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THE IMPORTANCE OF NEW TECHNOLOGIES IN THE MILITARY EDUCATION OF OFFICERS**

Resume

The integration of technology into military education and education in general represents the reality, need, and necessity of efficient functioning and survival in the information society. Military education is vital to the military profession and the army's future. This requires future officers to be capable and creative, learn, think, and adapt to new situations. Applying new technologies undoubtedly results in greater efficiency in mastering the planned teaching content. It makes teaching and training safer, more interactive, and more engaging, resulting in officers becoming more qualified and better equipped to face modern challenges, risks, and security threats. New technologies significantly enhance education, facilitate the transfer of theoretical knowledge, and support the development of practical skills, thereby preparing future officers to perform complex professional and combat tasks. The integration of technology into military education represents a transformative shift that enhances efficiency and prepares officers for modern warfare. In addition to building competencies, military education is crucial for fostering the interoperability of personnel (the ability to work

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together, communicate effectively, and comply with regulations) within the various structures of a country's military and its allied countries. Integrating technology into military education presents a significant challenge for military education organizations. To address this, military educational institutions have begun developing specialized training modules that focus on emerging warfare technologies, intelligence analysis, and joint operations. This trend continues as military education increasingly emphasizes interdisciplinary approaches to prepare officers for the complex challenges of the future. In some underdeveloped segments, it is necessary to implement, invest in, or adapt processes to meet the security environment's requirements. The role of new technologies will be increasingly prevalent and characterized by new, innovative tools.

Keywords: military, education, training, officers, new technologies.

INTRODUCTION

The world is characterized by a significantly more complex security environment than it was several decades ago. The contemporary environment is complex, presenting increased challenges (Porkoláb and Zweibelson 2018; Vuletić and Stanojević 2022). The service within modern armed forces asks for increasingly complex knowledge, skills, and abilities, such as developing critical thinking, understanding military operations, implementation of various joint military capabilities, understanding of the operational planning process, rules of engagement, and risk management, the necessity of adapting to different positions and functions, etc. (Barreiros dos Santos 2019, 128). New technologies significantly enhance education, facilitate the transfer of theoretical knowledge, and aid in the development of practical skills, thereby preparing future officers to conduct complex professional and combat tasks.

Military organization is based on professional competencies. The most critical management task is understanding and suitable interaction with the operational environment. The operational level of organizational action implies analytical thinking. Higher levels in the hierarchy ask the officer to visualize problems and find solutions. Education is crucial for managing and adapting to change in any

organization or field of endeavor. When a change in environment and demands occurs, officers should accept the new facts and methods of work, i.e., the new way of thinking. As the world "moves" towards increasing uncertainty, the ability of officers to think innovatively and strategically and apply finely honed critical skills and knowledge bases in any situation is quite significant. If military forces do not adequately understand the nature of the security environment and the implications of key trends in this environment (on the battlefield), the consequences can be catastrophic. On a micro level, such failure could be a matter of life or death; on a macro level, it could be the question of national survival (Kenney 1996, 52).

Over the past half-century, various scientists have researched the nature of professions. Samuel P. Huntington started the debate in "The Soldier and the State". Huntington believes that the officer corps is the key component of professionalism in the military. He perceives professionalism through three attributes: responsibility, corporateness, and expertise. Responsibility implies that the military forces are loyal to the state and strictly subordinate to the civilian government. Corporateness encompasses various aspects of the military organization's functioning, characterized by internal relations, communication methods, uniforms, and other elements. Their expertise is significant for the well-being of society and implies long-term acquisition of professional knowledge and formal education. The education and training of officers form the foundation for the development and maintenance of expertise (Huntington 1957, 7–18, cited in Moten 2011, 15).

The modern security and technological environment requires continuous transformation of the military education system. Traditional forms of teaching and training are often insufficient to respond to the complex and dynamic conditions in which officers may find themselves. New technologies offer significant opportunities for enhancing military education, but their application is often insufficiently researched or limited to specific segments. The question is how to optimally integrate new technologies into military education to achieve higher quality, efficiency, and adaptability to modern challenges. The subject of this research is the analysis of the importance, methods, and effects of applying new technologies in the military education process, as well as the possibility of their further integration to enhance the quality of officer training. The research aims to point out the importance and

potential of new technologies in military education. The research was conducted using content analysis, synthesis, deduction, and the case study method.

