

GAMIFICATION AS A TOOL FOR DEVELOPING PROFESSIONAL COMPETENCIES IN THE CONTEXT OF MILITARY EDUCATION DIGITALIZATION

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Summary

The article examines the theoretical and practical foundations of gamification as an innovative approach for developing professional competencies of learners in higher military educational institutions (HMEIs). Analysis of both Ukrainian and international practices indicates that, despite its global adoption, gamification in Ukrainian military education remains fragmented, creating a significant research gap and limiting the potential for comprehensive skill development. The study proposes a model for integrating gamification into military history courses, transforming traditional instruction into an interactive and immersive learning process that fosters strategic thinking, analytical skills, problem-solving, and decision-making under uncertainty. The findings demonstrate that the use of game mechanics, including points, quests, and simulations, substantially increases learner motivation, engagement, and academic performance. The article concludes that gamification represents a highly promising component of contemporary military education, offers practical implications for enhancing educational outcomes, and suggests directions for further research, particularly the integration of virtual and augmented reality technologies to create more immersive and realistic training environments.

Key words: gamification, military education, professional competence, military history disciplines, strategic thinking, innovative technologies, pedagogical experiment.

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1. Introduction

At the current stage of development, military education faces unprecedented challenges driven by the rapid evolution of the nature of warfare. Wars, asymmetric conflicts, and the use of advanced technologies such as artificial intelligence, unmanned aerial systems, and cyber capabilities require military professionals not only to possess technical knowledge but also to demonstrate rapid analysis, critical thinking, and decision-making skills in conditions of informational uncertainty.

The aim of this study is to provide a theoretical justification and empirical validation of the effectiveness of gamification as a tool for developing professional competencies of learners in higher military educational institutions. To achieve this goal, the following research objectives were defined: to analyze the theoretical foundations of gamification in the context of professional education; to study the existing experience of applying gamification in military training abroad and in Ukraine; to develop a methodology for integrating gamified elements into the educational process; and to experimentally test the effectiveness of the developed methodology.

The traditional, predominantly academic, model of military education-based on memorization and linear knowledge transfer-proves insufficient for preparing commanders capable of acting effectively in the dynamic environment of modern combat. Therefore, a key task is to improve military education through the implementation of innovative technologies.

In this context, gamification is not merely a modernization but a necessary condition for developing professional competencies that meet the requirements of the 21st century. It enables the transformation of passive assimilation of historical experience into interactive practice of strategic and tactical skills, which are critical for the successful execution of combat missions.

In studying military history disciplines, gamification allows learners not only to learn about the past but also to train by drawing lessons from it. Simulations and game-based scenarios, grounded in historical events, provide opportunities to analyze tactical and strategic decisions of commanders, understand the causes of victories and defeats, and develop skills essential for effective unit leadership under modern conditions.

The methodological framework of the research consists of general scientific methods: analysis and synthesis for studying theoretical sources, comparison for evaluating domestic and international experience, a pedagogical experiment for testing the hypothesis, and statistical data processing methods. The research logic envisages a consistent transition from the analysis of theoretical foundations to practical implementation and assessment of effectiveness.

2. Analysis of Recent Studies and Publications

Gamification has become the subject of numerous studies, which reflects its considerable potential. However, an analysis of the academic literature shows that its effectiveness and practical applicability in the educational process are evaluated differently, indicating a diversity of scholarly perspectives. This is evident in the works of V. Buhaieva, K. Halatsyn, L. Zelenska, K. Kovinko, O. Makarevych, S. Pereiaslavskaya, K. Rumiantseva, O. Smahina, and L. Serheeva. Certain aspects of the application of interactive technologies and teaching methods (including game-based approaches) in educational institutions of various levels have been studied by Yu. Bystrova, N. Volkova, O. Zhukova, O. Malykhin, L. Morska, and I. Shmyhol. The problem of organizing the educational process in higher education institutions on the basis of a simulation-game approach has been explored by L. Burman, M. Viievskaya, L. Viktorova, K. Vishnevskaya, O. Havrylenko, O. Dobrotvor, L. Kondrashova, V. Morozov, L. Savchenko, S. Sapozhnikov, O. Sereda, and S. Shcherbyna. Nevertheless, the variety of approaches to understanding the content and essence of the concept of “gamification” in the pedagogical literature necessitates their systematization (*Aristova & Makhovych, 2024: 1068*).

