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Integration of artificial intelligence into higher military education as a factor in increasing the efficiency of professional training

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Abstract. The study aimed to identify effective models and approaches to the integration of artificial intelligence technologies into the system of higher military education. The methodology of the study was based on theoretical analysis of scientific sources, content analysis of official documents, statistical reports and comparative analysis of national educational systems in the field of military training. The study determined that the use of artificial intelligence systems, including adaptive learning software, platforms with elements of virtual and augmented reality, as well as neuro-symbolic models of artificial intelligence, can increase the realism of training simulations, enhance the analytical training of students and improve the dynamics of learning. The analysis of current technological trends, according to which the military artificial intelligence market has been showing steady growth, accompanied by a growing need for specialists capable of effectively interacting with intelligent systems in operational conditions, was conducted. The analysis determined that the United States and the United Kingdom demonstrated the highest level of technological maturity and large-scale implementation of artificial intelligence in the educational process, while Germany followed a moderate but structured approach. Despite the challenges, Ukraine has shown a desire to innovate through the introduction of simulation solutions and adaptive technologies, subject to further government support and international partnership. The conclusions emphasised that the integration of artificial intelligence into higher military education is strategically important for all four countries, although it is implemented through different priorities and tools. The practical significance of the study is to develop recommendations for the digital renewal of military education in Ukraine, taking into account the successful international experience

Keywords: officer training; international experience; professional military education; augmented reality; artificial intelligence capabilities for knowledge assessment; personalised learning

INTRODUCTION

Constant geopolitical challenges, the Russian-Ukrainian war and the rapid development of military technologies necessitate the transformation of the system of training military specialists. In this context, the integration of

artificial intelligence (AI) into higher military education is of particular importance as a tool for modernising the educational process, enhancing the analytical and operational capabilities of future officers, and adapting the educational environment to the needs of modern combat. The countries of the North Atlantic Treaty Organisation (NATO), including the United States and European countries, have already developed practical models for implementing AI in military education. The need to ensure high-quality and technologically advanced training of officers in the face of hybrid and high-tech threats necessitates the introduction of the latest solutions, including AI, into the system of higher military education. Despite the active introduction of digital technologies into the military education systems of NATO countries, the level of integration of artificial intelligence into higher military education institutions (HMEIs) in Ukraine remains fragmented and insufficiently researched. There is a need to identify optimal models of AI application to improve the effectiveness of professional training of future officers, incorporating both national experience and practices of partner countries.

Much of the research focuses on analysing the potential of AI to optimise the learning process, automate assessment, and develop adaptive learning environments, including A.M.A. Alnaqbi & A.M. Yassin (2021), who examined the state of artificial intelligence and e-learning in the military education system of the United Arab Emirates, analysing existing practices, technological solutions, and organisational approaches in the context of educational challenges. The study identified several barriers, including a lack of technical infrastructure, poor staff training, and limited strategic vision. The study proposed multi-level strategies for modernisation, including updating policies, developing human capital, and introducing adaptive learning platforms. K. Bekpulatov (2024) analysed the experience of developed countries in the use of AI in military training. The study demonstrated the active use of simulation systems, decision support systems, and virtual training in the United States, the United Kingdom, and Israel. The study emphasised that AI in these countries has already become an element of strategic defence training and professional development of military personnel. C.A. Pfaff *et al.* (2023) analysed the issue of trust in AI among military experts in the US Armed Forces. The study determined that the effective integration of AI depends not only on the technological level but also on cultural and ethical aspects of perception. The study proposed a model for combining human expertise and AI in military decision-making.

The impact of AI on the management of pedagogical processes in military academies was studied by O. Zughoul *et al.* (2025). The study concluded that the integration of intelligent systems into pedagogy contributed to the personalisation of learning, improved monitoring of results and optimisation of schedules. The study emphasised that successful AI implementation requires changes in the management structure of institutions and training of teaching staff to use digital technologies. V. Chmyr & N. Bhinder (2023) determined that most military higher education institutions demonstrate an insufficient level of digital transformation and have limited experience in using AI. The study proposed the concept of integrated learning using adaptive platforms and simulators that can model technical tasks in combat. J.G. Peacock *et al.* (2025) studied the integration of AI into military medical education and training. The study determined that the use of intelligent systems significantly improved medical training through emergency simulations and personalised learning paths. The researchers emphasised the importance of an interdisciplinary approach to the implementation of AI in medical training in combat situations. J.R. Spirnak & S. Antani (2024) emphasised the need to introduce AI training content into military medical education. The study determined that most medical curricula of the Armed Forces do not cover key aspects of AI, which creates a gap in the training of future military doctors. The study proposed an AI integration framework that would include the basics of machine learning, medical image analysis, and ethical aspects of using intelligent systems.

K. Bondar (2024) studied the military artificial intelligence system in Ukraine. The study identified key actors, from government agencies to private companies, and analysed challenges, including insufficient funding and a lack of agreed standards. The study demonstrated Ukraine's potential to create a hybrid model of AI implementation in the military sphere. M. Onderco (2025) analysed the impact of the conflict in Ukraine on the formation of NATO's military AI strategies. The study stressed that real-life combat conditions have accelerated the need for standardisation and international regulation of autonomous systems. The study also noted that NATO should strengthen its role in ensuring the ethical and safe use of AI in the armed forces. O. Trofymenko *et al.* (2024) analysed the role of artificial intelligence in modern military strategies and technological systems. The study determined that AI is increasingly being used in battle management systems, cybersecurity, and autonomous platforms. They also highlighted regulatory issues and emphasised the need to develop a unified ethical policy on the use of AI in the military. The studies mainly emphasise the potential of AI and general strategies for its integration but did not sufficiently reveal the practical results of implementing AI in the daily educational process of military academies. There was also a lack of empirical data on the impact of AI on the development of professional competencies.

The study aimed to identify effective approaches and models for integrating artificial intelligence into the system of higher military education, based on a comparative analysis of the experience of Ukraine, the USA, the UK and Germany. The objectives of the study were to analyse the theoretical foundations and conceptual approaches to the introduction of artificial intelligence into higher military education in the context of the current security situation and technological development; to conduct a comparative

analysis of the level and forms of AI use in the professional training of military personnel in higher military education institutions of Ukraine, the USA, the UK and Germany; to process and summarise statistical data on the dynamics and effectiveness of AI implementation in military education.