THE IMPORTANCE OF MILITARY EDUCATION IN THE CONSTRUCTION OF MILITARY COMPETENCIES OF OFFICERS

Military organizations of the 21st century are constantly and rapidly changing due to changes in security threats, technological changes, and other factors (Vuletić 2017). Military education continually adapts to these changes, enabling armies and their members to respond to emerging demands. Changes in military education in the 21st century occurred in three dimensions: the adoption of rigorous academic standards, the continued development of military education activities, and the expansion of international cooperation. Contemporary Western armed forces usually have a three-tiered system of education, that is, the training of officers. In the first basic tier, officers acquire knowledge according to the demands of their chosen specialization. The second tier prepares officers to be, above all, commanders and staff officers. The third tier of training focuses on operational and strategic levels, preparing officers to perform the duties of the highest-ranking commanders (brigades and above) and key tasks in operational-level commands (Libel 2019, 79). In the structural sense, the first tier is conducted at military academies, the second in command and staff training, and the third at specialized military academies or colleges. In the United States of America (USA), the officers trained through the military education system are educated at the United States Military Academy West Pont and the National Defense University, the British at the Royal Military College of Defense Studies, and the German at the receive career advancement education (command and general staff) at the "Vojvoda Radomir Putnik" School of National Defense.

Military education has always been a significant component of military officers' development. It is founded on two key principles: train for certainty, so that military staff acquire and master the skills needed for known tasks, and also for uncertainty, so that they possess a broader base of knowledge and skills necessary for taking action in unclear and unforeseen situations. Military education is the backbone of the nation's military power development. A state needs to invest in

military education to prepare and train officers to face the difficulties of complex political and military crises and potential armed conflicts. Military academies, defense universities, and other military educational institutions mainly focus on the education and training of future military thinkers, strategists, and decision-makers (Mallick 2017, 1; Kharbanda 2018, 26–29).

Depending on the level to which they will be deployed, officers must possess specific skills and abilities, such as tactical expertise, operational competence, and strategic vision. Development at the level of tactical proficiency entails a comprehensive understanding of fundamental military duties, gaining experience in applying these skills, and fostering efficient and ethical leadership. Operational competence implies developing a broader understanding of the use of force and integrating various specialties and abilities in operational execution. Most military officers perform duties at the level of tactical expertise and operational competence. At the highest level, an officer must possess a developed strategic vision, including highly developed personal and institutional competencies, the application of broad organizational abilities, and the ability to lead and direct extremely complex and diverse units (organizations). The officer performing the duties on this level uses their capabilities, has developed operational and strategic skills, knows units (their own and the coalition units), and focuses on reaching strategic goals (*Air Force Handbook 1* 2021, 136).

The construct of the development of forces is a framework linking all developmental needs with basic competencies (knowledge, skills, and abilities for successful completion of work) through continuous learning. Along with the defined competencies, lifelong learning is aligned to ensure that officers are trained and ready to respond to the challenges of the current and future operational environment. Continuous learning is a development process in which experiences are combined with education and training (*Air Force Handbook 1* 2021, 136). Contemporary, modern armed forces have shifted from traditional, internal forms of military education towards interagency, civil-military concepts. Military agencies go through changes at different levels, from one form of "production" of military knowledge at military academies to the military education model at defense universities (Libel 2019, 79).

The military profession, analyzed from the expert or professional standpoint, demands a broad spectrum of comprehensive competencies to fulfill its duties and obligations within the required management and

command functions. Education and training should align with what the army must do to fulfil its mission. The difference between training and education is that training provides instruction on what should be done (or thought), while education teaches one to think critically. The fundamental goal of education is to make officers informed, competent, and responsible. Military education teaches officers how to think and transform knowledge into skills perfected during service. One of the challenges faced by the armed forces is the comprehensiveness and necessary proficiencies of future officers. Future officers require a broad range of competencies, including emotional intelligence, communication skills, physical and psychological endurance, and more (Schatz *et al.* 2017, 81–86).

