

# Innovative approaches to the use of interactive technologies in higher military education to enhance the cultural competence of students (cadets)

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## ABSTRACT

Considering the trends in the introduction of various innovative technologies, determining the role of modern integrative technologies in the system of higher military education to develop cadets becomes an urgent task. Therefore, this work aims to determine the main innovative approaches and technologies that will contribute to the development of cultural competence among cadets. The main research methods consisted of content analysis and comparison. Data collection was done using the Prisma approach. Total number of sources: 42. Date range: 2019-2024. The results emphasize the importance of developing cultural competence with the help of modern innovative technologies. Professional cultural training should be aimed at developing 4 main components: knowledge, experience, creativity, and motivation. These tasks are completely solved by the implementation of modern innovative approaches, in particular, the combination of offline and online courses in cultural studies and language training, the organization of special language clubs with a stable international discussion, and various international projects on the study of various cultural aspects on the examples of individual military missions. The conclusions summarize that implementing these approaches requires teachers to use various technologies: multimedia, virtual reality, simulation technologies, etc. They can contribute to forming interactive virtual classrooms, organizing virtual exchanges between students (cadets), and improving their professional skills in general.

**Keywords:** Pedagogical skills, Readiness of future officers, Professional interaction, Military personnel, Gender approach, Leadership competencies.

## 1. Introduction

During the dynamic changes in the modern educational environment, military education has also undergone significant transformations, mainly due to the intensive development of digital technologies. The importance of these changes is driven by the need for prompt decision-making, high adaptability to the current challenges of the future officer service, and the active use of interactive technologies in the performance of official duties both in times of peace and in combat missions. At the same time, the internationalization of military cooperation makes another requirement relevant: establishing productive interaction with colleagues from different countries for the effective fulfillment of international duties, negotiations, etc. Such a requirement requires an appropriate level of cultural competence that will allow the development of intercultural interaction, consider the peculiarities of functioning of representatives of different cultures, and increase the level of professionalism of cadets during their professional activities.

Modern innovations in using the latest technologies in the educational process provide new opportunities for the gradual development of students' (cadets) cultural competence during their studies. Such technologies make it possible to create new digital environments with an interactive component in which students (cadets) of higher military education can deepen their knowledge of the cultural characteristics of people from many regions of

the world [1]. Working on studying historical and social aspects of interaction in an international team, students (cadets) will develop their skills in intercultural interaction, which are relevant to implementing tasks during multinational operations worldwide. Scholars have partially studied this issue. They emphasized the relevance of forming a digital environment in the field of higher education (including military education) [2], [3], [4]. This helped to identify some of the difficulties that arose on introducing interactive technologies related to the digitalization of the educational process. This made it possible to trace the advantages and disadvantages of digitalization, about which the researchers have formed their ideas. In general, the studies emphasize the current experience of leading countries in developing modern military education [5], [6]. The use of pedagogical methods in times of dominance of distance education has also become an important area of research, which has led to the formation of certain conclusions about the introduction of innovations in higher military education institutions [7], [8]. At the same time, partial attention is paid to the Ukrainian practice, which is being implemented in times of unprecedented military Russian aggression [9], [10]. The digitalization of higher education in wartime is still insufficiently covered in research, which makes this issue a relevant subject for further scientific discussion. Whereas previous studies have focused on analyzing specific suras technologies, this study is characterized by a systematic approach to studying the relationship between interactive technologies and cultural competence. In addition, the uniqueness of this study lies in evaluating the effectiveness of modern digital tools and techniques focused specifically on the formation of intercultural interaction in military training.

The purpose of the proposed article is to analyze innovative approaches to the use of interactive technologies in higher military education and their impact on improving the cultural competence of cadets. The realization of this goal involves the disclosure of the following research objectives:

1. Examining practical aspects of implementing interactive technologies in the educational process of military institutions.
2. Identifying and characterizing the most effective innovative tools and technologies for developing cultural competence among cadets.
3. Evaluating the potential benefits and challenges of these technologies to improve curricula and teaching methodologies in military education.