MATERIALS AND METHODS

The study was theoretical in nature and aimed at identifying current trends, opportunities and effectiveness of introducing artificial intelligence technologies into the system of higher military education, as well as analysing the experience of different countries in using intelligent technologies for training military personnel, in the context of Ukraine, the USA, the UK and Germany. The choice of these countries is due to both the relevance of the topic for Ukraine in the context of war and the availability of best practices in the implementation of AI in defence education in the United States, the United Kingdom and Germany, which are technologically advanced countries and NATO members. The timeframe covered the period from 2020 to 2024, which traced the dynamics of the digital transformation of the educational process in military institutions and identified key stages of digital infrastructure development.

The study collected secondary data from official sources, including reports: International Committee of the Red Cross (2024), "Artificial Intelligence in Military Statistics and Facts" (Pangarkar, 2025), as well as analysis of documents, in particular JSP 936: Dependable artificial intelligence (AI) in defence (part 1: Directive) (Ministry of Defence, 2024). Additionally, academic publications were analysed (Borchert *et al.*, 2024), as well as selected materials from expert interviews and industry reports, including Defence Advanced Research Projects Agency (n.d.; 2025) and HGXR (2024). Statistical indicators on the introduction of AI in the educational process of military academies, in the areas of combat simulation, cybersecurity, intelligence processing and automated assessment, were emphasised (Pangarkar, 2025).

Three key research methods were used. Theoretical analysis (in particular, content analysis of scientific literature) was used to systematise the main conceptual approaches to the integration of AI into military education. It identified priority areas of digitalisation, to identify leading models of innovative technologies implementation and to assess the degree of their impact on teaching methods and the organisation of the educational process in military universities. Next, a comparative analysis was used to compare the level and forms of AI integration in military education in Ukraine, the USA, the UK and Germany. The analysis covered such aspects as the extent of the introduction of training simulators, the functioning of adaptive learning platforms, the use of automated assessment systems, and the level of funding for innovative educational initiatives in the military sphere. The analysis of statistical data was conducted using Microsoft Excel (version 2021), using descriptive statistics, which summarised the quantitative indicators of AI implementation in military education and identified statistically significant relationships between key parameters. The Wald criterion was used to assess the statistical significance of the impact of funding on the level of innovation. This criterion was used to test the hypothesis: does the amount of funding affect the scale of AI applications in these countries? The article summarised the indicators of coverage of higher military educational institutions by digital technologies, traces the change in the intensity of AI use in education, and establishes the correlation between the level of innovation integration and the effectiveness of military training.

RESULTS AND DISCUSSION

Theoretical and methodological foundations of artificial intelligence integration into higher military education

The integration of AI into military education is becoming an important component of the digital transformation of the educational environment, which aims to increase the effectiveness of training military specialists in the context of growing demands for technical literacy, adaptability and the ability to act in conditions of information and cognitive complexity. Priority areas of digitalisation of military education have been identified. These include:

- use of intelligent simulators and virtual trainers to model combat situations in augmented and virtual reality environments;
- implementation of adaptive learning systems that incorporate the individual pace and style of learning;
- creating digital platforms for developing teamwork and management skills;
- application of technologies for analysing the behaviour and cognitive state of cadets to detect stress, fatigue and a decrease in the level of engagement in training promptly.

All the areas aim to improve the efficiency of the educational process, optimising the workload and increasing the level of psychological resilience of future military professionals. The integration of artificial intelligence into the military education system demonstrates a strategic multi-vector focus not only on combat training but also on the protection of information space, operational intelligence analysis, individualisation of training and support of logistics processes. These tools are being continuously introduced into various aspects of military training. Figure 1 shows the general trend in the distribution of AI applications in this area.

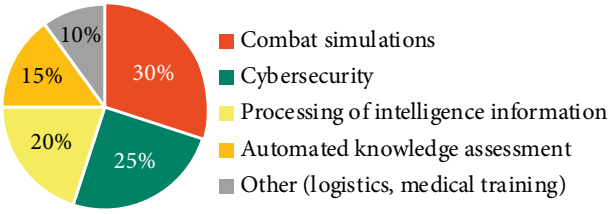

Figure 1. Areas of AI application in military education
Source: compiled by the authors based on the International Committee of the Red Cross (2024)

The structure of the use of artificial intelligence in military education indicates a reorientation of educational programmes towards technologically advanced and adaptive solutions that can prepare personnel for the challenges of modern warfare. Simulation technologies receive the most attention, covering 30% of all applications. They provide simulations of complex combat situations in a secure environment and can be used for tactical thinking and operational response without the need to physically deploy resources. This dominance of simulations is explained not only by their effectiveness but also by the growing need for adaptive training in the face of dynamic threats. Cybersecurity accounts for a significant share of 25%, which logically follows from the relevance of information and hybrid threats. The introduction of augmented reality to protect the digital infrastructures of military educational institutions not only improves efficiency of response to attacks but also ensures proactive identification of system vulnerabilities. At the same time, intelligence processing, which accounts for 20%, is becoming a critical analytical tool to support strategic planning and operational decision-making, especially in multi-domain operations and the need to quickly process large amounts of data. Automated knowledge assessment accounts for 15% of the market and is gradually gaining traction as a means of individualising the educational process. Such systems can be used to accurately track cadets' progress, quickly identify educational gaps and automatically adapt training goals, which increases the efficiency of training without additional burden on teachers. Lastly, the residual segment of 10% covers ancillary services, including logistics and medical training. This indicates the gradual integration of AI into related functions that support the combat readiness and resilience of military structures in general.

The analysis of conceptual approaches identified four key paradigms. The first is the technology-oriented approach, which involves using AI as a tool to automate routine educational processes, including testing, simulations, processing educational data, and providing feedback to cadets. The second is the pedagogical and adaptive approach, according to which artificial intelligence is seen as a tool for personalising learning, creating individual trajectories and predicting educational outcomes. The third is a strategic and innovative approach focused on transforming the educational paradigm in general, through the creation of collective decision-making systems, simulation of combat scenarios, and training in teamwork using intelligent technologies. The fourth is the security and ethical and legal approach, which focuses on cybersecurity, decision-making autonomy, legal responsibility in the use of AI and ethical aspects of human-machine interaction in military education.