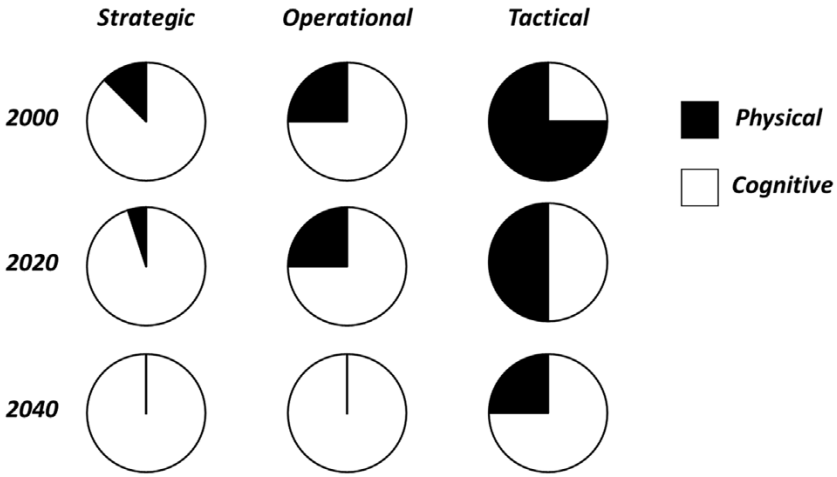
One of the main challenges of military education is transforming traditional education and applying new technologies. This implies the introduction of new curricula and new teaching methods to increase the competencies of future generations of officers (Pînzariu and Ionașcu 2023, 115). Military education covers a broad spectrum of activities. In one sense, this refers to training, continuous education, and other activities designed to ensure the advancement and development of officers at various phases of their careers, preparing them for the next level of responsibility. The strategy of development of military education refers to the balance between training, education, and experience. The three elements mentioned above are combined to create the "link between theory and practice", resulting in the ability to defeat the enemy. For a military to be truly adaptable, it must maintain a coherent and balanced investment in these elements (Iskandarov and Gawliczek 2019, 37).

The changing nature of war demands permanent investment in military education to develop an intellectual advantage. Officers in the army require specific abilities that encompass productive, cognitive, and interactive skills, including those related to creativity and communication. They must be highly adaptable and capable of dealing with complex and ambiguous problems (Iskandarov and Gawliczek 2019, 38). Military education in the 21st century must incorporate elements and lessons learned from past experiences and analyses of events. Military education should recognize the most capable officers and enable their advancement and development. Future officers must be ready to act in all domains (*Developing Today's Joint Officers for Tomorrow's Ways of War* 2020).

Institutions responsible for military education must include active and experiential learning to develop practical and critical thinking skills that officers need. These methodologies involve case studies from the past to help them develop reasoning, analysis, and problem-solving skills, which can be applied to challenges emerging in peacetime situations, especially in the context of war. Curriculums and programs should contain virtual, constructive methodologies, wargames, and exercise methodologies, which include multiple scenarios and repetitions to give officers better insight into possible situations and develop creativity (Lacey 2020). Military academies tend to fulfill academic standards while also preserving the professional values and motivations of young officers to face new challenges (Last, Morris and Dececchi 2019, 105).

Reviewing the assessment of the accuracy of long-term predictions regarding military education, Knott and Perconti concluded that predictions over 20–30 years are realistic and sufficiently precise to make decisions on education, research, and investment priorities. Technological advancement conditions cognitive and physical balance, especially on a tactical level. In illustration 1, we can see that these cognitive capabilities (thinking, learning, and concluding, among others) become increasingly significant, especially at higher decision-making levels (Kott and Perconti 2018; Billing, *et al*. 2021).

Illustration 1. Evolution of cognitive and physical relations of soldiers on strategic, operational, and tactic levels in 2020 and 2020, and forecasts until 2040



Data source: Billing *et al*. 2021.

The importance of military education is recognized within NATO. With the development of technology and the increase in the volume of information exchange, NATO's operational areas are becoming more complex and potentially more challenging to predict. Therefore, as the epicenter of global security, NATO should align with the challenges its member states and partners face. Education and training are the two main domains of cooperation between NATO and its partner states. NATO member states focus on joint, multinational, and interagency education and training of officers who will be capable of developing and implementing doctrines, strategies, and policies that integrate all instruments of power – political, military, economic, and informational (Iskandarov and Gawliczek 2019, 36).

Some highly positioned officers in the American Army have analyzed their military education and concluded that it has stagnated, falling short of creating favorable conditions for victory in future wars (Fisher 2022, 658–659). The Joint Staff document or publication *Developing Today's Joint Officers for Tomorrow's Ways of War* can be seen as a direct response to such a state. The document states that their vision is to direct and lead the most promising officers throughout their careers through the military education system. The military education system should identify, follow, and direct the most capable, creative,

and strategically oriented officers to prepare for future wars. Future conflicts are likely to occur across all domains. Globally integrated operations in all domains represent challenges for officers to be produced by the military education system (*Developing Today's Joint Officers for Tomorrow's Ways of War* 2020).