## **2. Research method**

### **2.1. Data design**

To achieve this goal, the article is based on using a certain list of scientific methods that will help organize scientific publications on this issue. In particular, through a qualitative approach to information processing, professional, scientific articles in specialized journals, certain methodological recommendations, statistical data from sections in relevant collective studies, single monographic works, individual abstracts and speeches at scientific conferences, etc., were systematized. By combining information from different sources, the principles of objectivity and impartiality were achieved, which is extremely important for understanding research approaches in different countries.

### **2.2. Data collection**

The first writing stage involved collecting the necessary information about scientific sources and searching for them. This task required the selection of publications among the scientific and metric databases Web of Science, Scopus, PubMed, and Google Scholar. The main markers for finding the necessary publications were the following keywords: cultural integration, military pedagogy, digital teaching methods, competence development, intercultural communication, and leadership competencies. The search yielded 836 results. From this list, those scientific publications that were repetitive were removed. As a result of this operation, the volume of scientific literature decreased by 103 items.

The next stage aimed at a more detailed analysis of the sources obtained - abstracts of scientific articles, monographic studies, conference abstracts, etc. Given the purpose of the proposed article, not all scientific texts met the set objectives. Accordingly, 243 search results were eliminated as a result of this discrepancy. Working with scientific literature also requires taking into account the relevant criteria. In particular, a clear range of dates of scientific papers was established - the search results published from 2019 to 2024 were considered. As a result of this approach, another 306 scientific papers that did not meet this criterion were excluded.

During the fourth stage, additional selection criteria were used to remove those scientific publications that, although relevant to the general thematic focus, did not contain important information about the subject matter.

These criteria include:

1. The study should address the basics of acquiring cultural competence in higher military education institutions.
2. The study should describe the possibilities of using interactive technologies to train future military specialists.
3. Based on the relevant scientific base, the study should describe innovative approaches to working with interactive technologies, problems associated with them, and some current views on the importance of acquiring cultural competence in the military environment.

Accordingly, considering the fulfillment of criteria 1, 2, and 3, only 35 scientific papers remained for further processing. The authors used another 10 articles in previous studies, so they meet the proposed search criteria (see Table 1).

Table 1. Data collection and selection process

Data Processing Stage	Number of Results
Initial Results	836
Removal of Duplicates	-103
Removal of Irrelevant Studies	-243
Date Range Reduction	-306
Filtering by Criteria	
Criterion 1	-47
Criterion 2	-48
Criterion 3	-54
Number of Included Sources	32
Additional Sources	10
Total	42

Source: author's development

### 2.3. Data analysis

The data obtained were processed using the content analysis method of scientific literature, with the help of Excel software and the formation of a table divided into the author, the understanding of cultural competence, the main technologies, innovations, and the main summaries. A minus was placed in the corresponding columns if certain aspects were not found in the works. This made it possible to single out important aspects of scientific works. The comparison method was also used, which made it possible to compare the results and recommendations of individual scientists to single out common and different visions.

### 3. Results and discussion

The basis of the professional culture of a future serviceman is knowledge that is of real value. Developing cultural competence involves using a cultural approach that includes knowledge of the country's history, culture, traditions, and values and a perfect command of the national language (country studies). An important part is engaging in a dialogue of cultures (foreign language development), cadets' awareness of the essence of linguistic phenomena, a different structure of values and worldview, multicultural skills, and comparing the phenomena of the foreign culture being studied with their own. Thus, the key goal of cultural training of modern cadets is the development of cultural forms and methods of teaching, optimization of methodology and methods of cognitive activity in the field of various humanitarian disciplines, improvement of forms and methods of training teachers of higher military educational institutions to use modern interactive technologies.