In the context of the introduction of innovative technologies, several models for integrating AI into military education were identified. The first is the human + AI model, in which teachers work in tandem with digital assistants that automate assessments, provide individual recommendations and provide real-time feedback. The second is the AI-enhanced blended learning model, which combines traditional forms of education with adaptive digital platforms. The third model is the full digitalisation of the learning process, which is typical for specialised programmes, such as cybersecurity, where learning takes place in virtual environments with offline monitoring of learning progress. The fourth model is institutionalised implementation, which involves the creation of specialised centres for the development and implementation of AI technologies for the educational and research process within military universities. An assessment of the impact of AI on teaching methods and the organisation of the educational process shows significant transformations in three key areas. First, the teaching methodology is changing due to the introduction of adaptive platforms, interactive visualisation of complex material, and individualised approaches to knowledge acquisition. Secondly, the organisation of the educational process is optimised by automating the timetable, monitoring educational outcomes, and integrating online courses and digital classrooms. Thirdly, the use of cognitive interfaces and emotional monitoring systems enables better psychological and pedagogical support for cadets, which increases moral and psychological stability and reduces the risk of professional burnout.

The results of the study demonstrated that the integration of artificial intelligence into higher military education significantly increases the effectiveness of professional training of future military specialists, through adaptive learning, virtual modelling of combat situations and improvement of cadets' analytical skills. This is consistent with the findings of H. Putra & B.E. Mulyono (2024), noting that the use of AI in military education contributes to the formation of operational thinking and risk reduction in real-world conditions, although also highlighting the need for ethical control over the implementation of such technologies. The use of AI systems in military training contributes to the creation of adaptive learning environments in which complex tactical situations can be modelled with a high level of realism (Hagos & Rawat, 2024). Importantly, by combining neural processing with logical rules, such models can embed the ethical and legal constraints necessary to train military professionals in a modern environment that requires not only technical literacy but also a deep understanding of the humanitarian aspects of warfare. In addition, D.H. Hagos & D.B. Rawat (2024) determined that neuro-symbolic AI can be central in improving military education courses aimed at developing critical thinking, situation analysis, risk management, and real-time decision-making. This opens new prospects for training commanders who can effectively interact with autonomous systems, control combat management processes, and adapt to the complex and changing conditions of the modern battlefield.

The introduction of virtual simulation systems based on artificial intelligence algorithms can be used by cadets to develop strategic planning skills more effectively. This correlates with the study by Y. Kim (2021), who proved

the effectiveness of AI simulations for modelling combat scenarios in military academies in the Republic of Korea, which accelerated the adaptation of future officers to non-standard situations. Moreover, it is possible to increase the motivation of cadets to study due to the interactivity and personalisation of the learning process provided by AI. This was confirmed by A.T. Biggs (2025), stressing that adaptive learning systems based on AI cane be used to account for the individual learning style of each cadet, which, in turn, improves training results and the level of material assimilation. This information is complemented by the work of J.E.M. Díaz (2024), which recorded an improvement in the critical thinking skills of cadets trained using AI tools, especially through decision analysis and machine learning systems. Therefore, the use of AI in military education contributes to the development of the ability to make decisions based on many variables in a short time, which is especially important in combat situations. It is also possible to reduce the workload of teaching staff by automating part of the learning process, including assessment and feedback. This is supported by the findings of A.B. Rashid & M.A.K. Kausik (2024), who highlighted the potential of AI in automating routine educational tasks in various fields, including the military.

Notably, there are also challenges associated with the introduction of AI in military education, including technical limitations, risks of confidential data leakage and dependence on digital systems. Similar warnings are present in the study by J. Black *et al.* (2024), which states that the strategic use of AI in the military should be accompanied by the development of security protocols and backup procedures in case of cyberattacks. Excessive automation of training can lead to a decrease in interpersonal interaction. This result correlates with the study by P. Kelly & H. Smith (2024), noting that the integration of generative AI should be accompanied by a lively dialogue between participants in the educational process to preserve the values of teamwork. Furthermore, the use of AI can contribute to the development of new professional competencies in the military, in the areas of big data analysis, cybersecurity, and information systems management. This correlates with the findings of J. Savelka *et al.* (2025), proving that the development of rapid training methods using AI can be used to form a competitive workforce capable of responding dynamically to technological challenges.

Thus, the unique experience of introducing artificial intelligence into higher military education is that this process not only transforms traditional approaches to military training, but also creates a fundamentally new educational ecosystem where knowledge, adaptability and digital competence are formed simultaneously. Thanks to simulation platforms, cognitive monitoring and big data analysis, future officers acquire skills in reflective thinking, strategic planning and rapid response to multidimensional threats. This contributes to the emergence of a new type of military specialist – not only technically armed, but also ethically conscious, resistant to information attacks and capable of rapid adaptation in a changing combat environment. Thus, the integration of AI into military education is not just a modernisation of the educational process, but a step towards the formation of an intelligent army of the future, where the main value will remain human.

Assessment of the use of AI in military education and comparative analysis of the experience of its integration in Ukraine, Germany, the USA and the UK

According to the analytical report by T. Pangarkar (2025), the introduction of artificial intelligence in the military sphere is one of the key trends in modern technological development, which demonstrates steady growth and significant impact on various aspects of defence activities. The use of intelligent technologies is increasingly being integrated into military strategies, tactical operations, and logistics management, as well as into education and combat training systems.

Statistics show that the global AI market in the military sector is growing dynamically: from 7.9 billion USD in 2022, it increased to 8.9 billion USD in 2023. According to forecasts, by 2032, this market could reach 24.7 billion USD, corresponding to a compound annual growth rate (CAGR) of 12.4% between 2023 and 2032. This growth is driven by both increased investment from public and private defence entities and growing global demand for automated and intelligent military solutions. Structurally, the AI market in the military sector is divided into several main components. Software accounts for the largest share, playing a leading role in the implementation of algorithmic systems based on machine learning, neural networks and forecasting. Revenue in this segment is projected to reach 10.52 billion USD by 2032. At the same time, hardware and related services are also showing steady growth. By 2032, these segments could generate 8.00 billion USD and 6.18 billion USD, respectively. This trend indicates a growing need for technical resources to support AI systems, as well as accompanying services, including technical support, consulting, and cybersecurity. An analysis of the market by type of military platform shows that space platforms account for the largest share (33%). This highlights the growing role of satellite technologies, which are critical for global surveillance, reconnaissance, navigation and communications. Ground platforms account for 29% of the market, air platforms for 21%, and maritime platforms for 17%. This distribution indicates that artificial intelligence is being implemented in virtually all domains of modern warfare, ensuring adaptation to a variety of combat scenarios (Pangarkar, 2025).

