I. J. Education and Management Engineering, **2025, 4, 50-63**
Published Online on August 8, 2025 by MECS Press (http://www.mecs-press.org/)
DOI: 10.5815/ijeme.2025.04.05

Professional Business Game as an Active Practice-Oriented Method of Teaching Modern Students in Technical Higher Education Institutions

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Received: 12 February, 2025; Revised: 15 April, 2025; Accepted: 03 June, 2025; Published: 08 August, 2025

Abstract: The purpose of the scientific article is to identify a possible solution to the problem of improving students' training effectiveness through the combined usage of active forms and methods of teaching students among the dependent learning parameters set. The authors came to this hypothetical opinion based on the comparative analysis results of previous studies, which confirm that the usage of active forms and methods of teaching students is the right vector for solving the lifelong problem of learning improving the effectiveness.

It has been established that the available psychological and pedagogical literature does not provide specific solutions for modern students – cyber - socialised youth, which would help to substantiate the best ways to intensify students' learning and cognitive activity.

Previous scientific studies have confirmed that the group of people who are most addicted to computer games, as practice shows, is difficult to motivate to study using traditional approaches when there is a distracting and, to some extent, gambling factor.

Based on these circumstances, the proposed research is obviously logical from the need to improve the theory and methodology of vocational education through the usage of active forms and methods of teaching students. New circumstances have determined the subject of the study, which is a professional business game. It has been experimentally determined that during a professional business game students will use simulation models to solve professional problems. To organise and conduct a professional business game, teachers define game and functional goals. In the above variant of the professional business game structural scheme, the goal of accelerating the discipline

development through students' learning activation is achieved. Organising and conducting a professional business game as an active teaching method involves preparation of both students and teachers for it, and also requires the methodological materials and technical means availability, which helps to increase the classes effectiveness conducted in a game form and to form professional competencies in students. The article provides practical steps for preparing participants of a professional business game.

Index Terms: Professional Business Game, Active Teaching Methods, Efficiency Coefficient, Students, Higher Education Institution, Teacher

1. Introduction

1.1. Problem Statement

The Strategy for the Development of Higher Education in Ukraine for 2022-2032, which meets Ukraine's obligations as a member of the European Higher Education Area, in particular, adheres to the key principles of the Bologna Process. This involves overcoming challenges, in particular through higher education digitalisation, the virtual mobility development, student-centred learning and teaching [1]. The teaching traditional system does not provide the necessary conditions for the formation and professional and business skills development in students of technical higher education institutions. Therefore, restructuring the educational process problem in higher education institutions, namely, revising the goals, teaching content and technology, is relevant. Among such technologies, an important place is occupied by game technologies, namely, business games. Due to the phenomenal activity of teaching forms and methods, it is possible to achieve the knowledge acquisition, the formation of students skills and abilities, as well as to contribute to improving the efficiency and quality of the educational process in higher education institutions. Solving the improving efficiency problem of learning is an important social task of modern higher education.

2. Literature Review

2.1. Analysis of Recent Research and Publications

According to A. Verbytskyi [2], the characteristic positive features of active teaching methods are high productivity of practical skills and abilities; increased student awareness; reduction of the educational process ‘formalisation’; high emotional level; demonstration, visibility.

In the scientist’s research [3], M. Herger compiled a table (Table 1) that allows a visual comparison of active game-based learning methods. M. Herger managed to visually draw the boundaries between similar, but not identical phenomena of different teaching methods in a tabular form, such as spontaneity, rules and goals, internal structure, real world and systematicity.

Table 1. Comparison of game-based teaching methods

Comparison Parameters	PopularTraditional Games	Role-Playing games	Business Games	Simulations	Gamification
Spontaneity	no	yes	no	no	no
Rules	yes	no	yes	yes	yes
Aim	yes	no	yes	yes	yes
Structure	yes	no	yes	yes	yes
Real world	no	no	yes	yes/no	yes
Systematicity	no	no	yes	yes/no	yes

As you can see, business games overlap with traditional (e.g. board) games in such areas as the presence of rules, goals, and game structure. We see the same similarities with Gamification and simulations. This is what makes a game as a type of human activity attractive: a clear, achievable and desirable aim, rules for achieving this goal and a step-by-step structure for getting to the goal.

However, a game transfers the player's action into the game space, into a fictional reality, while a business game leaves him or her in the real world with real non-game problems and tasks.

The structure of a business game in educational activities is twice as important, because the entire programme should be divided into certain steps/stages, and each stage should have its own goal, working towards the overall goal of the course.

We believe it is especially important that in a business game a student remains himself or herself and moves based only on his or her motivation and internal goal. The closest to Gamification are simulations that create the illusion of reality in a computer environment and serve educational purposes, but unlike simulations, Gamification uses the mechanics of a computer environment in the real world to create the illusion of a game.

As for the parameter of systematicity, which is extremely important for Gamification and not necessary for other game practices, systematicity means not occasional inclusions of the game in the structure of the activity, but a holistic process of appropriate support for this activity. In education, Gamification accompanies the entire educational course-from setting goals and objectives to the final knowledge control.

The main aspects of Gamification and business games are dynamics - the use of scenarios that require user attention and real-time response; mechanics - the use of scenario elements such as virtual awards, statuses, points, virtual goods; aesthetics - creating a general gaming experience that promotes emotional involvement of the user; social interaction - a wide range of techniques that provide interaction characteristic of games [3].

It is worth agreeing with the conclusions of Yu-Kai Chou that the practical application of gaming methods is more than just points, badges and leaderboards [4].

Undoubtedly, theoretical and practical changes have taken place in Ukraine and in the world for more than 30 years.

So, today, game-based methods are an important competitive advantage that allows you to 'reach out' to modern students who are used to playing computer games and communicating on social networks. The approaches used 20 years ago are becoming ineffective: learning as a simple transfer of information is perceived as a boring and uninteresting process [5]. In the face of declining motivation to learn, game-based learning methods come to the fore and become one of the trends in modern higher education [6].

Y. Arutyunov considers a business game as 'a new field of activity, as an imitation experiment, as a form of role-playing, research and solution of educational and upbringing tasks' [7].

B. Korotiaieva considers the business game as a component of contextual learning, in which the acquisition of knowledge, the formation of skills and abilities are combined with professional activities presented in a certain model form [8].

The uniqueness of the business game, as O. Kozlova notes, lies in the need for the student to make a decision. A characteristic feature of this game is the modelling by students of its content as a process of future professional activity, a system of relations within a given model of a real production team [9].

