

GAME-BASED LEARNING IN MODERN MILITARY EDUCATION: DIGITAL WARGAMING AS A TOOL FOR TACTICAL TRAINING

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Abstract: This study examines the effectiveness of digital game-based scenarios and wargaming in developing tactical skills and decision-making abilities among military cadets. Utilizing the ARMA 3 game, three tactical scenarios—offensive, defensive, and stability and support operations—were tested. The study involved cadets from “Nicolae Bălcescu” Land Forces Academy (NBLFA) Sibiu, selected for their interest in gaming, familiarity with ARMA 3, and knowledge of military tactics. The results showed multiple advantages of using game-based scenarios in military training. The immersive environment provided by ARMA 3 enabled cadets to simulate realistic combat situations, enhancing their involvement and enthusiasm, leading to better knowledge absorption and skills development. Wargaming offered a safe learning environment, eliminating the risks of real exercises while allowing cadets to experience specific events and incidents. In the offensive mission, cadets faced challenges due to incomplete map analysis, highlighting the need to complement map analysis with real terrain reconnaissance. The defensive scenario underscored the importance of flexibility and adaptability of the combat forces' disposition. In the stability and support scenario, cadets effectively managed civilian-military interactions, demonstrating the potential of digital games to develop broader competencies in multicultural communication and negotiation. The study concludes that digital game-based scenarios effectively prepare leaders for contemporary conflicts marked by conventional or hybrid threats. It recommends implementing a specific wargaming discipline in the military higher education curriculum and extending this approach to Land Forces units for continuous professional development.

Keywords: Digital game-based learning, Wargaming, Military training, Tactical skills, ARMA 3

1. Introduction

Over time, wargames have been extensively used for developing future leaders, evaluating critical decisions, analyzing tactical situations, and formulating war strategies [1]. Wargaming involves the simulation of conflict scenarios in a controlled environment, allowing participants to explore techniques, tactics, and strategies, and to develop decision-making skills in conflict-like settings but under safe conditions. Despite technological advancements and the

development of numerous commercial wargaming software, their use in academic settings based on simulation and gaming remains limited [2].

2. Literature Review

The reasons for the lack of game-based scenarios in academia are attributed to constraints such as time, expertise, and resources, as well as the stigmatization associated with wargaming due to its perceived childishness and modeling deficiencies [2].

Testing scenarios to optimize the Course of Action (COA) within the Military Decision-Making Process (MDMP) has been utilized with the help of wargaming software that employs artificial intelligence (AI) to recommend COA improvements to commanders and staff [3].

The automation of the military decision-making process through the implementation of scenarios and the development of possible courses of action via virtual simulations of real military actions is a significant interest among military theorists [4].

In an era of the internet and digital gaming platforms, traditional methods of training and planning can be insufficient to meet current challenges [5]. Previous studies have identified the effectiveness of wargaming and game-based scenarios in military academia [6]. It has been concluded that the digital game ARMA 3, developed by Bohemia Interactive, enables the development of military competencies among cadets in military academies. Integrating digital games into the military educational process successfully develops essential tactical skills that are difficult to achieve through traditional teaching methods [7]. Military training should simulate conditions as close to reality as possible, exposing decision-makers to operational scenarios that closely resemble those of the hybrid battlefield[8]. Beyond the use of digital games in training military leaders, it is recommended to implement artificial intelligence in tactical decision-making to enhance mental agility, thereby enabling bold and sound decisions [9].

3. Research Methodology

The primary objectives of this study are:

- To evaluate the impact of wargaming and digital game-based scenarios on the decision-making skills of military cadets.
- To identify the benefits and limitations of using game-based scenarios in academic military training.
- To analyze how tactical scenarios in

ARMA 3 can be integrated into the military academic curriculum.

To test the effectiveness of wargaming, three tactical-level scenarios in ARMA 3 were utilized: offensive, defensive, and stability and support operations. ARMA 3 is a realistic combat simulator that provides a detailed and interactive virtual environment, ideal for training military cadets who are digital natives and familiar with gaming. The justification for using ARMA 3 lies in its ability to replicate real combat conditions and offer a flexible platform for various tactical scenarios.

The study was designed to evaluate the performance and decisions made by military cadets during wargaming simulations. Each scenario was structured to reflect diverse tactical situations, closely resembling real-life field training exercises (FTX). The scenarios provided opportunities to analyze challenges and make tactical-level military decisions within the following themes:

- **Offensive Actions:** Cadets were instructed to plan and execute an attack on an enemy objective.
- **Defensive Actions:** Cadets were required to occupy, fortify, and defend an objective against an enemy attack.
- **Stability and Support Operations:** Cadets conducted missions specific to irregular conflicts and counterinsurgency, aiming to win “hearts and minds” and gain the support of the local population.