The integration of AI into military education and training deserves special attention. In this context, the latest technologies, including virtual and augmented reality systems powered by artificial intelligence, are actively used to create adaptive, realistic and safe learning environments. This makes it possible to simulate combat situations, optimise decision-making and develop critical thinking in military personnel without risking their lives. The use of such

tools significantly increases the effectiveness of training, reduces training costs and promotes an innovation-oriented approach to the professional development of the military. At the same time, despite the positive dynamics of development, the introduction of AI technologies in the military sphere is accompanied by several challenges. According to the report by T. Pangarkar (2025), 59% of respondents point to the shortage of qualified data analysts as a key obstacle to the introduction of relevant technologies. An even more substantial challenge is the issue of transparency and ethics: 76% of executives express concern about potential data bias and the lack of transparent algorithms in AI systems. This requires the development of clear regulations, professional training, and ongoing monitoring of implemented solutions.

In the context of the transformation of military education, the introduction of artificial intelligence tools that change both the forms of training and the content of the educational process is becoming increasingly important. The integration of AI can enhance individualisation of learning, provide flexible management of educational trajectories and improve the assessment process. In the period from 2020 to 2024, the digital transformation of the educational process in military institutions gained rapid momentum in several countries. International experience demonstrates a variety of approaches to the introduction of digital technologies in the military sphere, which is driven by both technical capabilities and political priorities. A comparison of the practices of four countries, namely Ukraine, the United States, the United Kingdom, and Germany, identified the strengths, challenges, and trends in the development of digital education in the military context. The analysis addressed four key aspects: the extent of use of augmented reality-based training simulators, the functioning of adaptive learning platforms, the use of automated assessment systems, and the level of funding for innovative initiatives. The assessment of these components helps to identify the degree of technological maturity of each country in the field of digital transformation of military education. Comparison of these parameters not only identified best practices but also assessed the possibility of adaptation to Ukrainian realities. Table 1 presents comparative characteristics of the introduction of AI in military education in the context of these countries.

Table 1. Comparative analysis of AI integration in military education

Country	Training simulators with AI	Adaptive learning platforms	Automated knowledge assessment	Financing innovation in defence education
Ukraine	Limited use; used mainly in pilot projects at military academies	Partial testing of adaptive platforms, including in cooperation with private IT companies	Use at entry level; depends on human factors	Low level of public funding; dependence on international assistance
USA	Large-scale implementation in all branches of the armed forces; active use of VR/AR with AI	Developed a network of adaptive systems (e.g. DARPA)	Widespread use in testing, skills assessment, progress forecasting	High level of funding (billions of dollars in budgets through the Defence Advanced Research Projects Agency (n.d.; 2025), etc.)
Great Britain	High level of integration, including multi-agent simulations	Adaptive learning environments are in place (e.g., as part of the Defence Learning Environment programme (Ministry of Defence, 2024))	Automated systems are partially implemented, considering ethical standards	Stable funding through the Ministry of Defence; cooperation with universities
Germany	Medium level of application; focuses on command-and-control training	Tested in selected military schools; emphasis on data security	Pilot systems in place; focus on accuracy and reliability	Moderate funding; emphasis on integration with civilian research institutions

Source: compiled by the authors based on J. Freeman & W. Zachary (2018), E.H. Christie (2022), H. Putra & B.E. Mulyono (2024), S. Ding *et al.* (2025)

A comparative analysis of the integration of artificial intelligence into military education demonstrated significant differences between countries both in terms of the scale of implementation of relevant technologies and the depth of their adaptation to national educational and defence contexts. In the United States of America, AI is being introduced into the educational processes of military academies and training institutes as part of systemic government programs and targeted initiatives funded and coordinated by the Defense Advanced Research Projects Agency and the US Department of Defense. In particular, the Defence Advanced Research Projects Agency (2025) competition titled AI Tools for Adult Learning involves a multi-phase competitive selection system and provides funding of up to 750,000 USD. These funds aimed to support the development of innovative adaptive learning tools for defence professionals. Participants in the competition will receive funding to create prototypes of intelligent learning platforms that can analyse the individual educational needs of cadets in real time and adapt the

content of training modules accordingly. In parallel, the ENGAGE programme (Defence Advanced Research Projects Agency, n.d.) addressed the development of new methods for mass evaluation of the effectiveness of blended learning formats, including offline models, virtual classrooms and simulations. The use of large amounts of data within this programme objectively tracked learning progress for thousands of cadets simultaneously, as well as automated generation of individual learning trajectories to train highly qualified officers capable of operating in a rapidly changing digital battlefield. The United States demonstrates strategic consistency in the process of digitalising military education. An example is the activities of the US Military Academy at West Point, which is actively implementing new curricula focused on developing officer competencies necessary for effective performance of tasks in the digital environment. The main emphasis in the educational process is on the study of autonomous systems, artificial intelligence, and big data analysis, as well as the basics of cybersecurity and artificial intelligence modelling (Gilland & Reeves, 2024). Such an interdisciplinary approach ensures the training of personnel capable of operating in the context of hybrid warfare, cyber threats and information confrontation. In addition, the US Department of Defence at the state level supports the development of the concept of adaptive learning, which includes the introduction of intelligent decision support systems based on artificial intelligence. These systems are used both in classroom training and in the field, forming a new standard of combat training focused on individual characteristics and real-time knowledge updating.