I. Syroiezhyn emphasises that a business game should be understood as a living model that reproduces the processes of decision-making and interaction of participants in the management system [10].

I. Belkin believes that it is necessary to conduct business games with students that to some extent imitate professional situations. Then the participants of the game develop practical skills of working in a labour collective, they gain experience in managing, leading and organising a team, master the skills of complex creative problem solving [11].

The results of the study [7-12] convincingly prove that active learning improves learning outcomes. However, the authors do not provide an example of a pedagogical technology for organising and conducting these particular lessons.

Business games are becoming a full-fledged means of activating students' cognitive activity [13]. This is confirmed in the scientific article [14], which results in the practice-oriented foundation formation of a business game as an active learning method in higher education institutions.

The business games stages and their application peculiarities in economic specialists training are reflected in [15]. It is convincingly proved that this teaching method can effectively develop the skills and professionally important qualities of a future specialist. This becomes the basis for expanding the business games scope, for example, in learning a foreign language [16]. It is through the game that a certain psychological mechanism of experience accumulation and transfer can be freely implemented. The main component of the game is the role and its perception. Role acceptance is carried out at the cognitive, emotional and behavioural levels. They are realised through the assignment of external features and behaviour norms, as well as tasks inherent in the role, to its performance. The game makes people exert their strength in sports, scientific research, and art. Role play as a tool to facilitate learning, self-reflection and social awareness [17]. Therefore, it is not difficult to organise and conduct a business game in a humanitarian HEI.

We believe it is necessary to note that organising and conducting a professional business game in higher education institutions of technical orientation should be recognised as having certain difficulties in perceiving the role. Certain successes were achieved in higher education institutions with specific learning environments in the officer-leader formation courses [18] using a professional business game on the future professional activity roles [19]. It is worth noting that modern military conflicts are becoming more complex, hybrid and require officers to constantly improve and adapt to the conditions. For this purpose, the use of the latest technologies in the process of training military specialists in higher military educational institutions (HMEIs) is becoming an extremely important element to ensure the success and effectiveness of military operations [20]. The majority of students evaluate role-playing games positively, seeing them as of great practical benefit. This is confirmed by the results of research [21], which shows that modelling practical situations in the course of a business game affects learning outcomes. As well as the new experience [22] that game-based learning is an effective learning experience for Generation Z.

Thus, having analysed various approaches to the definition of a business game, we can note that its distinctive feature is the presence of a simulation model that allows reproducing real production processes, identifying and coordinating the peculiarities of the activities of participants in these processes, practicing justification and management decision-making, developing and consolidating professional knowledge and forming skills of their creative use in practical activities.

2.2. Highlighting Aspects that are Understudied

These and many other studies confirm that the teaching students' active forms and methods use is a vector for solving the improving learning efficiency problem. Nevertheless, the current psychological and pedagogical literature does not provide specific solutions that would help to substantiate the optimal ways and directions of activating students' learning and cognitive activity.

Thus, the study is logical from the need to improve the theory and methodology of vocational education through the teaching students active forms and methods use.

2.3. Purpose of the Article. Research Objectives (Goals)

The purpose of the article is to consider the issue of solving the problem of improving teaching effectiveness through the active teaching forms and methods usage for students, namely, a professional business game. In order to achieve this goal, the following tasks should be solved: to analyse publications on the topic of the identified problem; to present the results of the author's own research.

3. Methodology

3.1. Methodological Basis of the Study

Solving the improving effectiveness problem of teaching through the active forms and methods used for teaching students has been the subject of research by many scholars. In didactics, the theory of teaching methods is represented by the scientific works of Y. Babanskyi, M. Danilov, I. Lerner, M. Makhmutov, M. Skatkin, and others. The methodological basis of the study is A. Verbytskyi, A. Kamenev ideas (on the use of teaching students' active methods); I. Ilnytskyi, V. Kudriavtsev ideas (on the use of problem situations and ways to create them in students' learning) and their followers.

The general rules of designing, organising and conducting business games were substantiated by A. Verbytskyi, I. Kulish, P. Pidlasystyi, I. Sytnyk, O. Khomenko, P. Shcherban and others. In particular, O. Khomenko believes that the business game is one of the most promising ways to improve the efficiency of the educational process in higher education. In his opinion, a business game is a modelled and pedagogically organised activity (educational, research, professional and production) that ensures the formation of social and professional experience of a person [23, p. 9–10].A. Verbytskyi is convinced that a business game is a special type of involvement of a specialist in future professional activities [2].

3.2. Research Tools

To solve the tasks defined by the authors, the following methods of theoretical research were used: analysis and generalization of scientific literature by research direction; the method of going from the abstract to the concrete; method of analytical and comparative analysis when evaluating the novelty of research results; generalization when formulating conclusions and recommendations regarding the continuation of further research.

3.3. Reliability and Accuracy of Results

Reliability of the results of the study is ensured by the correctness of using mathematical apparatus and research methods.

3.4. Limitations in the Application of the Results

It is important to eliminate any potential biases by focusing on the Ukrainian context, which will provide a more balanced view of the problem. Therefore, the use of the findings in other countries may be considered as one of the possible options at the preliminary analysis stage.

3.5. Theoretical Part of the Study

To use active learning methods, the following principles should be observed: the methods should be in line with the learning goals and objectives, the content of the topics, the conditions and time of learning, the capabilities of students and teachers, and the specifics of using technical and auxiliary learning tools. Active learning methods can be classified as follows: simulation and non-simulation. Simulation methods are divided into game and non-game methods and involve the simulation of an activity based on the construction of its model. Non-simulation methods do not require recreating the context of a teacher's professional activity and his/her interaction with students. An example of simulation methods is game methods and, in accordance with the chosen object of study, further consideration will be focused on business games

3.6. Methods of Conducting a Professional Business Game

A business game is based on the use of a simulation model for solving professional problems in order to accelerate the discipline mastery being studied by activating students' learning activities. A business game can be a mechanism for

the production and transfer of certain behavioural experience in various learning situations, as it encourages students to be active, take initiative, and self-organise when solving situational tasks on professional topics.

To conduct a business game, game and functional goals are defined. The former are characterised by a specific game situation with a certain number of points. The latter are determined by the specifics of the performance of specific functions by the participants. Their actions are simulated during the game.