Besides, the current concept of education is based on the integrated teaching of the national language and culture of the country, its history and traditions, and foreign languages (based on the study of the peculiarities of foreign language communication, customs, and culture) (8). The key goal of such teaching is to gain knowledge of language through culture and culture through language. In this way, a foreign language plays an important role

in the integrative connection with cultural studies. Modern innovative approaches to interactive technologies in higher military education can improve students' (cadets) cultural competence. This is especially important for effective communication and multinational military operations. In particular, virtual and augmented reality plays an important role in training cadets [11], [12].

These technologies are important because they allow cadets to develop practical skills and immerse themselves in professionally created cultural situations where they can communicate with different characters who may represent different cultures [13], [14]. An important method is also introducing special AR training, primarily to develop the ability to create interactive tasks in real-time. With the help of AR or VR, cadets can solve various cultural dilemmas and go through difficult situations. Simulation technologies also contribute to the professional training of cadets [15].

In some simulations, students (cadets) are required to perform certain missions that may require understanding certain cultural contexts, such as negotiations with foreign partners. In this system, it is also important to use interactive platforms to simulate real-life situations that may occur during military operations in other countries. Students (cadets) can discuss and offer solutions during such practical exercises. Besides, different multimedia interactive technologies are also an important part of the training. In particular, the use of multimedia materials, such as infographics, multimedia images, and videos that demonstrate the cultural characteristics of different regions of the world, allows for a deeper dive into the material and better learning. Interactive webinars with experts also play an important role in this system [16]. The involvement of international experts or military personnel with experience in intercultural military operations is important in order to organize various interactive sessions to discuss cultural difficulties [17].

On the other hand, exchanges and cooperation with international educational institutions should also be considered. For this reason, various programs of cooperation with foreign military academies, where students (cadets) can participate in joint seminars, conferences, discussions and even joint training missions in the virtual space, allow them to develop both practical skills and increase their cultural awareness (see Figure 1).

As seen in Figure 1, the structure of professional cultural training should be aimed at the formation of cultural competence, which consists of 4 components: knowledge, experience, creativity, and motivation. New innovative approaches are aimed at their comprehensive development in the system of higher military education. In particular, an important place is occupied by integrating cultural studies through blended learning mechanisms [4]. In the integration system, combining offline and online courses in cultural studies and language training will allow studying different cultural characteristics and histories of countries with which the military may deal. For this reason, cadets take interactive tests and participate in virtual tournaments and simulations that help them to understand other traditions more deeply. Digital cultural laboratories also allow students (cadets) to work on projects that explore the interaction of cultures and analyze cultural conflicts [18], [19].

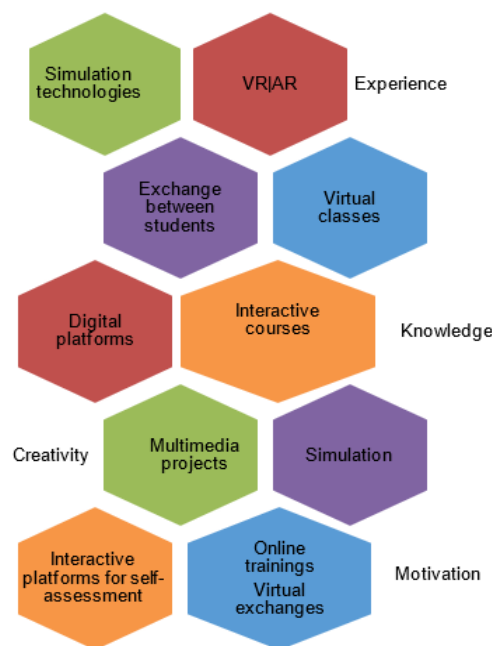


Figure 1. Key technologies and their role in the structure of knowledge, experience, creativity, and motivation

However, organizing special language clubs with a stable international discussion is an important approach. For this reason, it is worth organizing cross-cultural discussion clubs where cadets can discuss specific situations with foreign students (cadets) and analyze real-life cases from diplomatic missions or military operations. At the same time, modeling real-life situations using VR technology allows for developing practical skills in navigating a foreign language environment [20], [21]. Another important approach is organizing various projects to study various cultural aspects of individual military missions. They can consist of cultural and historical research and formulating scenarios for cultural interaction (Figure 2).