The participants were military cadets from the “Nicolae Bălcescu” Land Forces Academy (NBLFA) in Sibiu. Selection was based on the students' interest in gaming, targeting those familiar with the commands and characteristics of ARMA 3 to avoid the need for learning key combinations and other details. Additionally, third-year students with knowledge of military tactics were chosen to ensure they had the necessary tactical understanding for the scenarios. The participants were organized into teams with various roles, from platoon

commanders to rank-and-file soldiers.

Data were collected through video recordings of cadets' actions during the simulations, evaluating decisions made, reaction times, and the outcomes of each mission. At the end of the activities, After Action Review (AAR) sessions were conducted, where the success of the mission, identified challenges, and group discussions were held to gather cadets' perceptions of their game-based scenario experiences.

4. Results

The results of this study were obtained by evaluating the achievement of objectives and the decisions made by military cadets during wargaming simulations. Each scenario was played only once, based on standardized documents (Operation Orders - OPORD) containing fictional data. The results are presented according to the type of mission: offensive, defensive, and stability and support operations.

Offensive Actions: in the offensive mission, the platoon demonstrated a high level of preparation and coordination, successfully executing a maneuver that took advantage of the dominant positions near the objective (see Figure 1).



Figure 1: Screenshot illustrating the cadets' maneuver to occupy dominant positions near the objective.

However, the platoon failed to execute the planned maneuver, leading to an incorrect positioning of forces near the established objective. The problem was caused by the platoon commander's failure to identify an obstacle (a ditch) on the virtual terrain map that the armored vehicle could not cross.

This oversight created a moment of panic within the platoon, which was exploited by the enemy, resulting in the opening of fire and the injury of a soldier. To improve future performance, the need for a more thorough evaluation of the terrain was emphasized, along with additional training for reacting to unplanned incidents. The subunit's adaptation to the enemy, terrain, and other mission factors is crucial for success. The offensive scenario highlighted the importance of coordination and adequate preparation, demonstrating that adaptability and rapid response to terrain changes are essential for success in offensive operations.

Defensive Actions: the game facilitated the planning and organization of a circular defense formation (see Figure 2). In the defensive scenario, the cadets demonstrated the ability to quickly adapt to the given situation and efficiently coordinate among the soldiers, even when surprised by the enemy. Initially, the platoon received intelligence indicating that the enemy's course of action involved an attack from the eastern side of the locality. This prompted the platoon commander to redeploy three soldiers from the western side to reinforce positions in the area where the enemy was expected.



Figure 2: Screenshot illustrating the cadets' circular defense formation.

However, the enemy attacked from the west, and the absence of these three soldiers led to the loss of two soldiers, the injury of

another, and damage to an armored vehicle. This situation highlighted the volatility of the operational environment and the necessity of balanced force deployment to avoid being caught off guard. To improve future actions, it was recommended to pay closer attention to evaluating available intelligence and to employ more flexible defensive formations that enable rapid adaptation to changing situations. The defensive scenario, like the offensive one, demonstrated that preparation and adaptability are crucial for success in defensive operations and that rigorous and flexible planning is required.

In **stability and support operation scenario**, the cadets were involved in a patrol mission combined with a key leader engagement (KLE) (see Figure 3). The team assigned to negotiate with local representatives demonstrated remarkable skills in managing the initial reluctance of the local leader (played by another cadet trained for the role) and in gaining his trust through an open approach and attentiveness to community needs. Following the discussions, the team successfully simulated the identification of issues faced by the local population, offering solutions and support to improve living conditions and security in their area of responsibility.



Figure 3: Screenshot illustrating the cadets' engagement in a key leader engagement (KLE)
The process of engaging the local leader highlighted the importance of developing collaboration and building a trust-based

relationship between military forces and the local community. Through constructive dialogue, the team managed to secure the local leader's support for coalition forces and his active involvement in solving community problems. This collaboration created a favorable climate for stability and security in the area, counteracting the influence of insurgent groups and improving the quality of life for the local population.

The scenario specific to stability and support operations demonstrated that digital games develop a broader range of competencies necessary for military leaders, not just those specific to offensive or defensive operations. Winning wars no longer depends solely on purely military efforts. A comprehensive approach is needed, complementing military efforts with social, economic, diplomatic, and informational strategies. Collaboration with the civilian environment, governmental and non-governmental organizations, and other civilian actors is essential for achieving success in military operations and for creating a climate of stability and security in affected areas.