The main structural element of a business game is the modelling of specific situations. The model is built by adopting the rules of a business game that define its essence and the relationship of all its components. Game rules are developed on the basis of practical experience and common sense, based on the actual situation. They can be conditionally divided into three types, taking into account the construction of a simulation model: 'rigid', "free", and 'intermediate'. 'Rigid' rules are developed based on a formal model of these processes, 'free' rules are developed based on the main directions of development of events in a pre-written scenario, and 'intermediate' rules contain elements of "rigid" and 'free' rules at the same time.

Mandatory for a business game are: formulation of the problem and general goals; distribution of roles of participants; consideration of the time factor; presence of emotional tension and motivation of players; impossibility of full formalisation of the game scenario; dynamism of the situation; feedback; multi-alternative solutions; documentary support of the business game; evaluation of the results of game activity.

When preparing for a business game with students, it is recommended to draw up a package of documents that includes a detailed plan and description of the game; the procedure and rules for its conduct; instructions to participants and its leader; evaluation criteria; information about the information base; literature used in the preparation and appendices. Depending on the objectives of the business game, the structural scheme of its conduct may be presented in different ways. The author's interpretation of the scheme of conducting a business game with students of a technical university is shown in Fig. 1.

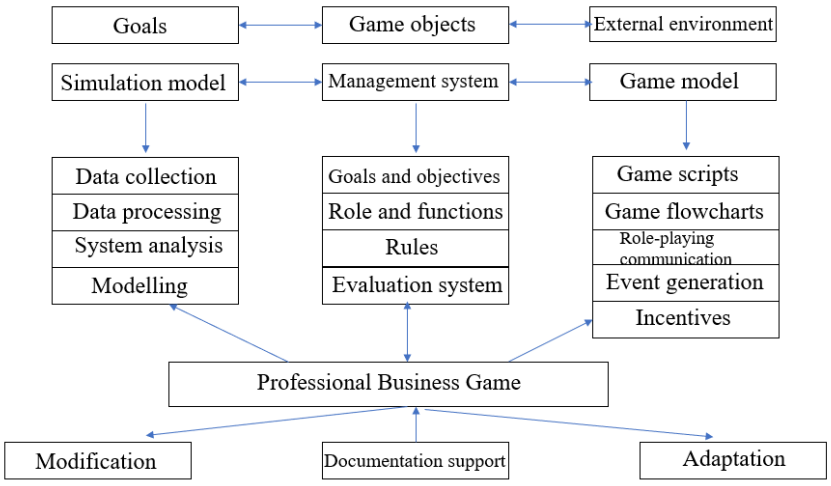

Fig. 1. Variant of the structural scheme of the business game

The methodology of conducting business games is multifaceted. The games are conducted according to a model consisting of the following stages: students training for the game; study of the situation, instructions, guidelines and other additional materials by students; conducting the game; analysis, discussion and the game results evaluation.

The stage of the participants training of the professional business game:

- defining the topic of the game and studying the problem situation;
- formulating the main purpose of the game and establishing its rules;
- working out specific tasks to determine its forms;
- approving the organisation of the game and the form of its conduct;
- identifying officials whose roles will be performed during the game;
- modelling a training situation based on previously developed materials;
- issuing a package of documents and materials to the participants of the game necessary for solving the problem.

The content of the stage of studying the didactic situation, instructions, guidelines and a number of other materials that are necessary for solving the educational problem is as follows:

- studying guidance materials;
- collecting additional information and systematising it;
- obtaining information from the teacher;

- making certain contacts between the participants of the games;
- processing documents and preparing the teaching and methodological base.

A crucial and meaningful stage of business games is the analysis, discussion and evaluation of the game results. At this stage, the participants exchange views, discuss, defend their decisions and conclusions, and summarise the results of the game.

Before the start of the business game, students are familiarised with the topic, goals, objectives, learning questions, game rules and evaluation criteria. After that, the training group is divided into several subgroups to perform practical tasks, which include various situational tasks. The classroom can be divided into learning zones. In each zone, the students are expected to perform a specific practical task and solve a certain set of situational problems, trying to demonstrate quasi-professional learning experience.

There are three ways to select participants to solve the tasks. The first way is for the teacher, as the head of the business game, to appoint students to solve situational tasks; the second way is for the subgroup leader, a top manager consisting of students, to appoint participants to solve tasks based on their preparedness; the third way is for participants to choose which situational tasks they will solve. There are two ways to solve such tasks. It is possible to either make a decision in a specific situation or perform practical actions in an extreme situation.

After solving the situational tasks, the players' actions are evaluated, taking into account the time of completion of the tasks and their correctness. For this purpose, certain evaluation criteria are developed that take into account these parameters. After all students have solved the situational tasks, they can change places, and at each place where they are solved, the learning subgroups receive evaluation points based on their performance by each student. After all the points received by each subgroup are added up, the total points are calculated to determine the placement of a particular subgroup. In addition, the score of an individual participant allows you to understand what place he or she will take according to the results of the game and get a personal assessment.

The authors aimed to implement in practice the fundamental idea of the teacher P. Pidkasystyi that a didactic game is a collective, purposeful educational activity when each participant and the team as a whole are united by the performance of one task and orient their behaviour towards a positive successful outcome. To a certain extent, the results of using games, modelling and gamification in higher education were taken into account [24] and were further implemented in the military specialists training on the basis of a professional business game for leadership development [25].

For this purpose, a functional diagram of the participants interaction dependence in the educational process when used in a training complex, for cadets of higher education institutions and for students was developed, which are respectively shown in Fig. 2 and Fig. 3 The decision was made to expand innovations in military education through the use of professional business games, which were once emphasised by researchers from the Department of Higher Military Education [26]. It is worth noting that the reform of combat training from traditional to computer-based education began back in 1998 [27] and until 2002 was accompanied by numerous problems of not understanding how to modernise and create military training and simulation complexes [28].