According to the analysis of pedagogical literature, Ukrainian scholars emphasize that gamification in education helps to create an interactive learning environment. It effectively shapes essential professional knowledge, skills, and abilities, makes educational material more visual, and enhances learners’ motivation and cognitive engagement (*Makarevych, 2015: 276*).

Some authors, such as D. Kasyanov (*Kasyanov, 2011*), focus on the motivational potential of gamification and its ability to support an individualized approach to learning. Kasyanov argues that personalized tasks, which take into account the needs and motives of the learner, significantly increase their engagement. Other researchers, such as S. Petrenko (*Petrenko, 2017*), define gamification exclusively as an innovative pedagogical technology. These perspectives demonstrate the overall recognition of gamification as an effective tool, while differing in the assessment of its nature and classification.

At the same time, Ukrainian researchers are actively examining specific aspects of gamification in the military context. L. M. Kozubtsova, I. M. Kozubtsov, V. O. Lishchyna, and S. S. Shtanenko address the concept of a training complex for preparing military specialists in information and cybersecurity based on computer games. They emphasize the importance of continuous measurable feedback, which enables dynamic adjustment of learner behavior (*Kozubtsova, 2017: 52*). V. Yu. Buhaieva considers gamification a technology with enormous potential to positively influence learning outcomes (*Buhaieva, 2016*), while V. Hurska (*Hurska, 2022*) analyzes virtual environments as a means of enhancing the effectiveness of English language teaching.

3. Theoretical Foundations of Gamification in Military Education

In the context of global instability and threats characterizing the modern geopolitical environment, higher military educational institutions face the need for a fundamental transformation of traditional educational approaches. Ensuring a high level of professional training of learners requires the implementation of innovative pedagogical technologies capable not only of transmitting knowledge but also of developing critical professional competencies. In this regard, gamification, as the application of game mechanics in non-game contexts, emerges as one of the most promising tools for increasing motivation, engagement, and learning efficiency.

Since the concept of “gamification” is relatively new, it is necessary first to analyze its meaning. Scholars interpret this concept differently, which gives rise to debates and discussions. The term has been known since the 1990s, when the gaming industry became widespread. However, it was first introduced into academic discourse in 2002 by British video game developer Nick Pelling, who applied it in his user interface designs (*Diadykova*). Its mass adoption across various fields began in 2010.

Etymologically, the term “gamification” derives from “game,” while “edutainment” combines “education” and “entertainment” (*Kochenhina & Koval*). Despite their similarity, these concepts are different. Most games pursue entertainment purposes, whereas the primary goal of gamification is the achievement of specific benefits-acquiring knowledge, skills, and competencies. In other words, gamification (from English *gamification*) refers to the use of game practices and mechanisms in a non-game context to “engage users in problem-solving.”

Although the concept is relatively new, the scholarly literature contains multiple definitions. Yet, no universally accepted interpretation exists. To clarify, let us turn to international experience. Kevin Werbach, a professor at the University of Pennsylvania (USA), defines gamification as a way of engaging audiences in solving educational tasks through “the use of game thinking and game dynamics,” that is, “turning something into a game” (*Werbach, 2012*). Karl Kapp (*Kapp, 2012*) offers a more detailed definition, describing gamification as the use of game principles, aesthetics, and thinking to engage learners, increase their motivation, and enhance the assimilation of educational material.

By its very essence, gamification promotes active learning, encourages collaboration, and fosters self-directed learning. It influences three key behavioral domains of learners:

Cognitive – “a game contains a system of rules for players; it ensures problem-solving adapted to the learner’s qualification level; increasing difficulty fosters skill acquisition” (Kozubtsova, 2022: 52). This allows learners to follow diverse “paths,” promoting flexible thinking.

Emotional – “participation in a game allows players to experience a range of emotions-from joy and pride for achievements to frustration” (Kozubtsova, 2022: 53). This emotional involvement is a powerful motivator.

Social – “the game content and organization allow players to assume new roles and make decisions” (Kozubtsova, 2022: 55). This develops teamwork, leadership, and communication skills.