APPLICATION OF NEW TECHNOLOGIES IN MILITARY EDUCATION

Introducing new technologies into the educational process and the need for the information society a realities. The application of new technologies can significantly enhance the academic level of officers, thereby elevating their knowledge. Teaching methods should be directed towards making learning as easy and efficient as possible. Utilizing new technologies in the educational process is key to educating officers who will contribute to shaping the institution's image, having been trained in their competencies. The multifunctional, integrative, continued, and complex nature of military education calls for the implementation of innovative teaching methods (Khizhnaya *et al.* 2016).

Throughout history, military education has suffered significant transformation, adjusting to the changeable needs of warfare and technological advancements. Over time, military education shifted from purely military (tactical) training to a comprehensive curriculum, which includes theoretical concepts and practical implementations, leadership development, a deeper understanding of international relations, etc.

Interdisciplinary approaches in military education include integrating various fields of study to "produce" more trained and more ready officers, in line with the needs of contemporary society. For example, introducing psychology into military education improves understanding of team dynamics and stress management. Training that combines warfare skills with ethical decision-making contributes to critical thinking and moral reasoning, which are essential for contemporary leaders (commanders, heads) facing complex global challenges (Stanar 2024, 14). Cooperation with civilian universities and research institutions additionally enriches their competencies.

Many contemporary challenges are related to the breadth and diversity of knowledge, as well as the necessary skills, of new

generations of officers. New generations (i.e., the millennials and the generation Z)[1] learn differently from the previous ones (Barreiros dos Santos 2019, 124–125). The increasing use of new technologies can significantly contribute to fulfilling the projected goals. The use of new technologies is inevitable in military education, but it also presents certain risks; therefore, officers must educate themselves on cybersecurity.

As new technologies emerge, they provide innovative methodologies and tools that enhance the efficiency of education and training (Khizhnaya *et al.* 2016). Contemporary armies use advanced technological solutions, from virtual reality simulations to comprehensive data analysis. The application of advanced simulations and digital resources in the education and training of officers presents scenarios they may face in the future, as well as opportunities for developing decision-making skills, which can help them be better prepared for operations in an increasingly complex global environment. Technology also serves as a channel for information exchange and cooperation between military educational institutions (Mallick 2017). By integrating platforms for cooperation, military schools can facilitate the exchange of information, thereby optimizing learning outcomes.

Mobile learning solutions are gaining popularity, providing flexible educational options for military personnel. These solutions provide access to resources for training at any time and from anywhere, thereby enabling officers to adapt to the demanding obligations and tasks assigned to them. Such a possibility promotes continuous learning and creates favorable conditions for skill improvement. A good example of the application of technology in military education is the *Enhanced Learning Environment – ELM* [2] of the American army, which represents an efficient integration of virtual reality and simulations to transfer officers' experiences from training, in parallel with the development of necessary military skills. The British military's increasing use of

[1] The Millennials, i.e. the Y generation, is the generation of people born in the period from 1981 to 1996 and that grew up in the transition period, that is, in the times of technological changes (Internet, smartphones, social networks), while Generation Z (1997–2012) grew up in a completely digitalized world. After these, the so-called Alpha generation comes into play (from 2013), which is growing up in the era of advanced technological achievements (virtual reality, artificial intelligence, etc.).

[2] An enhanced educational environment implies the implementation of technologies that improve the learning experience, making it interactive, more engaging, and efficient.

mobile learning apps enables access to materials from a distance, thereby encouraging continuous education even in challenging and unstable environments. In Australia, integrating artificial intelligence into education and training modules has transformed curricula based on performance measurement, resulting in improved outcomes in officer education. The case studies illustrate that technology enhances military education and training methods, but it also deals with the unique needs of officers, which, in the end, leads to more efficient and more adaptable military leaders (Khan *et al*. 2024).

Online platforms enable students and instructors to present and edit documents online in real-time and project them on the screen. Such a platform allows for exchange among officers and the documentation of their words. The presentation software enables teachers, along with textual content and oral lessons, to also display photographs, diagrams, high-resolution video footage, and audio files. Different devices (i.e., tablets, smartphones, etc.) can be connected to computers, projectors, and the so-called "cloud" (cloud computing),[3] where texts, illustrations, and diagrams were previously uploaded. In this way, one could acquire feedback from the auditorium, conduct surveys, and so on. Recording tools enable teachers to record their lessons, which can later be viewed by the students who were prevented from attending for some reason (Barreiros dos Santos 2019, 129).