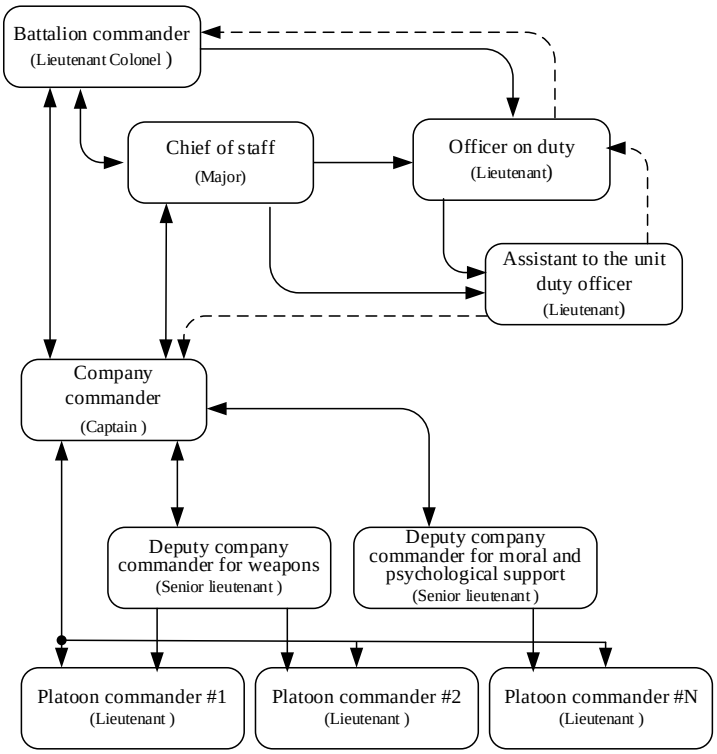

Fig. 2. Distribution of tactical officers' positions command and subordination in a professional business game

It should be noticed that after completing leadership courses, in the format of a professional business game, whose role distribution scheme is shown in Fig. 2, officers became successful leaders in combat positions. This confirms the prediction that new teaching methods, such as professional business games, allow young officers to immediately begin performing their duties [29].

The need to address the problem of leadership development is also relevant for higher education students. The civilian sector also needs successful top managers. With this in mind, the experiment included university students alongside military cadets. Of course, for university students, the training tasks of the professional business game were adapted to the tasks of the civilian sector of the economy.

Of course, at the preparatory stages of developing a scenario for a professional business game, it is advisable to involve students as an effective tool for their cooperation [30]. In an informal setting, it will be easy for teachers to assess the feedback of students' satisfaction with the application of teaching methods [31] in the format of a professional business game.

3.7. Methodology for Calculating the Effectiveness of a Professional Business Game

To evaluate the effectiveness of the business game as an active learning method, we apply the following methodology for assessing its effectiveness coefficient, which is determined by formula (1):

$$K_{EF} = K_{PR} + K_{ZN} + K_K \tag{1}$$

where K_{PR} – is the coefficient of its attractiveness; K_{ZN} – is the significance coefficient; K_K – coefficient of usefulness.

The attractiveness coefficient K_{PR} of a business game is determined by the formula (2):

$$K_{PR} = \frac{3D_I + 2D_B + 1D_N}{100\%} \tag{2}$$

where D_I – the percentage of students who liked the game and were interested in it; D_B – the percentage of students who were indifferent to this method of teaching; D_N – percentage of students who did not like the business game.

The attractiveness coefficient is in the range $1 \leq K_{PR} \leq 3$.

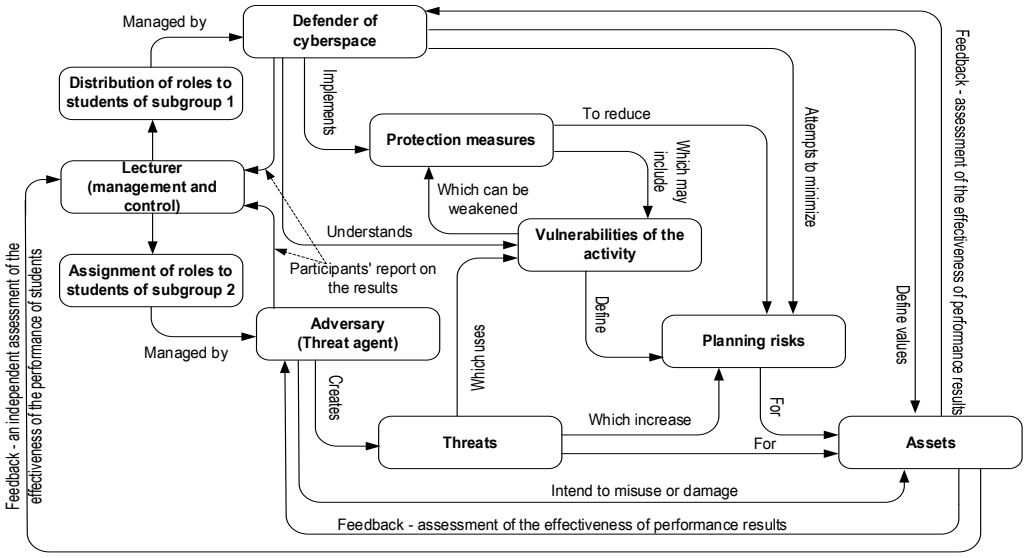

Fig. 3. Functional diagram of the participants' interaction (gamification) dependence in the educational process

The significance coefficient K_{ZN} is determined by the formula (3):

$$K_{ZN} = \frac{3D_{CB} + 2D_{NB} + 1D_{VB}}{100\%} \tag{3}$$

Where D_{CB} – is the percentage of students who believe that the business game has a significant impact on the course; D_{NB} – is the percentage of students who believe that business games have a minor impact on the course; D_{VB} – is the percentage of students who believe that the business game influences the study of the discipline.

The significance coefficient K_{ZN} is in the range $1 \leq K_{ZN} \leq 3$.

The coefficient of usefulness K_K is determined by formula (4):

$$K_K = \frac{3D_D + D_G}{100\%} \tag{4}$$

where D_D – is the percentage of students who received substantial assistance in the discipline; D_G – is the percentage of students who specifically trained for the game.

The coefficient of usefulness K_K lies in the range $0 \leq K_K \leq 4$. In this case, the efficiency coefficient K_{EF} is in the range $2 \leq K_{EF} \leq 10$.

We believe that the proposed methodology allows us to obtain a generalised efficiency factor for conducting a professional business game and, in addition, to give recommendations to game developers on how to improve it in order to increase the attractiveness, significance and usefulness of the game. Thus, the authors believe that if the efficiency coefficient is in the range of $2 \leq K_{EF} \leq 3{,}5$, then the development of a business game is not recommended for use; if the efficiency coefficient is in the range of $3{,}51 \leq K_{EF} \leq 7{,}5$, then the development needs to be improved; if the efficiency coefficient is in the range of $7{,}51 \leq K_{EF} \leq 10$, then the development is recommended for implementation. These parameters, in our opinion, are conditional and may vary slightly in terms of both upper and lower values.