The British approach to the integration of artificial intelligence into military education is characterised by a combination of a developed regulatory framework and innovative technological solutions implemented within the defence learning environment (DLE). The key regulatory document in this area is JSP 936 (Ministry of Defence, 2024), which sets out the minimum requirements for personnel training to ensure the safe, ethical and effective use of artificial intelligence technologies. According to this document, all specialists involved in military activities must undergo mandatory training through the DLE, which provides access to modular online courses, interactive simulations, videos, and testing with automated assessment of the level of skills mastery. It is also worth noting the active cooperation of the UK Ministry of Defence with the private sector. In particular, the startup Hadean has developed a generative language model that is integrated into the British army's virtual simulators to create an adaptive "human environment". This technology enables simulators to dynamically respond to the actions of cadets, bringing training situations closer to the realities of the modern battlefield and at the same time increasing the cognitive complexity of training. The UK's military education policy is being transformed in response to the strategic challenges of modern defence doctrine, which emphasises the need for technological dominance in future conflicts. The All-Party Parliamentary Groups report (2023) emphasises that future commanders must have basic competencies in artificial intelligence, algorithmic thinking and digital operations management. On such basis, it is recommended to include relevant training modules in officer programmes, as well as to create interdisciplinary training centres at the intersection of defence and IT with the involvement of relevant experts.

In the Federal Republic of Germany, the integration of artificial intelligence into military education is based on a science-based approach and a moderate incremental strategy. The concept of Master and Servant, which has become widespread among German defence researchers, emphasises that AI should remain a "servant", i.e. a tool fully controlled by humans. The focus is on the application of AI in C4ISR (command, control, communications, computers, intelligence, surveillance and reconnaissance) systems and open-source analytics (Borchert *et al.*, 2024). A significant portion of defence innovation funding, approximately 50 million EUR annually, is directed to the development of AI-enhanced early warning systems and the application of intelligent visual data processing in the field of missile technology. At the same time, the content of military education is being adapted: The Bundeswehr Command and Staff College and the Bundeswehr University Hamburg are revising their curricula to include specialised courses in artificial intelligence and launching new bachelor's and master's degree programmes with relevant profile (HGXR, 2024). In the context of the digitalisation of military training, Germany demonstrates the effective implementation of VR/AR technologies. Virtual parachute jump simulators are used in the training of airborne units, which can significantly reduce training costs and minimise the risk of injury. Such solutions provide a high level of realism in combat scenarios, contributing to the development of operational decision-making skills in a dynamic environment (CPM Defence Network, 2024). Germany's digital infrastructure for military education is also gradually integrating AI technologies into the processes of feedback and assessment of learning outcomes, providing more accurate and adaptive monitoring of cadets' and officers' progress at all stages of their training.

In Ukraine, the digitalisation of military education began to develop rapidly in the context of a full-scale invasion (since 2022), which created an urgent need to introduce the latest approaches to personnel training. Even though Ukrainian military academies do not yet have full-fledged AI courses, in 2024 the Ministry of Defence of Ukraine initiated a competition for the development of VR/AR simulators using AI for comprehensive training of military personnel, including in urban combat, casualty evacuation, and reconnaissance scenarios (Ministry of Defence of Ukraine, 2024). Ukraine's participation in the North Atlantic Treaty Organisation's Defence Education Enhancement Programme (DEEP) (2025), which aims to modernise curricula, develop distance learning courses and implement NATO standards in the military training system, remains an important component of digital transformation. The

concept of digital transformation of military education in Ukraine is currently in its infancy. AI-driven simulations are used mainly in pilot projects involving international partners and leading IT companies, mainly to practice tactics in simulated combat conditions (Bondar, 2024). These simulators can adjust scenarios according to individual user performance, as well as generate recommendations for further optimisation of training. At the same time, PSS by Logics7 VR simulators is operating in Kyiv, simulating small arms and air defence, enabling cadets to practice tactical techniques in variable weather and tactical scenarios without risking their lives (Epstein, 2025). At the same time, the lack of stable state funding and the absence of a unified strategic roadmap leads to the sporadic implementation of adaptive digital platforms and fragmented use of automated assessment systems, which significantly limits the scaling of innovations and the unification of the educational process in general.

The results of the study demonstrated a correlation between the level of funding for innovations in the field of military education and the extent of integration of artificial intelligence technologies into educational processes. To confirm this dependence, the Wald criterion was used to identify statistically significant relationships between key quantitative parameters, between the amount of state and external funding, on the one hand, and the level of implementation of innovations such as simulation environments, adaptive platforms and automated assessment systems, on the other. The calculations showed that the value of the Wald statistic for the relevant parameter exceeds the critical threshold at the significance level of 0.05, which confirms the existence of a stable positive relationship between financial support and the scale of AI integration. Countries with a higher level of stable funding (e.g., the United States and the United Kingdom) demonstrate significantly higher rates of implementation of AI tools in the training of military specialists. The application of the Wald criterion has shown that these differences are not random but statistically justified: the coefficients of the relationship between funding and the level of digitalisation in the educational sector exceed the critical values at the accepted level of significance, indicating a direct relationship. These results have important practical implications: they confirm that financial support is a determining factor in the successful integration of artificial intelligence into the educational environment of military academies. In countries with lower levels of funding, such as Ukraine, the pace of digitalisation is much slower, and the introduction of innovations is mostly fragmented and depends on international technical assistance or pilot projects.

The results of this study demonstrate that the integration of AI into higher military education has become a powerful factor in improving the effectiveness of professional training, which is consistent with several studies. At the same time, similarly to other researchers, the need to combine innovation with control, ethical standards, and ensuring a balance between automation and the human factor was emphasised. The study also determined a positive trend in the level of teamwork among cadets who underwent AI training, particularly in a virtual collaborative decision-making environment. This result is in line with the findings of the U.S. Department of the Treasury's Office of Foreign Assets Control (2023), which showed that AI platforms can serve as a tool to enhance multilateral military cooperation, including within NATO training programmes. In addition, the study results confirm that AI significantly reduces the time required to achieve professional competence through intensive analysis of learning progress and prompt adjustment of the educational trajectory. Similar conclusions were presented by A.B. Rashid *et al.* (2023), emphasised that AI systems in the army can accelerate the process of acquiring combat and analytical skills. This partially correlates with the study by N.K. Shruthi & A.K.S. Yadav (2025), described the effectiveness of AI-based geo-intelligent systems in predicting attacks and creating simulations for training commanders. This study confirms the importance of combining technological innovations with traditional values of military education such as discipline, moral responsibility, and physical fitness. This correlates with the findings of L.V. Scipanov *et al.* (2023), emphasised the need for a harmonious combination of digital learning tools with classical teaching methods in military science.

