation of gamification at various stages of professional training.

CONCLUSIONS

The most promising direction for the development of modern education is the adaptation of digital gamification to the process of obtaining professional education. In the context of war, this requires an integrated strategy, swift responses, and precise control over changes in the learning environment. Incorporating gamification elements into contemporary educational programmes enhances students' motivation and engagement in the

learning process and contributes to developing professional skills focused on adaptability, creativity, and collaboration with peers. However, gamification implementation comes with several risks, such as insufficient financial resources, dependency on technology, the consequences of war, and economic instability. In this context, the effective implementation of innovative approaches and game elements in professional education necessitates modern technologies, individualised learning strategies, and reliable infrastructure.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

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