3.8. Effectiveness Experimental Testing of a Professional Business Game

For a preliminary assessment of the effectiveness of the method of organising learning on the basis of a professional business game, we will use the results of E. Dale's research on the relationship between the quality of learning during training and the forms of its teaching (see Table 2) [32]. Thus, based on the data of E. Dale's cone on the relationship between the learning quality and the teaching forms [32], we can assume the hypothesis that due to the real activities simulation during a professional business game as a practical training form, students can demonstrate up to 90% of the theoretical knowledge application in solving situational (problem) control tasks.

Table 2. Cone of experience according to experimental data of E. Dale

Activity	Memorization of information	Acquisition of ability
Reading	up to 10%	Define, list, describe, clarify
Listening to a lecture	up to 20%	
Watching drawings	up to 30%	Perform, Execute, apply
Video watching	up to 50%	
Participation in the discussion	up to 70%	Analyze, create, evaluate, develop
Imitation of real activity	up to 90%	

The results described in [33] indicate a positive relationship between a content-related curriculum and the improvement of students' overall academic achievements, which demonstrated the perceived benefits of practice-based learning methods by students and teachers. And, as is known from the classification accepted in the pedagogical circle, professional business game is one of the methods of practice-based learning.

The experimental evaluation was based on the descriptive and causal non-experimental method of empirical pedagogical research. This will increase the value of our study, as we proposed an educational technology similar to 'design experiments' [34]. To obtain the data, we used an anonymous questionnaire that included one question. To test the effectiveness of the applied professional business game to stimulate motivation to study, the authors conducted a quick survey of students to find out the final opinions of the respondents. A total of 300 respondents were interviewed, 100 each from the following higher education institutions. The quantitative distribution of respondents is presented in Table 3.

Table 3. Quantitative distribution of respondents by higher education institutions

Category	Educational institution	Specialty	Number of respondents
Cadets Students	Kruty Heroes Military Institute of Telecommunications and Information Technology (MITIT)	172 Telecommunications and radio engineering	40
		122 Computer science	40
		125 Cybersecurity	20
Cadets	Lutsk National Technical University, (LNTU)	122 Computer science	100
Students	Kyiv National University of Construction and Architecture (KNUCA)	125 Cybersecurity	100
Total respondents:			300

The list of questions (questionnaires) offered to respondents is presented in Table 4. Respondents had the opportunity to choose one answer in each group of questions. Respondents put a '+' sign against the corresponding field. The percentage was calculated according to the rules of mathematics.

Table 4. List of questions (questionnaire)

№ п\п	Questionnaire Points	Conditional parameter code	Percentage of students		
			MITIT	KNUCA	LNTU
1.	Group of questions - its attractiveness coefficient	K_{PR}	-	-	-
1.1	Did you like the professional business game and did it arouse your interest in learning?	D_I	92	50	45
1.2	Do you have an indifferent attitude to the professional business game as a teaching method?	D_B	3	40	40
1.3	Did you not like the professional business game as a teaching method?	D_N	5	10	15
2.	Group of questions - coefficient of significance;	K_{ZN}	-	-	-
2.1	Where do you think that the professional business game has a significant impact on the study of the discipline?	D_{CB}	93	55	66
2.2.	Do you think that the professional and business game has a minor impact on the study of the discipline?	D_{NB}	5	35	27
2.3	Do you think that the professional business game does not affect the study of the discipline?	D_{VB}	2	10	7
3.	A group of questions - coefficient of usefulness.	K_K	-	-	-
3.1	Did you receive significant assistance in studying the discipline?	D_D	2	85	30
3.2	Did you specifically prepare for the professional business game?	D_G	98	15	70

The next step is to calculate the corresponding coefficients of attractiveness (K_{PR}) by formula (2); significance (K_{ZN}) by formula (3); usefulness (K_K) by formula (4) and record them in Table 5. Next, we will check whether the results of the attractiveness coefficient (K_{PR}), significance (K_{ZN}) and usefulness (K_K) fell into the zone of acceptability, using the following criteria.

Table 5. Checking the calculation result for compliance with the attractiveness factor (K_K) criterion

HEI	Criterion K_{PR}		Criterion K_{ZN}		Criterion K_K	
	$1 \le K_{PR} \le 3$	Conclusion	$1 \le K_{ZN} \le 3$	Conclusion	$0 \le K_K \le 4$	Conclusion
MITIT	2,87	Within the specified tolerance, acceptable	2,91	Within the specified tolerance, acceptable	1,04	Within the specified tolerance, acceptable
KNUCA	2,4	Within the specified tolerance, acceptable	2,45	Within the specified tolerance, acceptable	2,7	Within the specified tolerance, acceptable
LNTU	2,3	Within the specified tolerance, acceptable	2,59	Within the specified tolerance, acceptable	1,6	Within the specified tolerance, acceptable

The resulting value of its efficiency coefficient (K_{EF}) is calculated using the well-known formula (1) and recorded in the corresponding column of Table 6.

Table 6. Results of the survey. Distribution of respondents' answers

HEI	Survey result (A) / calculation (R)											
	R	A			R	A			R	A		R
	K_{PR}	D_I	D_B	D_N	K_{ZN}	D_{CB}	D_{NB}	D_{VB}	K_K	D_D	D_G	K_{EF}
MITIT	2,87	92	3	5	2,91	93	5	2	1,04	2	98	6,82
KNUCA	2,4	50	40	10	2,45	55	35	10	2,7	85	15	7,55
LNTU	2,3	45	40	15	2,59	66	27	7	1,6	30	70	6,49

4. Findings and Discussion

4.1. Discussion of Research Results and Experience

The obtained results are summarized in Table 7. The received results are compared with the generalized efficiency coefficient K_{EF} and the following recommendations for implementation are proposed.

Table 7. Results of the survey. Distribution of respondents' answers

HEI	Criterion K_{EF}			Recommendation for the design investigation usage
	$2 \le K_{EF} \le 3,5$	$3,51 \le K_{EF} \le 7,5$	$7,51 \le K_{EF} \le 10$	
MITIT	-	6,82	-	The development of the methodology needs to be finished.
KNUCA	-	-	7,55	The development of the methodology should be implemented.
LNTU	-	6,49	-	The development of the methodology needs to be finished.