For example, distance learning is one of the most significant forms of educating students in the information society (Vulić 2016, 146–148). The Simulation and Learning Centre of the University of Defence offers the members of the Ministry of Defence and the Military of Serbia (MD and MS) the possibility to educate and train themselves during their career with minimal absence from their workplace. The National Simulation Center for Security Risks, located within the Faculty of Security at the University of Belgrade, is also available to officers and other members of the MO and MS for scientific research, education, and the improvement of expert knowledge and skills, as well as for conducting joint exercises. The training and shooting simulators at the Military Academy of the University of Defence are of great importance in the military education of future officers, as they enable realistic and safe training in controlled conditions.

[3] Cloud computing enables users to access some computer resources via the Internet (servers, databases, apps, etc.) with permission of specific subjects.

Moreover, social networks enable a rapid exchange of information among officers, allowing them to quickly share current information, attitudes, analyses, and results of scientific research projects, among other things (Jaćimovski 2024, 14–15). Blogs and other social media platforms play a crucial role in disseminating new knowledge, facilitating the exchange of opinions, and fostering group discussions. Future officers can practice various operations through simulation, possibly adjusting the parameters or variables (Mallick 2017). According to Neil, even though simulators are increasingly used in training programs, one should bear in mind that contexts of training in which simulators contribute to an increase in efficiency are calculated in advance. The integration of e-learning platforms enables officers to participate in both theoretical and practical training from a distance. This flexibility enhances learning efficiency, enabling independent learning that satisfies officers' individual styles and needs. E-learning tools ease cooperation between officers, thus creating a more interactive educational environment. Multimedia resources, such as video footage and simulations, complement the traditional teaching methods, offering richer experiences that incite a deeper understanding of the teaching materials. Ultimately, the role of technology in military education, primarily through e-learning, enables officers to develop the key skills necessary for modern warfare.

Artificial intelligence has a significant impact on military education by introducing innovative learning methods and enhancing officer evaluation and training. Its application enables personalized learning experiences, adjusting to the unique needs of each officer. Consequently, this encourages a more efficient education system within educational institutions. Adaptive learning technologies use algorithms to analyze learner performance, identifying areas to be improved (Đorić i Glišin 2023, 62–65; Miljković i Beriša 2023, 77–78; Proroković i Parezanović 2023, 24–26). This real-time feedback enables teachers to adjust curricula by increasing officer engagement and knowledge acquisition. Evaluation methods led by artificial intelligence simplify the evaluation process by providing timely and precise assessments of officer proficiency. The Department of Defense (DOD) of the USA signed 2019 a nine-year contract with *Microsoft* for 7.6 billion USD (General Services Administration 2019). As a result of cooperation, *Microsoft* released the *Copilot* artificial intelligence platform, which assists soldiers in everyday activities. Within the scope of military

education, the military can provide its soldiers with relevant and realistic learning experiences. Artificial intelligence software, such as Microsoft Copilot, can enhance the learning environment by encouraging creative thinking while preparing officers for the rapidly evolving technological landscape of the real world. The rapid adoption of new technologies has a profound impact on the global environment. The US Department of Defense is aware that artificial intelligence offers a competitive advantage in terms of speed, precision, adaptability, and effectiveness (Clark 2023).

Virtual and augmented reality enable the modelling and simulation of military actions and the management of certain elements. Software applications, such as the Ada Viewer software, allow the creation of specific presentations and simulations (Virca 2021, 338–343). A virtual learning environment creates real-life simulations, providing officers with the ability to learn in a safe and controlled environment (Chen, 2021). Officers use a variety of equipment, including screens, specialized glasses, helmets, and gloves, that simulate environments similar to real ones. Virtual reality can be utilized for driving training, vehicle maintenance, pilot training, medical education, and combat training. Augmented reality is a type of mixed reality that combines real-world elements with virtual ones. This relatively new technology enables the digital generation of three-dimensional presentations that should be integrated with real stimuli from the environment. Technological solutions related to augmented reality can be utilized with the aid of smartphones, tablets, and other devices, thereby creating a stimulating learning environment and providing practical experience. The use of augmented reality, due to its distinct advantages, is also increasingly characteristic of military education (Chmyr *et al*. 2024).