The results of the study demonstrated that the introduction of artificial intelligence technologies can increase the efficiency of educational processes in higher military educational institutions, contributing to the adaptability of learning and improving the quality of training of military specialists. This correlates with the findings of O. Bazyl *et al.* (2025), who also noted the positive impact of AI integration on the educational systems of higher education institutions in Ukraine and Kazakhstan, especially in the context of digital transformation and innovation. At the same time, the study correlates with the article by L. Berger *et al.* (2025), emphasised the role of European countries in shaping advanced approaches to education using intelligent technologies, emphasising the importance of comprehensive education that considers the specifics of military training. Furthermore, the results coincide with the warnings of H. Oguz (2025), emphasised the potential risks of authoritarian control using AI in educational and military contexts. This emphasises the need for a balanced approach to the introduction of technologies, incorporating ethical and socio-political aspects.

Summarising the above, it is possible to conclude that the introduction of AI in military education is not only a technological innovation but also a factor of profound pedagogical transformation. In this context, the priority task is to create balanced integration models that combine pedagogical appropriateness, technological efficiency and ethical responsibility. Successful digitalisation is only possible if there is a strategic vision, regulatory support, adequate training of teaching staff and an institutional infrastructure capable of adapting innovations to the specifics of the military education system.

Recommendations for improving the process of introducing artificial intelligence into higher military education in Ukraine based on international experience

In the context of integrating artificial intelligence into higher military education in Ukraine, it is advisable to incorporate the best practices of leading NATO countries, particularly the United States, the United Kingdom and Germany, adapting their successful practices to national realities. First, it is advisable to develop a national strategy for the digital transformation of military education, which should include clear priorities, stages of implementation, funding mechanisms, and regulatory support for the process. A similar strategic approach was demonstrated by the United States, where digitalisation and the introduction of intelligent technologies in the military are supported by federal programmes.

An important step should be the creation of interdisciplinary centres for the training of military specialists in the field of AI based on leading national academies and institutes. These centres should unite experts in the fields of information technology, defence, education, and law, which will enable holistic training of officers following modern challenges. A similar experience is being implemented in the UK, where AI is integrated into curricula through the defence learning environment, and interdisciplinarity is recognised as a key condition for effective educational change. Ukrainian military educational institutions need to update the content of educational programmes by integrating adaptive learning based on the principles of personalised educational trajectories that incorporate the individual needs of cadets. In this context, it is worth focusing on American programmes that actively implement AI tools to adapt learning in real-time. In addition, an effective step would be to expand the use of digital simulations and virtual reality in military training. An example is Germany, where VR/AR technologies can simulate complex combat scenarios with high fidelity and reduce risks during training. At the same time, it is necessary to create regulatory mechanisms that govern the ethical, safe and lawful use of AI in military education. In this context, the British document JSP 936 (Ministry of Defence, 2024), which sets minimum requirements for personnel training in the ethical use of AI, is notable.

To ensure the sustainability of digital transformations, it is necessary to implement systematic programmes for the professional development of teaching staff, through the introduction of certified courses in algorithmic thinking, data analysis, digital pedagogy and the basics of AI ethics. In addition, a system for monitoring and evaluating the effectiveness of digital innovations should be created, which will enable timely adjustments to educational approaches and identify weaknesses in training. Lastly, active international cooperation, participation in joint research, exchange of experience with NATO and EU partners, as well as the inclusion of Ukrainian specialists in international initiatives in the field of military education and AI are key factors for development. Therefore, the strategic introduction of AI in higher military education in Ukraine should combine a systematic, interdisciplinary and value-based approach that will ensure that the educational system meets the current challenges of security and technological development.

CONCLUSIONS

The results of the study confirm the relevance of integrating AI into the system of higher military education as a strategic direction for modernising military training in the context of global digital transformation. A comparative analysis of the experience of Ukraine, the United States, the United Kingdom, and Germany has shown the existence of common trends, as well as distinct national approaches to the introduction of intelligent technologies in military education. Firstly, all the countries studied recognise the critical role of digital and AI solutions in the formation of a new generation of military professionals capable of acting effectively in hybrid warfare, information influence, cyber threats and high-tech confrontation. At the same time, the level and forms of AI integration vary significantly depending on the national context, financial resources, educational policy, and strategic priorities of the defence sector. The United States has demonstrated the highest degree of technological maturity in the implementation of AI in higher military education. Emphasis is placed on the intellectualisation of educational processes through the use of adaptive learning systems, cognitive modelling, automated assessment and cloud analytics. Significant investments in research and development, as well as strong institutional support from the Defence Advanced Research Projects Agency and other agencies, ensure the leadership in innovation of the United States.

The UK relies on the development of strategic thinking of military personnel and the formation of digital literacy of future commanders. The integration of AI into the educational process is aimed at improving decision-making under uncertainty, increasing interoperability within NATO, and modelling modern combat scenarios. Germany is committed to science-based, institutionally balanced integration of AI. Visualisation platforms, training simulators, and real-world combat simulation systems play an important role. The focus is on increasing the interdisciplinary nature of training and ethical support for the use of AI in the military. Despite the existing barriers (resource constraints, incomplete legal framework, digital infrastructure problems), Ukraine demonstrates a high level of motivation to implement AI. In the context of war, the Armed Forces and educational institutions are adapting to new challenges through accelerated digitalisation, including the use of combat simulations, automated information processing systems, cyber defence elements, and distance learning.

The analysis confirmed the asymmetry of approaches to the digitalisation of military education. The United States and the United Kingdom demonstrate advanced AI integration through high levels of funding and strategic planning, while Germany is focused on slow but high-quality technology adaptation. Ukraine is in the process of active development in this area, and its further progress

depends on the implementation of a systemic state policy, deepening international cooperation, and investment in digital infrastructure. The study's findings provided several practical recommendations for Ukraine: creating a national strategy for the digitalisation of military education using AI; forming partnerships with leading NATO countries to share experience and technologies; investing in institutional modernisation, training simulators, and faculty training. Only a holistic and adaptive approach will ensure a qualitative transformation of the national military education system following the challenges of the modern security environment. The prospects are to deepen empirical research, expand the number of countries for comparison, and analyse the effectiveness of AI solutions in the training of military specialists.

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REFERENCES

[1] All-Party Parliamentary Groups. (2023). *Defence select committee: AI in defence report published*. Retrieved from https://www.defencetechappg.org.uk/defence_select_committee_ai_report.