Since the scientific research was carried out on the researchers' own initiative, according to the obtained generalized efficiency coefficient K_{EF}, the proposed methods of organizing training in the form of a professional business game for KNUCA students are most suitable for implementation with minor refinement. The methodology of organizing training in the form of a professional business game for MITIT cadets is quite close to implementation, with a value of K_{EF}=6.82, which is 0.73 lower than the same coefficient for KNUCA and at the same time 0.33 higher than

for LNTU. In an informal setting, the cadets of the higher education institutions admitted that they felt some constraint due to military discipline and the intensive implementation of non-standard teaching methods by the teacher, which were not previously used by teachers, including those of the military and humanitarian cycle of disciplines.

Therefore, a professional business game should be interpreted as a type of experiential learning, such as modeling. We agree with the opinion of scientists [35] who consider experiential learning as a means of combating students' misconceptions. Experiential learning encourages higher-level learning, which contributes to critical thinking development and independent learning abilities [36]. In [37], the hypothesis that students involved in experiential learning have a better understanding of their subject than students of traditional lectures were experimentally confirmed. Students studying using experiential learning methods note that they perceive themselves as more competent practitioners than students using traditional teaching methods [38].

Since, M.M. Jessup, states that: 'Modelling is also more effective than conventional teaching methods...' [39, pp. 103]. Therefore, we should agree with the opinion of the authors [40] that to improve teaching and learning, it is necessary to use assistive technologies, such as gamification or modelling with the audience involvement in active learning, where participants learn from each other, not just from the teacher [41]. And as you know, the problem of choosing pedagogical teaching technologies is still a subject problem of the educational process – the teacher (I. Blokhina, G.O. España, L. Kozubtsova, V. Lishchina, O. Moskalenko, [42; 43]. Thus, the proposed methodology of conducting a professional business game promotes the new competencies development of students, stimulates their cognitive activity, intensifies the educational process and, in addition, develops a cohesion sense, responsibility, and students' discipline.

4.2. Assessment of the result validity

Validity is the degree to which research methods and results meet the objectives. Validity is considered a fundamental concept in experimental psychology. Since, in psychology and statistics, a valid measurement is a measurement that measures what it is supposed to measure, in our case, the validity of the effectiveness of a professional business game, where the APC is the attractiveness coefficient; the ICC is the significance coefficient; and the CU is the utility coefficient. It is well known that a perfect experiment (possible only in theory) will have perfect validity: it will show exactly that the experimental effect was caused by a change in the independent variable, it will fully correspond to reality, and its results can be generalized without restrictions. With regard to our results, we should talk about the degree of validity, i.e., the extent to which the research results meet the objectives (however, validity is not measured in any conventional units).

An important feature of validity is that it cannot be established once and used as the final argument for the quality of an experiment or methodology. Validity must be constantly substantiated with new data and rechecked in independent researches.

There are three main ways to establish the validity of a methodology, and we will use the assessment of content validity.

Content validity is the degree to which the content of the tasks of the methodology corresponds to the real activities in which the property measured in the methodology is manifested. A special case of content validity is the so-called apparent validity, which is the degree to which the methodology meets the expectations of those being assessed. For most methods, it is considered important that the participant of the assessment has an obvious connection between the content of the assessment procedure and the actual activity that is the object of the assessment (professional, educational).

Thus, the validity of the result obtained by the generalized efficiency coefficient K_{EF} of the proposed methods of organizing training in the form of a professional business game for students and cadets is within the tolerance of $3.6 \leq K_{EF} \leq 7,5$ which corresponds to the criterion "The development of the methodology needs to be finalized" for MITIT and LNTU, and for KNUCA we recommend "The development of the methodology should be slightly finalized", since the result is 0.05 conventional units lower than the lower limit of the tolerance for implementation, namely $7.6 \leq K_{EF} \leq 10$ and it is proposed to round the result $K_{EF} \approx 7.6$. In general, it should be assumed that the study initiated by the authors to develop a methodology for organizing a professional business game for cadets and students has achieved its goal, but needs further improvement, development of typical and non-standard role-playing scenarios by teachers together with students.

4.3. Limitations in the Application of the Result on application in practice

It has been confirmed that the group of people who are most addicted to computer games, as practice shows, is difficult to motivate to study using traditional approaches when there is a distracting and, to some extent, gambling factor [20]. It is noted that uncontrolled excessive enthusiasm for computer games can lead to gambling addiction [44]. At the same time, it is worth noting that the proposed methodology of professional business game is a gamification process of the educational process, but it is not a direct substitute for a computer game. Of course, when using a business game as a gamification, it is worth remembering that the learning method through the game does not turn into a pure game [45; 46].

The influence of computer games as a negative factor in the formation of personality and digital culture should be mentioned separately [47].

4.4. Scientific Novelty. Scientific Justification

The scientific result obtained in this work expands the scientific boundaries of the philosophy of education and the theory and methodology of vocational education through the further theory development of game-based learning as part of the methodology for teaching disciplines to students of technical higher education institutions in the tendency context to reduce motivation. At the same time, the expansion is carried out in a systematic manner. A professional business game in combination with a blended learning environment allows the teacher to improve the diagnostics objectivity due to the fact that in a short period of time during the game, students are diagnosed with the level of acquired knowledge, skills, abilities, certain competencies and assessed from the point of view of the stakeholder their sufficiency for further not only reproductive but also creative professional activity. Even if the credit is given in a distant form, the use of situational logic tasks makes it impossible to manifest academic integrity through cheating, deception, facts fabrication, etc. Even if the credit is given in the remote form of applying situational logic tasks, this makes it impossible to manifest academic integrity through cheating, deception, facts fabrication, etc.

4.5. Practical Use

Business games should be widely used as a means of training, education and development of future professionals. Any game develops attention, observation, and ingenuity. Modern didactics, turning to game-based learning in the classroom, sees them as an opportunity for effective interaction between teachers and students, a productive form of communication with inherent elements of competition and genuine curiosity.

The need for rational construction, organisation and application of role-playing games in the process of teaching and upbringing of students requires a thorough and detailed study of this issue.

Most scholars consider it advisable to conduct the game at the final stage of work on the topic, since not all students can freely improvise in a role-playing game without prior preparation. Some authors believe that games can be used at all stages of learning, without giving any recommendations on the sequence of introducing games into the learning process. The authors argue that small role-playing games should be introduced into the educational process at the initial stage of work on a topic so that students get used to this type of work gradually, because otherwise games fail to achieve the desired results due to the barrier that arises from the unusual form of communication characteristic of role-playing.