5. Discussions

The results obtained in this study confirm the importance of wargaming and digital game-based scenarios in academic military training. Previous studies have already highlighted the benefits of wargaming in developing tactical skills, and the implementation of these diverse scenarios in this study adds further evidence regarding the effectiveness of this method in training military cadets.

In the offensive mission, the platoon faced the problem of incomplete map analysis, which led to the inability to execute the force maneuver. The resulting panic was exploited by the adversary. Terrain analysis is essential in the context of planning and conducting combat missions, but the challenge encountered does not represent a limitation of game-based scenarios. On the

contrary, digital maps provide precise terrain details, unlike printed maps, which may not be updated or, in some cases, do not exist. Practicing the wargaming scenario was a valuable lesson for the platoon commander, emphasizing the importance of a thorough analysis of terrain details and planning maneuvers according to terrain obstacles. This lesson is crucial because, in real terrain conditions, attempting to cross a similar ditch could lead to injuries or damage to armored vehicles. Another challenge was managing panic and indecision in crisis situations. The game provided a safe environment to experience and learn how to react to the unexpected, without the risks associated with field exercises. The cadets learned an important lesson about solving problems under pressure, which will be extremely useful in future real operations.

In the defensive scenario, the platoon of cadets demonstrated the ability to quickly adapt to the given situation and effective coordination among the soldiers, even when surprised by the enemy. Initially, the platoon received intelligence that the enemy's course of action involved an attack from the eastern side of the locality. This prompted the platoon commander to redeploy three soldiers from the western side to reinforce positions in the area where the enemy was expected. This practice is not necessarily "wrong", considering that the received intelligence indicated a different enemy course of action. The principle of concentrating forces allows for massing effort towards vulnerable directions or those specific to the most probable course of action. In military art, there are no universally valid solutions, and exposing leaders to as many unforeseen situations as possible can lead to developing the skills necessary to make the best decision in the given context. The use of intelligence must be complemented by careful on-site reconnaissance and the use of flexible defensive formations that allow rapid adaptation of forces in any situation.

In the stability and support operations scenario, the cadets demonstrated remarkable skills in managing specific challenges. The initial reluctance of the local leader was resolved through an open approach and by opening communication channels. The game allowed the simulation of the civil-military negotiation process and facilitated multicultural dialogue to understand the needs of the local community. The team leader managed to identify and analyze civilian problems, offering solutions and support in order to improve living conditions and security in the area. These aspects show that the chosen game also facilitates the development of competencies in complex environments, such as those specific to insurgency. Gaining popular support and winning "hearts and minds" were achieved through effective communication and empathy, demonstrating that the use of digital games can also be effective in preparing leaders for complex and unpredictable situations.

6. Conclusions

This study highlighted the effectiveness of digital game-based scenarios and wargaming in developing tactical skills and decision-making abilities among military cadets. The use of game-based scenarios demonstrated multiple advantages that contribute to the efficient training of military cadets. ARMA 3 provides an extremely realistic virtual environment that allows for the simulation of authentic combat situations. The engaging experiences, such as the importance of detailed terrain analysis or the flexible nature of combat formations, remain in the cadets' memory for a long time. Being digital natives, students are attracted to gaming activities. The tactical immersion offered by digital wargames enhances involvement and enthusiasm, leading to better absorption of knowledge and skills. Wargaming ensures a safe learning environment, eliminating the risks

associated with real tactical exercises. Cadets can experience complex and unpredictable scenarios without being exposed to physical dangers and can focus on the actual action without needing to spend time on administrative tasks. Wargaming activities offer immersion similar to field tactical exercises, allowing the practice of scenarios in all types of military operations. These activities develop essential military skills, such as movement, maneuvering, and attacking an objective, as well as skills in other key areas, such as communication and negotiation with authorities and other civilian representatives from the area of responsibility.

Digital game-based scenarios demonstrate the capability to form leaders capable of managing contemporary conflicts, marked by conventional or hybrid threats, and contribute to developing the necessary competencies for students to manage the complex challenges of the modern operational environment. To consolidate and expand the results of this study, future research could involve repeating the scenarios to obtain more robust and varied

data. Additionally, using more diverse virtual environments and including additional scenarios could provide even more comprehensive insights into the effectiveness of wargaming and game-based scenarios.

It is recommended to implement a specific wargaming discipline within the military higher education curriculum that applies game-based scenarios to enhance the efficiency of cadet training and develop the necessary competencies for modern military leaders. This approach can also be effectively applied within Land Forces military units where leaders continue their ongoing professional development, ensuring that they are prepared to face evolving threats and complex operational environments.

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