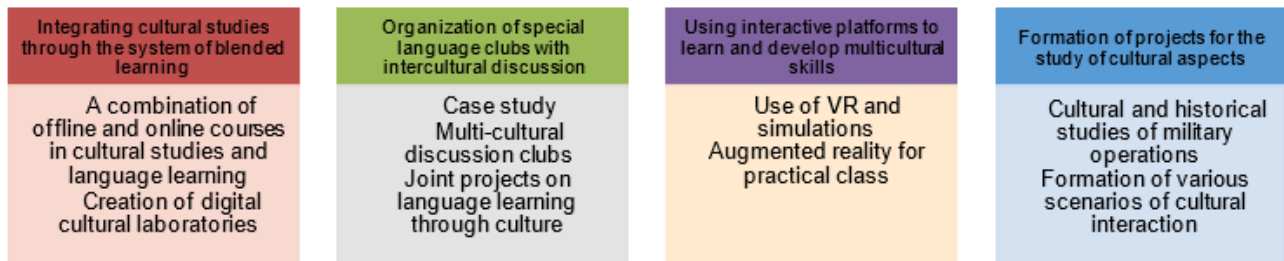


Figure 2. Main approaches to the introduction of modern interactive technologies to improve cultural competence

These innovative approaches and their implementation methods are aimed at developing the cultural competence of the military. In addition, it is worth it because the content of higher education of a military specialist is determined by service-combat and social functions, which include professional and socio-professional tasks and the ability to solve them with the established level of quality. Table 2 presents the structure of innovative technologies in the system of professional competence consisting of knowledge, experience, creativity, and motivation.

Table 2. Means, components and technologies for the formation of cultural competence for future military personnel

Component	Tools and technologies	Description
Knowledge	VR, AR, interactive courses, digital cultural laboratories	Contributes to the study of the language, history, culture, traditions and values of different countries. Immersion in virtual learning spaces
Experience	VR/AR VR Simulators, simulations of cultural interaction, exchanges	These technologies form practical cases and real cultural situations, contributing to the formation of practical interaction experience in various cultural contexts.
Creativity	Multimedia projects, cross-cultural discussion clubs	The use of creative tasks promotes the development of creative approaches
Motivation	Interactive platforms for understanding results and self-evaluation, virtual exchanges, international online trainings	Modern interactive tools allow you to assess your level of cultural competence and general skills

Therefore, in the professional training of cadets, in order to develop their cultural competence, it is necessary to rationally use modern innovations in accordance with the purpose and content of training [23], [24]. Their use will allow the focus not only on the development of cultural competence but also on the formation of general professional skills. However, the introduction of modern technologies can also face various difficulties. In particular, the use of virtual reality and simulation technologies is expensive. Accordingly, not every educational institution can afford it. In addition, technological support for updates of the technologies required for these technologies is also quite costly and will require additional funding.

High costs are also associated with the high cost of security and countering cyber threats. Problems with data leakage or malicious use of educational platforms require reliable digital security systems [25]. The third major challenge is related to training the teaching staff to use the necessary technologies. In particular, interactive digital technologies require changed methods of teaching, continuous development of professional knowledge, and the acquisition of the necessary information and communication competencies.

#### 4. Discussion

The study demonstrates that an important task of the cultural training of modern cadets is the development of cultural forms and teaching methods, optimization of the methodology of cognitive activity in the field of various humanities disciplines, etc. These thoughts are consistent with contemporary scholars who have demonstrated the importance of cultural competence for modern students (cadets) [4], [8]. However, it is also important to consider the existing shortcomings in understanding the importance of cultural competence for the professional training of future officers.