5. Conclusion

Based on the above, it can be concluded that a professional business game is a complex interactive learning technology that has certain advantages and disadvantages. The following advantages of a business game can be distinguished.

1. In a short period of time during the business game, the teacher has the opportunity to check and evaluate the level of knowledge, skills, abilities, certain competences of students and find out from the point of view of the employer their sufficiency for further not only reproductive but also creative professional activity.
2. A professional business game allows you to effectively master new educational information and acquire the necessary professional skills.
3. Skilful organisation of a business game allows to intensify the educational process and enhance its emotional component, which gives a certain pedagogical effect.

The disadvantages of conducting a business game include the following.

1. There are some problems with theoretical and methodological aspects of developing and conducting business games related to their quality.
2. The level of conducting a business game largely depends on the mastery of the content of the material studied, which is presented to students and is not always sufficient. This circumstance does not contribute to improving the quality of learning during a business game.
3. Currently, there is no single methodology for organising and conducting business games in higher education institutions, which leads to certain difficulties in using existing game methods.
4. Teachers who prepare and conduct business games do not always have the necessary psychological and pedagogical competencies, the required level of management of the student team, and cannot effectively and efficiently resolve conflict situations that may arise during the game.

Thus, organising and conducting a business game as an active teaching method requires preparation of both students and teachers, as well as the availability of methodological materials and technical means that contribute to the effectiveness of classes conducted in a game form and the formation of professional competences of students.

6. Recommendations

It is expected that the study will add the possibility of greater practical realization of academic and practical value if we continue to expand the scientific boundaries of the philosophy of education and the theory and methodology of vocational education by improving the application of the theory of game-based learning as part of the methodology for teaching disciplines to students of technical higher education institutions in a downward trend.

In general, it is mentioned as necessary to use professional business game in combination with the latest technologies in military education according to NATO standards to help Ukraine strengthen its defense capabilities, ensure high readiness and effectiveness in the fight against the aggressor. Continuous improvement and development of the military sphere based on advanced technologies is an important factor for Ukraine's victory, and can serve as an unprecedented example for other countries.

This article does not fully exhaust all aspects of the problem and requires further research.

The theoretical results obtained in the course of scientific research form the basis for further study perspectives, and the results can be used to develop a methodology for teaching cadets using simulator models based on virtual and augmented reality technologies.

Acknowledgment

We express our gratitude to the organisers and general sponsors of ICCSEEA 2025: The 8th International Conference on Computer Science, Engineering and Education Applications, for providing a grant opportunity for free publication of scientific articles by authors from Ukraine.

References

[1] Order of the Cabinet of Ministers of Ukraine (2022). On approval of the Strategy for the Development of Higher Education in Ukraine for 2022-2032, https://zakon.rada.gov.ua/laws/show/ 286-2022-p.

[2] Verbitsky, A. (1991). Active learning in higher school: contextual approach, Kyiv, Vyshaya Shkola.

[3] Herger, M. (2014). Enterprise Gamification: Engaging People by Letting Them Have Fun: The Basics. Create Space Independent Publishing Platform.

[4] Chou, Yu-Kai (2016). Actionable Gamification: beyond points, badges and leaderboards. Octalysis Media: Fremont. CA. Revista Internacional de Organizaciones, 17, 137-114. DOI: 10.17345/rio18.137-144.

[5] Gutyryak, O., & Pavlishak, O. (2018). Business game as a method of active learning of future specialists. Youth and the Market, 11(166), 47–51.

[6] Volkova, N.P. (2018). Gamifi cation as one of the trends of modern higher education. Modern higher education: problems and prospects. VI All-Ukrainian Scientifi c and Practical Conference of students, postgraduates, and scientists. Dnipro, 33-35.

[7] Arutyunov, Y., Borisova N., & Kolesnichenko S. (1983). On the classification of active learning methods. Interdepartmental school-seminar on active teaching methods "Application of active teaching methods in the educational process": abstracts. (pp. 21–24), Riga.

[8] Korotyaev, B. (1989). Learning is a creative process. Kiev: Prosveshchenie.

[9] Kozlova, O., & Razu, M. (1978). Business games and their role in staff development. Kyiv: Znanie.

[10] Syroezhin, I. (1970). Essays on the theory of production organizations. Kyiv: Ekonomika.

[11] Belkin, I.V. (2011). Pedagogical conditions for the emergence of business games in higher education institutions. Humanitarian, 22, 3–5.

[12] Freeman, S., Eddy, S., McDonough, M., Smith, M.K., Okoroafor, N., Jordt. H., et al. (2014). Active learning increases student performance in science, engineering, and mathematics. Proc Natl Acad Sci USA;111:8410-5. DOI: 10.1073/pnas.1319030111.

[13] Katerusha, O.P. (2009). Business games as a means of cognitive activity of students. Higher school, 12, 53–60.

[14] «Gamification Improves Work Experience for 91% of Employees, Increases Productivity Across U.S. Companies» (Press release). PR Newswire. August 6, 2015. https://enterpriseengagement.org/newswire/content/8468367/survey-gamification-improves-work-experience-for-91-of-employees.

[15] Yavorska, Zh. (2005). Business games and their role in the training of modern specialists, Bulletin of Lviv University. Pedagogical Series, 19, 1, 241–246.

[16] Ocheretna, N.D. (2013). Peculiarities of application of business games in the process of learning a foreign language in higher education institutions. Pedagogical education: theory and practice, 14, 206–210.

[17] Kilgour, P., Reynaud, D., Northcote, M.T., & Shields, M. (2015). Role-playing as a tool to facilitate learning, self-reflection and social awareness in teacher education. International Journal of Innovative Interdisciplinary Research, 2(4), 8–20.

[18] Kozubtsov, I., Nesterov, O., Slisar, P., & Kiyanovskyj, K. (2023). Features of the formation of a cadet leader in the courses of professional military education L-1A, B, C (tactical level of military education). Perspectives and Innovations of Science (Series 'Pedagogy'), 15(33), 235–248.

[19] Kozubtsov, I. (2023). Methodology of the Professional-Business Game for the Development of a Cadet Leader in Professional Training Courses (L-1B) of the Tactical Level of Military Education. IgMin Research - STEM A Multidisciplinary Open Access Journal, 1, 2, 160–169. DOI: 10.61927/igmin132.