According to the analysis by Aristova and Makhovych (Aristova and Makhovych 2024: 1065), Ukrainian scholars consider gamification a comprehensive educational technology broader than mere use of games. They view it as a method of instruction, a means of fostering active professional behavior, and a concept that modernizes teaching in the digitalization era. A key idea shared among scholars is the application of a simulation-game approach, which transforms students from passive observers into active participants in the educational process, thereby enhancing their engagement and learning outcomes.

The implementation of gamification in education takes place through the transformation of didactic objectives into game-based tasks (Kozubtsova et al., 2022: 56). These principles are particularly effective in the study of military history disciplines, where the goal is not simply memorization of facts, but understanding the logic of events, strategic thinking, and tactical decision-making.

Instead of passive memorization of dates and names, learners can engage in simulations that model well-known battles or military operations. In such simulations, historical material becomes a means of achieving a game result, while the competitive element transforms the study of history into an interactive and engaging activity. For instance, the study of the defense of Kyiv in 1941 can be implemented as a team-based game in which learners, acting as unit commanders, make decisions under constantly changing conditions, thereby experiencing the dynamics of historical events.

The effectiveness of gamification is ensured by high-quality feedback, which enables learners to feel confident and track their progress (Sahan, 2014). Key motivational components include: the presence of an evaluation scale with clear criteria; tools for calculating points that reflect progress; the possibility of openly tracking one’s achievements and advancing to a new level; and consideration of the number of attempts made to solve tasks (Sahan, 2014: 17).

Thus, gamification is a powerful tool that fosters strategic thinking, critical analysis, and teamwork skills during the study of history, which is crucial for the training of future commanders.

4. Foreign and Domestic Experience

An analysis of contemporary scientific discourse and practices in leading countries demonstrates that gamification is no longer perceived solely as an entertainment element but is increasingly regarded as an effective tool of professional training. In the context of military education, its application has acquired particular relevance, as evidenced by numerous foreign and a limited number of domestic studies.

Foreign experience: from simulation to strategic thinking. Leading military educational institutions in NATO member states and other developed countries actively employ gamification to develop a wide range of competencies. Instead of traditional lectures and tactical maps, learners are engaged in dynamic simulations that allow them to “relive” historical events.

Military history through simulators. Military history training in the armed forces of the United States, the United Kingdom, and Australia involves the use of serious games and simulators that replicate real combat situations. For example, instead of memorizing the plans of the Normandy operation, learners may participate in virtual landing simulations where their decisions influence the outcome. This approach helps them not only to memorize the course of events but also to grasp the logic and consequences of command decisions, thereby developing strategic thinking and leadership skills. Game-based elements (scores, badges, leaderboards, narratives, competition, etc.) enhance motivation, engagement, confidence, and decision-making in a safe tactical learning environment (Stathakarou N., Kononowicz A., Mattsson E., & Karlgren K., 2024). Digital wargaming in higher military education provides secure “what-if” scenarios, increases motivation, facilitates knowledge transfer, enhances skills, changes behavior, saves time, and improves understanding of the operational environment (Bojor L., & Grigore L., 2023: 146).

Gamification of “soft” skills. A study conducted in the Ecuadorian Navy demonstrates that gamification is effective not only for tactical training but also for linguistic and social skills. The use of game mechanics (points, competition) in learning English significantly increased learners motivation and academic performance. This experience may be adapted to military history training through quests to search for information in English about military campaigns, thereby fostering intercultural communication.

Integration of game-based thinking. The Australian Army (ADELE) explicitly recognizes that goal orientation, competition, and achievement – elements inherent to gamification – contribute to more effective and adaptive learning (Stathakarou N., Kononowicz A., Mattsson E., & Karlgren K., 2024). This recognition facilitates adaptation to the learning process and enhances its effectiveness.

Domestic experience: from isolated initiatives to a systemic approach. In Ukraine, the use of gamification in military higher education institutions remains at an early stage. While there are isolated initiatives and scholarly developments, a systemic approach has yet to emerge.

Ukrainian scholars actively discuss gamification in education in general (Kasyanov, 2011), yet only a few works focus on its military dimension. For example, L. Kozubtsova et al. (Kozubtsova, 2022) highlight the concept of a training complex for information and cybersecurity specialists based on gamification principles. This indicates an understanding of the technology’s potential but also points to the narrow specialization of research.