Traditionally, the emphasis in the relevant pedagogical training is on the development of leadership habits, the acquisition of relevant theoretical knowledge and practical skills, the formation of professional skills to act in difficult circumstances, etc [8], [26], [27]. However, with this approach, understanding the importance of cultural competence may be of secondary importance. The lack of understanding of the importance of forming appropriate interactions in multinational teams due to the globalization of modern peacekeeping or interaction with civilians belonging to different cultures significantly reduces the effectiveness of military use of units [27]. However, these results have shown the importance of cultural cooperation in the educational component of cadet training.

In addition, the results determine that the modern concept of education should be based on the integrated study of the national language and culture of the country, its history and traditions, and foreign languages, customs, and cultures of other nations. These opinions correlate with those of other researchers [8]. In particular, according to recent studies, one of the requirements for a professional military serviceman is fluency in cultural studies at the professional level (in particular, cultural studies and a foreign language) [8]. These statements fully coincide with the results of this study.

At the same time, the paper outlines the main innovative technologies that contribute to the development of cultural competence: virtual reality, augmented reality, digital learning platforms, simulation technologies, multimedia, etc. The potential of augmented and virtual reality is emphasized by many contemporary scholars who comprehend their potential for optimizing knowledge acquisition [28], [29], [30]. In addition, modern studios have proven the effectiveness of using digital technologies to better attract students' (cadets) attention and form a high level of motivation to learn [31], [32], [33].

In addition, this study mainly focuses on the potential of modern innovative approaches but indirectly also mentions the gaps in their implementation. Contemporary researchers have also emphasized the importance of taking into account the problems encountered when introducing innovative approaches to using interactive technologies in higher military education [34], [35]. As demonstrated in the paper, the problematic aspect of introducing interactive technologies is the high requirements for funding and technological resources on which their proper functioning depends.

According to recent studies, higher military education institutions may not have sufficient access to technological resources (e.g., devices for working with virtual reality, virtual platforms, and relevant software) that would allow them to work in the appropriate digital environment [34], [29], [36]. In addition, the approach to interactive digital interaction needs to be further improved as the software is updated.

The study also briefly focuses on the security challenge. For the military environment, security issues are critical, and the use of interactive digital platforms with access to the open Internet is an additional risk factor [37], [38]. This aspect of the struggle for information security makes the educational process more expensive and can generally halt the integration of the latest technologies into military education. The results also emphasize the problems of preparing the teaching staff to use the necessary technologies. This also correlates with the results of other studies [30], [39]. Their analysis shows that not all teachers actively use innovations in training organizations, expressing a desire to develop and acquire the necessary skills independently.

As a result, there is a significant likelihood of underutilization of existing technological solutions that could significantly optimize the educational process, increase its efficiency, and ensure better interaction between teachers and students [40], [41], [42]. Many of the proposed solutions continue to be underutilized or even fragmented due to limited awareness or lack of time to make full use of them. An equally important problem is that this situation in education is causing opportunities for further unlocking the potential of the latest pedagogical tools, including interactive digital learning platforms [43]. In addition, researchers have emphasized the importance of such tools as adaptive digital systems for assessing knowledge, virtual platforms (generally, interactive environments for improving the educational process), various means for communicating

in the digital environment, implementing joint projects, working freely in an online format, etc. In line with this issue, other important issues are closely related to such processes, primarily those related to the need to adapt curricula, textbooks and other teaching materials to meet modern requirements for the educational process and challenges that complicate its organization [45]. In this context of cultural development of competence and training for highly qualified specialists, it is imperative to integrate updated and demanded elements into the content of educational systems and individual digital learning platforms. Such work, as rightly noted by scholars [46], aims to use modern methods, individual cases, and some interactive tasks on the use of multimedia materials, which can be used to reflect the needs of modern education that will fully meet the requirements of national and some international educational criteria. However, as suggested, the processes of gradual updating of educational materials and incorporation of the latest technological methods into them will require both significant efforts and appropriate time on the part of teachers, although this will lead to a significant increase in the additional burden on them, which is especially relevant for military or medical universities, where the organization of the educational process takes place taking into account strict regulations and strict adherence to the content of educational programs [47]. Therefore, this may somewhat complicate innovations in education since teachers will have to find a balance between the need to adhere to established standards and the importance of modernizing education. Table 3 presents a comparison of the obtained data with the results of other authors.