[2] Alnaqbi, A.M.A., & Yassin, A.M. (2021). Current status, challenges and strategies of artificial intelligence and e-learning the UAE military education system. *International Journal of Sustainable Construction Engineering Technology*, 12(3), 352-361. doi: 10.30880/ijscet.2021.12.03.034.

[3] Bazyl, O., Abilova, O., Karpenko, O., Mierienkov, H., & Poliakova, A. (2025). Assessing the impact of artificial intelligence integration on educational processes in higher education institutions of Ukraine and Kazakhstan. *Sustainable Engineering and Innovation*, 7(1), 97-116. doi: 10.37868/sei.v7i1.id418.

[4] Bekpulatov, K. (2024). Possibilities of using artificial intelligence in training military personnel in developed foreign countries. *International Multidisciplinary Research in Academic Science*, 7(12), 126-129. doi: 10.5281/zenodo.14533182.

[5] Berger, L., Borghoff, U.M., Conrad, G., & Pickl, S. (2025). Intelligence education made in Europe: Critical reflections on the German experience. *International Journal of Intelligence and CounterIntelligence*, 38(3), 802-821. doi: 10.1080/08850607.2025.2460940.

[6] Biggs, A.T. (2025). Enhancing professional military education with AI: Best practices for effective implementation. *Journal of Military Learning*, 22-37.

[7] Black, J., *et al.* (2024). *Strategic competition in the age of AI: Emerging risks and opportunities from military use of artificial intelligence*. Santa Monica: RAND Corporation. doi: 10.7249/RRA3295-1.

[8] Bondar, K. (2024). *Understanding the military AI ecosystem of Ukraine*. Retrieved from https://surli.cc/rppngm.

[9] Borchert, H., Schütz, T., & Verbovszky, J. (2024). Master and servant: Defense AI in Germany. In *The very long game: 25 Case studies on the global state of defense AI* (pp. 195-216). Cham: Springer. doi: 10.1007/978-3-031-58649-1_9.

[10] Chmyr, V., & Bhinder, N. (2023). AI in the higher military institutions: Challenges and perspectives for military engineering training. *Rupkatha Journal on Interdisciplinary Studies in Humanities*, 15, article number 4. doi: 10.21659/rupkatha.v15n4.11.

[11] Christie, E.H. (2022). Defence cooperation in artificial intelligence: Bridging the transatlantic gap for a stronger Europe. *European View*, 21(1), 13-21. doi: 10.1177/17816858221089372.

[12] CPM Defence Network. (2024). *Virtual reality and augmented reality – importance for education and training*. Retrieved from https://defence-network.com/virtuelle-realitaet-und-augmented-reality/.

[13] Defense Advanced Research Projects Agency. (2025). *AI-powered education tools chosen for further development*. Retrieved from https://www.darpa.mil/news/2023/ai-education-tools.

[14] Defense Advanced Research Projects Agency. (n.d.). *Engage*. Retrieved from https://www.darpa.mil/research/programs/engage.

[15] Díaz, J.E.M. (2024). Benefits and challenges of military artificial intelligence in the field of defense. *Computing and Systems*, 28(2), 309-323. doi: 10.13053/cys-28-2-4684.

[16] Ding, S., Pavliuk, O., Lysenko, T., & Hetmanenko, L. (2025). Technology implementation in the process of higher education: Issues and opportunities. *Journal of Posthumanism*, 5(2), 1325-1344. doi: 10.63332/joph.v5i2.508.

[17] Epstein, J. (2025). *Inside the virtual battles Ukrainian soldiers are fighting with top-of-the-line fake guns to train for real combat*. Retrieved from https://www.businessinsider.nl/inside-the-virtual-battles-ukrainian-soldiers-are-fighting-with-top-of-the-line-fake-guns-to-train-for-real-combat/.

[18] Freeman, J., & Zachary, W. (2018). Intelligent tutoring for team training: Lessons learned from US military research. In *Building Intelligent Tutoring Systems for Teams* (pp. 215-245). Leeds: Emerald Publishing Limited. doi: 10.1108/s1534-085620180000019013.

[19] Gilland, S.W., & Reeves, S.R. (2024). *West Point 2050: How the U.S. Military Academy is preparing for future conflict*. Retrieved from https://surl.li/zukwhx.