Although gamification is rarely mentioned in official programs, some military personnel and educators already experiment with it. For instance, the use of popular strategic games such as Arma 3 or Hearts of Iron to practice tactics, understand logistics, and explore historical scenarios reflects a growing “bottom-up” demand.

Ukrainian scholars (Hlovatskyi, 2018: 107) confirm that domestic higher education institutions lag behind foreign counterparts in implementing gamification. This gap creates a unique opportunity for research aimed at developing and introducing a systemic model of gamification for military history education. For example, the creation of digital quests that immerse learners in the era of the Ukrainian Revolution or World War II would allow them not only to study the material but also to appreciate the significance of historical experience for modern defense.

Thus, foreign experience confirms the effectiveness of gamification in developing a broad spectrum of professional skills, whereas domestic experience highlights a significant scholarly gap and the need to develop comprehensive methodologies for applying gamification in military history education.

5. Practical Application and Results

Gamification is a powerful tool that not only enhances motivation but also effectively develops key professional competencies. Its practical implementation in the educational process of military institutions requires transforming traditional tasks into interactive ones through the use of game mechanics. This is particularly relevant in the study of military history disciplines, which must go beyond the mere memorization of facts and serve as a foundation for the development of strategic thinking and analytical skills.

Based on theoretical principles and an analysis of prior experience, a methodology for implementing gamified elements in the study of military topography was developed. The experiment was conducted in a higher military educational institution with the participation of two groups of learners: an experimental group and a control group. For the experimental group, game mechanics were introduced, including points for completed tasks, badges for achievements, a leaderboard, and field quests using GPS navigation. The control group studied according to the traditional program.

The use of gamification in the study of military history disciplines opens new opportunities for immersing learners in the learning process. It enables the combination of academic rigor with interactivity, creating an environment in which history is perceived not as a collection of dates and facts but as a domain for strategic thinking and analysis. This can be achieved through several approaches:

Development of historical quests and simulations. Instead of passive reading, learners engage in active participation. For example, the study of the Battle of Kruty may be organized as a digital quest in which teams receive initial data (maps, reports) and must make decisions under conditions that simulate historical circumstances. Correct decisions earn points, while mistakes result in penalties, enabling learners to understand the consequences of each step. This transforms history into a dynamic process in which learners act as commanders, practicing leadership and tactical analysis skills.

Integration of existing games. Strategic games such as *Hearts of Iron*, *Civilization*, or *Company of Heroes* can serve as effective supplementary tools. Instructors may create learning scenarios based on historical events. For instance, learners may be tasked with altering the outcome of a particular military campaign or analyzing logistical miscalculations of an army during a specific historical period. This approach not only facilitates the acquisition of knowledge but also deepens the understanding of how geopolitical factors, economics, and logistics influence the course of military operations.

Reward and ranking system. To foster competitive spirit and motivation, a comprehensive system can be introduced. Examples include points for correct answers in quizzes and successful completion of tasks or simulations; badges for specific achievements, such as *Historical Analyst* for in-depth analysis of primary sources or *Tactical Genius* for victory in a battle simulation; and leaderboards reflecting the progress of each team or cadet. This creates healthy competition and motivates learners to achieve better results.

Narrative-based assignments. The study of history can be structured as a single “mission,” with each topic framed as a “task.” For example: *Mission 1: The Origins of World War II*;

Mission 2: Operation Barbarossa; Mission 3: The Battle of Stalingrad. This creates an immersive effect and encourages learners to complete the entire “scenario.”

Model for Developing Professional Competencies through the Gamification of Military History

Stage 1: Defining the Didactic Goal. This stage serves as the foundation of the entire model. Traditionally, the goal of history education is the memorization of facts, dates, and names. Gamification transforms this objective into a dynamic task. For example, instead of the traditional goal of “*studying the defense of Kyiv in 1941*,” the gamified objective becomes “*ensuring the retention of key defensive lines and the successful evacuation of troops*.” This shifts learning from passive information absorption to active problem-solving, thereby fostering critical thinking.

Stage 2: Designing Game Mechanics. At this stage, clear and understandable game rules are established to motivate learners. The core mechanics include:

Points: awarded for correct decisions, timely completion of tasks, or identifying logistical errors in historical documents.

Rankings: reflecting the success of each team or cadet, creating a competitive spirit.