[20] Use of the latest technologies in the process of combat training and military education according to NATO standards. Ukraine to NATO magazine. URL: https://ukrainetonato.com.ua/osvita-ta-boyova-pidhotovka-za-standartamy-nato/vykorystannia-novitnikh-tekhnolohiy-u-protsesi-boyovoi-pidhotovky-ta-viyskovoi-osvity-za-standartamy-nato.

[21] De Smale, S., Overmans, T., Jeuring, J., & Van de Grint, L. (2016). The effect of simulations and games on learning objectives in tertiary education: A systematic review. In de Gloria, A., Veltkamp, R. (eds), Games and Learning Alliance. GALA 2015. Lecture Notes in Computer Science, Springer, 9599, 506–516.
[22] Ding, D., Guan, G., & Yinghui, Y. (2017). Game-based learning in tertiary education: A new learning experience for the Generation Z. International Journal of Information and Education Technology, 7(2), 148–152.
[23] Xomenko, O. (1994). Educational business games as a means of forming professional skills of students of technical schools and colleges (for example, construction specialties). Extended abstract of candidate's thesis. Kyiv.
[24] Wiggins, B.E. (2016). An overview and study on the use of games, simulations, and gamification in higher education. International Journal of Game-Based Learning, 6(1), 18–29.
[25] Kozubtsov, I., & Nesterov, O. (2024). The Conceptual View of the Department of Combat use of Communication Units on the Creation of a Training Game Complex for Training Military Specialists on the Basis of Leadership. IgMin Research - STEM A Multidisciplinary Open Access Journal, 2, 2, 048–058. DOI: 10.61927/igmin145.
[26] Rusnak, I., Mirnenko, V., Kas'ianenko, M., Oliferuk, V., & Viter, D. (2021). Innovative military education: state and prospects of development. Collection of scientific papers "Military Education", 2 (44), 9–20.
[27] Saifetdinov, Kh.I. (1998). Reforming combat training: computer forms of training. Military Th ought, 36, 77–81.
[28] Rusnak, I.S, & Shevchenko, V.L. (2002). Problems of modernization and creation of military training and modeling complexes. Science and Defense, 1, 32– 39.
[29] Kozubenko, O. (2021). New training methods allow young offi cers to immediately perform their offi cial duties. Army Inform News Agency, Ministry of Defense of Ukraine, https://armyinform.com.ua/2021/05/18/novi-metodykynavchannya-dozvolyayut-molodym-oficzeram-odrazu-vykonuvatyposadovi-obovyazky.
[30] Riley, S., & McCabe, G. (2021). Enabling staff-student co-creation of experiential learning at scale. Times Higher Education. https://www.timeshighereducation.com/campus/enabling-staffstudent-cocreation-experiential-learning-scale.
[31] Rigopoulos G. (2022).Assessment and Feedback as Predictors for Student Satisfaction in UK Higher Education. International Journal of Modern Education and Computer Science (IJMECS), 14, 5, pp. 1–9.
[32] Dale, E. (1969). Audio-Visual Methods in Teaching. 3rd ed. New York: Holt, Rinehart & Winston.
[33] Sibulkin, J. (2018). Analysis on Content-Based Instruction Methods Influencing Student Outcomes in Higher Education. Open Journal of Social Sciences, 6, 176-194. doi: 10.4236/jss.2018.611013.
[34] Reeves, T.C. (2000) Enhancing the worth of instructional technology research through 'design experiments' and other development research strategies. Symposium on International perspectives on instructional technology research for the 21st century (session 41.29: New Orleans, LA, USA).
[35] McClintock, C. (2000). Creating communities of practice for experiential learning in policy studies. Social Change, Public Policy and Community Collaboration: Training Human Development Professionals. Editors: P. Ralston, R. M. Lerner, A.K. Mullis, C.B. Simerly, and J.P Murray. Publisher: Springer, 32–51.
[36] Kreber, C. (2001). Learning experientially through case studies? A conceptual analysis. Teaching in Higher Education, 6, 217–228.
[37] Hakeem, S.A. (2001). Effect of experiential learning in business statistics. Journal of Education for Business, 77, 95–98.
[38] Rocha, C. (2000). Evaluating experiential teaching methods in a policy practice course: The case for service learning to increase political participation. Journal of Social Work Education, 36, 53–63.
[39] Jessup, M. (2001). Sociopoly: Life on the boardwalk. Teaching Sociology, 29, 102–109.
[40] Adebayo, E.O., & Ayorinde, I.T. (2022). Efficacy of Assistive Technology for Improved Teaching and Learning in Computer Science. International Journal of Education and Management Engineering (IJEME), 12, 5, 9–17. DOI: 10.5815/ijeme.2022.05.02.
[41] Dorn, D. (1989). Simulation games: One more tool on the pedagogical shelf. Teaching Sociology, 17, 10–18.
[42] Blokhina, I.O., & Moskalenko O.V. (2021). The role and place of professionally significant qualities of a teacher in the process of distance learning. Actual problems of psychology: a collection of scientific works of the H.S. Kostiuk Institute of Psychology of the National Academy of Pedagogical Sciences of Ukraine, XIV, 4, 15–25.
[43] España, G.O. (2025). De la innovación a la acción: la tecnología educativa como motor del desempeño docente. Revista Ciencia Multidisciplinaria CUNORI, 9(1), 1–25. https://doi.org/10.36314/cunori.v9i1.314.
[44] Kapp, K. (2012). The gamification of learning and instruction game-based methods and strategies for training and education. San Francisco, USA: Pfeiffer.
[45] Tkachenko, O. (2015). Gamification of education: formal and informal space. Topical issues of Humanities, 11, 303–309.
[46] Petrenko, S. (2018). Gamification as an innovative educational technology. Innovation in education, 2, 7, 177–185.
[47] Chaika, G.V. (2006). Th e infl uence of computer games as a new factor of culture on the formation of personality. Actual Problems of Psychology, 3, 218-296.

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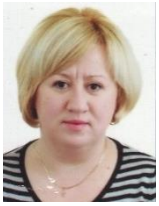

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How to cite this paper: Lesia M. Kozubtsova, Valerii O. Lishchyna, Igor M. Kozubtsov, Halyna L. Isaienko, Lesia O. Shevchuk, " Professional Business Game as an Active Practice-Oriented Method of Teaching Modern Students in Technical Higher Education Institutions", International Journal of Education and Management Engineering (IJEME), Vol.15, No.4, pp. 50-63, 2025. DOI:10.5815/ijeme.2025.04.05