[20] Hagos, D.H., & Rawat, D.B. (2024). Neuro-symbolic AI for military applications. *IEEE Transactions on Artificial Intelligence*, 5(12), 6012-6026. doi: 10.1109/tai.2024.3444746.
[21] HGXR. (2024). *German army and HGXR bring AI to XR training*. Retrieved from https://hgxr.com/german-army-and-hgxr-bring-ai-to-xr-training/.
[22] International Committee of the Red Cross. (2024). *Expert consultation report – artificial intelligence and related technologies in military decision-making on the use of force in armed conflicts: Current developments and potential implications*. Retrieved from https://www.icrc.org/en/publication/expert-consultation-report-artificial-intelligence-and-related-technologies-military.
[23] Kelly, P., & Smith, H. (2024). *How to think about integrating generative AI in professional military education*. Retrieved from https://www.armyupress.army.mil/Journals/Military-Review/Online-Exclusive/2024-OLE/Integrating-Generative-AI/.
[24] Kim, Y. (2021). Development and application of artificial intelligence for military training modeling and simulation in Republic of Korea. *Journal of Advances in Military Studies*, 4(2), 21-36. doi: 10.37944/jams.v4i2.114.
[25] Ministry of Defence of Ukraine. (2024). *The Ministry of Defense announces a competition for the development of simulators based on virtual and augmented reality technologies*. Retrieved from https://mod.gov.ua/news/ministerstvo-oboroni-ogoloshue-konkurs-na-rozrobku-simulyatoriv-na-osnovi-tehnologij-virtualnoi-ta-dopovnenoi-realnosti.
[26] Ministry of Defence. (2024). *JSP 936: Dependable artificial intelligence (AI) in defence (part 1: Directive)*. Retrieved from https://www.gov.uk/government/publications/jsp-936-dependable-artificial-intelligence-ai-in-defence-part-1-directive.
[27] North Atlantic Treaty Organization. (2025). *Defence education enhancement programme (DEEP)*. Retrieved from https://www.nato.int/cps/en/natohq/topics_139182.htm.
[28] Oguz, H. (2025). Authoritarian recursions: How fiction, history, and AI reinforce control in education, warfare, and discourse. *arXiv*. doi: 10.48550/arXiv.2504.09030.
[29] Onderco, M. (2025). Navigating the AI frontier: Insights from the Ukraine conflict for NATO's governance role in military AI. *Journal of Strategic Studies*, 48(3), 602-626. doi: 10.1080/01402390.2025.2463451.
[30] Pangarkar, T. (2025). *Artificial Intelligence in military statistics 2025: By efficiency, tech, simulations*. Retrieved from https://scoop.market.us/artificial-intelligence-in-military-statistics/.
[31] Peacock, J.G., Cole, R., Duncan, J., Jensen, B., Snively, B., & Samuel, A. (2025). Transforming military healthcare education and training: AI integration for future readiness. *Military Medicine*, article number usaf169. doi: 10.1093/milmed/usaf169.
[32] Pfaff, C.A., Lowrance, C.J., Washburn, B.M., & Carey, B.A. (2023). *Trusting AI: Integrating Artificial Intelligence into the Army's professional expert knowledge*. Carlisle Barracks: US Army War College Press.
[33] Putra, H., & Mulyono, B.E. (2024). The role of artificial intelligence in military education: A double-edged sword. *Indonesian Journal of Educational Science and Technology*, 3(3), 167-174. doi: 10.55927/nurture.v3i3.12366.
[34] Rashid, A.B., & Kausik, M.A.K. (2024). AI revolutionizing industries worldwide: A comprehensive overview of its diverse applications. *Hybrid Advances*, 7, article number 100277. doi: 10.1016/j.hybadv.2024.100277.
[35] Rashid, A.B., Kausik, A.K., Sunny, A.A.H., & Bappy, M.H. (2023). Artificial intelligence in the military: An overview of the capabilities, applications, and challenges. *International Journal of Intelligent Systems*, 2023(1), article number 8676366. doi: 10.1155/2023/8676366.
[36] Savelka, J., Kultur, C., Agarwal, A., Bogart, C., Burte, H., Zhang, A., & Sakr, M. (2025). AI technicians: Developing rapid occupational training methods for a competitive AI workforce. In *SIGCSETS 2025: Proceedings of the 56th ACM technical symposium on computer science education V. 1* (pp. 1029-1035). New York: Association for Computing Machinery. doi: 10.1145/3641554.3701935.
[37] Scipanov, L.V., Roman, D., Pătrașcu, P., & Scipanov, D.M. (2023). Possible solutions for capitalizing e-education tools in military science. In *Proceedings of the IADIS international conference on e-learning 2023* (pp. 67-74). Lisbon: International Association for Development of the Information Society.
[38] Shruthi, N.K., & Yadav, A.K.S. (2025). AI-based geo intelligent system for attack prediction and virtual simulation. In *2025 International conference on intelligent control, computing and communications (IC3)* (pp. 876-880). Mathura: Institute of Electrical and Electronics Engineers. doi: 10.1109/IC363308.2025.10956665.
[39] Spirnak, J.R., & Antani, S. (2023). The need for artificial intelligence curriculum in military medical education. *Military Medicine*, 189(5-6), 954-958. doi: 10.1093/milmed/usad412.
[40] Trofymenko, O., Loginova, N., Sokolov, A., Chykunov, P., & Akhmametieva, H. (2024). Artificial intelligence in the military. *Electronic Professional Scientific Journal "Cybersecurity: Education, Science, Technique"*, 1(25), 161-176. doi: 10.28925/2663-4023.2024.25.161176.
[41] U.S. Department of the Treasury's Office of Foreign Assets Control. (2023). The Treasury Department implements Security Council Resolution establishing a humanitarian carveout for UN sanctions. *American Journal of International Law*, 117(2), 335-340. doi: 10.1017/ajil.2023.12.

[42] Zughoul, O., Momani, F., Alfalah, B.M., & AlSabhany, A. (2025). Integrating artificial intelligence into military pedagogy management: A review of its impact on training in military academies. *Tanmiyat Al-rafidayn*, 44(145), 351-370. doi: 10.33899/tanra.2025.186524.

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Інтеграція штучного інтелекту у вищу військову освіту як фактор підвищення ефективності професійної підготовки

Анотація. Метою дослідження було виявити ефективні моделі та підходи до інтеграції технологій штучного інтелекту у систему вищої військової освіти. Методологія дослідження ґрунтувалася на теоретичному аналізі наукових джерел, контент-аналізі офіційних документів, статистичних звітів і використанні порівняльного аналізу національних освітніх систем у сфері підготовки військових фахівців. Було встановлено, що використання систем штучного інтелекту, зокрема адаптивного навчального програмного забезпечення, платформ з елементами віртуальної та доповненої реальності, а також нейро-символічних моделей штучного інтелекту, може давати змогу підвищити реалістичність навчальних симуляцій, посилити аналітичну підготовку слухачів та покращити динаміку засвоєння матеріалу. Особливу увагу було приділено аналізу сучасних технологічних трендів, згідно з якими ринок військового штучний інтелект демонстрував сталий приріст, що супроводжувався зростанням потреби у фахівцях, здатних ефективно взаємодіяти з інтелектуальними системами в оперативних умовах. Виявлено, що США та Великобританія демонстрували найвищий рівень технологічної зрілості та масштабного впровадження штучного інтелекту в освітній процес, тоді як Німеччина дотримувалася поміркованого, проте структурованого підходу. Україна, попри наявні виклики, виявляла прагнення до інновацій через впровадження симуляційних рішень та адаптивних технологій, за умови подальшої державної підтримки та міжнародного партнерства. У висновках було підкреслено, що інтеграція штучного інтелекту у вищу військову освіту є стратегічно важливою для всіх чотирьох країн, хоча реалізується через різні пріоритети та інструменти. Практичне значення дослідження полягає у розробці рекомендацій щодо цифрового оновлення військової освіти в Україні з урахуванням успішного міжнародного досвіду

Ключові слова: підготовка офіцерського складу; міжнародний досвід; професійна військова освіта; доповнена реальність; можливості штучного інтелекту з оцінки знань; персоналізоване навчання