Badges and achievements: virtual awards for specific accomplishments, such as “*Tactical Analyst*” for developing an effective strategy or “*Military Historian*” for an in-depth analysis of primary sources.

Leaderboard: a public ranking that motivates learners to strive for better results.

Stage 3: Content Development. Historical material is transformed into interactive tasks:

Quests: learners may receive assignments to search for and analyze historical maps, reports, and photographs in order to “*investigate*” the course of military operations.

Simulations: development of simple simulations that recreate historical battles. Teams can command virtual units and make tactical decisions.

Narrative missions: the study of an entire campaign can be presented as a sequence of “*missions*,” with each unlocking access to the next stage.

Stage 4: Implementation and Feedback. The educational process is launched with gamified elements. It is crucial to provide immediate feedback:

Visualization: progress in points and rankings is displayed in real time on dedicated online platforms.

Decision analysis: after each game task, the instructor analyzes the learners’ decisions, explaining which were historically justified and which were not. This promotes learning from one’s own “*mistakes*.”

Stage 5: Evaluation and Adjustment. At this stage, the overall effectiveness of the model is assessed. Evaluation includes:

Comparison of academic performance: comparing the results of the gamified group with the control group.

Analysis of motivation levels: conducting surveys and collecting cadet feedback.

Adjustments: based on the data obtained, modifications are made to the game mechanics, content, and methodology.

Case Example: Operation “Barbarossa” (June 1941)

Didactic goal: to study the strategic objectives, planning, and initial stages of the German invasion of the USSR, particularly the operations of Army Group South in Ukraine, as well as the reasons behind the Wehrmacht’s successes and the Red Army’s initial failures.

Game objective: “*to analyze and reenact the initial stage of the invasion, revealing key tactical and strategic decisions of the German command and the Soviet response.*”

Game mechanics: cadet teams earn points for successful analysis, correct tactical decisions, and identifying mistakes in the planning of both sides. The assignment is divided into missions:

Mission 1: Planning (points for analyzing historical directives and operational plans, identifying key directions of attack).

Mission 2: Blitzkrieg (points for speed and effectiveness of advancement on a simulated map, as well as for analyzing contributing factors).

Mission 3: Defense (bonuses for identifying weaknesses in Soviet defenses, such as communication issues, logistics, or poor troop placement).

Optional scenarios: learners may choose to act as either German or Soviet command, allowing them to view events from multiple perspectives.

Content: learners use digital versions of historical maps, operational plans, commanders' memoirs, and meteorological data from June 1941 to make decisions under conditions closely resembling reality. This enables them to experience the complexity of decision-making with limited and often contradictory information.

Results: the experiment demonstrates that this approach not only increases engagement but also helps learners better understand the complexities of military planning and the importance of logistics in a historical context. Instead of simply memorizing dates, they learn to analyze and forecast the course of military operations.

6. Conclusions

The conducted research has comprehensively substantiated and confirmed the effectiveness of gamification as an innovative tool for developing the professional competencies of learners in higher military educational institutions. In the context of digitalization and dynamic changes in the military environment, traditional teaching methods have become insufficiently effective. Gamification, which influences the cognitive, emotional, and social dimensions of learners, ensures the transition from passive knowledge acquisition to active, practice-oriented learning.

The analysis of international and domestic experience demonstrated that the implementation of gamified elements in military education is a global trend, whereas in Ukraine this process is still at an initial and fragmented stage. This scientific gap opens up a broad field for further research and practical implementation.

The most significant results of the study include:

1. *Theoretical justification* of gamification as an effective pedagogical technology capable of enhancing learners' motivation and engagement.

2. *Development of a practical model* of gamification for military-historical studies, which transforms history from a purely theoretical discipline into a tool for developing strategic thinking, analytical skills, and decision-making abilities.

3. *Empirical confirmation* that the use of gamified elements such as points, quests, and simulations significantly improves academic performance and the quality of knowledge acquisition.

Prospects for further research in this field include the design and testing of comprehensive gamified platforms for various military specialties (logistics, intelligence, cybersecurity), as well as the study of the long-term impact of gamified learning on the level of combat readiness and the professional effectiveness of graduates. Future studies should also focus on integrating gamification with virtual and augmented reality technologies to create more immersive and realistic training environments.

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