Table 3. Comparison of the obtained data with the results of other scientists

Main results of the study	Consistency with other studies	Discrepancies and gaps
Development of cultural forms and teaching methods, optimization of cognitive activity methodology	It is consistent with the views of modern scholars regarding the importance of cultural competence for modern students [4]; [8]; [16]	Requires additional research on the inclusion of cultural competence in the professional training of officers [26], [27]
Insufficient awareness of the importance of cultural competence in military education	Confirmed by research that emphasizes the traditional focus of military education on leadership and the development of theoretical knowledge and practical skills [8], [26], [27]	The lack of intercultural interaction in programs significantly reduces the effectiveness of military missions [27]
Use of innovative technologies (VR, AR, digital platforms, multimedia)	Consistent with research on the effectiveness of VR and AR in optimizing knowledge acquisition [28], [29], [30], as well as with research on motivation to learn through digital technologies [31], [32], [33]	-
Challenges in the implementation of interactive technologies (financing, technological resources)	Consistent with research on limited access of military academies to technological resources [34], [29], [36]	Requires a more detailed analysis of the possibilities of solving this problem in various military educational institutions
Security problems when using digital platforms	Consistent with contemporary research on information security in the military environment [37], [38], [39]	-
Insufficient readiness of teachers to implement innovations	Consistent with other research indicating a low level of use of new technologies among instructors [30], [40], [41], [42]	-

The limitations of this study include the focus on English-language literature and publications made before 2019. This may affect the failure to consider the current opinions of scholars on the formation of cultural competence and the use of digital tools to support it. In addition, the study is limited by the lack of empirical data obtained through direct experiments or observations in military educational institutions. These limitations will be taken into account in future research. In particular, future research directions include conducting a detailed empirical observation of cadets. Based on this, an analysis of the impact of innovations on cadets' practical training will be proposed. An important area for further research is also the development of methodological recommendations for integrating interactive technologies into military educational programs, considering modern challenges.

#### 4. Conclusions

Thus, cultural competence is the ability of a future military serviceman to understand, evaluate and effectively interact in different cultural environments, based on the acquisition of language knowledge and information about the history, culture and traditions of different countries. Innovative approaches to its development are aimed at forming various multicultural skills, understanding linguistic phenomena, values and worldview. These skills will allow the future military to act effectively in a complex, multicultural environment.

Key innovative technologies, such as virtual reality, augmented reality, digital learning platforms, simulation technologies, and multimedia, contribute to the improvement of cultural competence by including cadets in real-world cultural interaction. This also contributes to the development of knowledge and experience. In addition, the introduction of virtual exchanges allows for self-assessment, which also affects the motivation of students (cadets). The combination of offline and online courses in cultural studies and language training will allow the study of different cultural characteristics and histories of the countries with which the military may deal.

The study also found that an important innovative approach is the organization of special language clubs with international discussion and various projects to study cultural characteristics. The implementation of these approaches and tools will not only optimize the formation of cultural competence but also develop practical skills among cadets.

#### Declaration of competing interest

The authors declare that they have no known financial or non-financial competing interests in any material discussed in this paper.

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#### Author contribution

The contribution to the paper is as follows: H. Antonenko, N. Lemesheva: study conception and design; A. Zborchyi: data collection; H. Antonenko, N. Lemesheva, S. Sobolieva: analysis and interpretation of results; A. Hrytsenko: draft preparation. All authors approved the final version of the manuscript.

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