By applying data mining (the search and analysis of data), it is possible to predict whether a military career will be chosen as a life calling among young people. Data mining is the process of analyzing large datasets and extracting relevant information using mathematical and statistical methods. Data mining automatically detects previously unknown patterns in large datasets. Large amounts of data are automatically analyzed, and patterns and rules are rapidly processed and extracted. Some well-known tools are utilized in the military, including *the Multi-State Anti-Terrorism Information Exchange (MATRIX), the Able Danger program,* and *the Automated Targeting System (ATS)*, among others. The analyzed data are being uploaded to

the system, specifically to the databases for the Learning Management System (*LMS*). Through big data analysis, educational institutions can track the progress, i.e., the results and areas for improvement, of officers. Based on the acquired information, it is possible to take some corrective measures to improve the efficiency of military education and training (Ionita 2015, 297–298).

Cybersecurity education and training involve the transfer of information and the development of necessary skills to enable individuals to recognize and defend themselves against cyber threats. Given the increasing occurrence of cyberattacks, this specialized and indispensable knowledge creates the preconditions for a higher level of security culture, protection of information, and critical infrastructures, thereby improving both personal and national security. Additionally, creating conditions for the military educational system to be protected from cyber threats is of pivotal importance for successfully applying and protecting vulnerable information. Blockchain technology[4] integration can improve security in military education systems. By applying the aforementioned technology, confidential teaching materials can be protected, reliable methods for monitoring educational achievements and qualifications can be implemented, human resources management can be streamlined, and other benefits can be achieved.

CONCLUSION

Military education is vital for the military profession and the army's future. This, in turn, requires future officers to be capable, creative, and willing to learn, think, and adapt to new situations. Future wars will demand adaptable officers who use doctrine as a guide, rather than a rigid set of rules, and who are capable of devising their own solutions. They will be able to repurpose weapons or technology and find a way to fulfill their goal. The officer's most significant tool is not his weapon but his mind. Better military education results in success on the battlefield. If a unit is commanded by an officer who is incapable of analyzing and understanding the situation, the mission may fail, and lives could be lost.

[4] Blockchain technology enables data protection by dividing data into so-called blocks that are cryptographically linked into a chain. The said technology is characterized by invariability, i.e., once recorded, information cannot be changed.

The integration of technology into military education represents a transformative shift that enhances efficacy and prepares officers for modern warfare. The role of new technologies will become increasingly prominent in the future, characterized by the use of innovative tools and solutions. Besides building competencies, military education has a significant impact on constructing interoperability among personnel (the ability to work together, communicate, and be in tune) within different structures of a state's army, as well as among allied states.

The integration of technology into military education presents a challenge that organizations involved in military education must address. The development of new, advanced technologies has also dramatically impacted military education. Besides financial limitations, the problem within military education can also be resistance to change among staff accustomed to traditional education and training methods. This reluctance can hinder the adoption of innovative technological solutions. Additionally, there is often a lack of suitable training for educators (instructors) to effectively utilize new technologies. Inadequate preparation can lead to inefficient education methods, preventing the realization of the potential advantages of the technology. Military educational institutions have begun developing specialized training modules on new warfare technologies, intelligence analysis, and joint operations. This trend has continued, as military education increasingly emphasizes interdisciplinary approaches to preparing officers for the complex challenges of the future.

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ЗНАЧАЈ НОВИХ ТЕХНОЛОГИЈА У ВОЈНОМ ОБРАЗОВАЊУ ОФИЦИРА[**]

Резиме

Интеграција технологије у војно образовање, али и образовање уопште представља реалност, потребу и нужност ефикасног фунционисања и опстанка у информационом друштву. Предмет овог рада представља анализа значаја и примене нових технологија (вештачке интелигенције, виртуелне реалности, појачане реалности, итд.) у војном образовању. Циљ рада јесте да се укажу пре свега на потребе и могућности примене нових технологија и позитивних ефеката њихове имплементације на официре, будуће руководиоце (командире, команданте, начелнике и др.). Анализом садржаја односно анализом релевантних научних извора, и примера из праксе, сагледава се које су то најзначајније нове технологије које се примењују у војном образовању. Примена нових технологија несумњиво резултује већом ефикасношћу у савладавању планираних наставних садржаја. Наставу и обуку чини безбеднијом, интерактивнијом и занимљивијом, а као крајњи резултат добијају се официри оспособљенији и спремнији да се супротставе савременим изазовима, ризицима и претњама по безбедност. Нове технологије већ имају значајну улогу и примену у војном образовању. У одређеним, недовољно развијеним сегментима, нужно је извршити процесе имплементације, инвестирања односно прилагођавања да би се одржао корак са захтевима безбедносног окружења. Улога нових технологија ће у будућности бити све заступљенија и карактерисаће је употреба и неких нових, иновативних, алата.

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Кључне речи: војска, образовање, обука, официри, нове технологије.

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