

# Utilizing multimedia technology to create educational tools for teaching national defense and security

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## ABSTRACT

*Fostering national defense and security knowledge is not merely a policy imperative but a fundamental necessity for our nation's governance, crucial for reinforcing comprehensive national defense and ensuring the safety of our citizens. However, the traditional methods of imparting military expertise in high schools and universities face significant challenges, with outdated textbooks and static lectures often failing to engage students effectively. This article proposes a solution by advocating for the integration of multimedia technology into educational software, offering interactive simulations, virtual reality experiences, and multimedia presentations to bring national defense and security concepts to life. By embracing these innovative tools, we can enhance the quality of national defense and security instruction nationwide, engaging learners more effectively, fostering deeper comprehension, and ultimately strengthening our collective grasp of defense and security matters. By introducing multimedia technology into software development, this article aims to enhance the teaching of national defense and security to students across the country.*

**Keywords:** *multimedia, national defense and security, teaching military knowledge*

## 1. INTRODUCTION

Multimedia technology encompasses the integration of diverse media types, including text, graphics, audio, video, and interactive elements, within digital contexts. This technology enables the creation, manipulation, storage, and distribution of multimedia content using computer-based tools and platforms. Text is utilized for conveying information, while graphics such as images, illustrations, and animations enhance visual communication. Audio components include sound effects, music, narration, and dialogue, adding depth and engagement to multimedia presentations. Video elements encompass moving images and footage, including recorded scenes and animations. Additionally, multimedia often incorporates interactive features like clickable buttons, hyperlinks, quizzes, and simulations, allowing for user engagement and participation. This versatile technology finds extensive applications in

education, entertainment, advertising, gaming, virtual reality, and various other fields, enhancing communication and user experiences across different platforms and devices [1, 2].

The application of multimedia technology in developing software for military knowledge is multifaceted and impactful. By leveraging multimedia elements, developers can create immersive and realistic simulations that replicate combat scenarios, strategic planning exercises, and operational procedures. These simulations enable learners, including military personnel and cadets, to gain hands-on experience in a controlled environment, fostering practical skills and decision-making abilities crucial for real-world missions.

Moreover, multimedia-based educational software offers versatility and adaptability in training programs. Military training software can

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be customized to accommodate various learning styles and preferences, catering to auditory, visual, and kinesthetic learners alike. Interactive features such as quizzes, animations, and virtual tours further enhance engagement and knowledge retention among learners. Additionally, multimedia technology facilitates remote learning and self-paced study, enabling military personnel to access training materials anytime and anywhere, which is particularly valuable for individuals deployed in remote or operational locations [3].

However, the application of multimedia technology for learning and accessing military knowledge within domestic military units remains limited, despite some units introducing multimedia-based products for training and teaching soldiers. The effectiveness of these initiatives often falls short due to various reasons, with a primary issue being the lack of professional expertise in graphic design to adequately meet training requirements. Current practices often involve simplistic recording of training processes using cameras, resulting in products that lack vivid visualization during training sessions. To address this gap, there's a need to selectively integrate 2D graphics, 3D graphics, and simulation technology in each specific product. This approach can yield vivid visualizations that significantly enhance learning efficiency and knowledge acquisition, meeting the actual needs of military training and education.

Driven by the necessity to provide Defense and Security education in high schools and universities nationwide, a research team from the Institute of

Simulation Technology at the Military Technical Academy has developed software products to support learning, teaching, and research on national defense and security knowledge for educators, students, and pupils across the country.

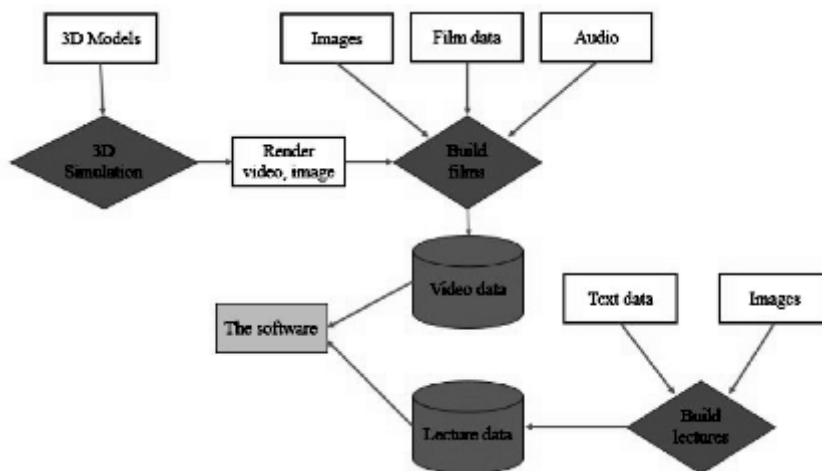
**2. SOFTWARE DEVELOPMENT METHODOLOGY**

**2.1. Objectives**

The objective of this product is to aid officials and educators in delivering defense and security education at high schools and universities through intuitive and engaging means, utilizing vivid 3D simulation images. It also empowers students to study independently effectively at their convenience, regardless of location. Furthermore, the product complements national defense and security teaching programs in various formats, prioritizing user-friendliness, convenience, and ease of implementation. Notably, the product is affordably priced and comes with comprehensive support, including warranty, maintenance, updates, and the incorporation of new knowledge as needed.

**2.2. Software building process**

Creating a 3D simulation product requires a comprehensive process that includes surveying, measuring, taking photos, building 3D models, and understanding the structure and principles of motion for each type of weapon. Each of these steps necessitates that workers research and utilize various software tools and processing techniques to produce the final product [4],[5]. The software construction process is carried out by the author group according to the following steps (figure 1):



**Figure 1.** Software construction diagram

*For theoretical lectures, the tasks to be performed include the following steps:*

- Utilize Existing Educational Materials: Leverage information and visual documents that are currently used for teaching at military schools to ensure consistency and relevance in the lecture content.
- Incorporate Survey-Based Visuals: Integrate images and videos captured from actual surveys to provide real-world context and enhance the authenticity of the lectures.
- Process and Enhance Graphics: Process and enhance graphic images to improve clarity and instructional value, making the content more engaging and easier to understand for students.
- Integrate 3D Model Exports: Use images exported from 3D models to illustrate complex concepts and structures, providing a visual aid that helps in better comprehension of the material.
- Synthesize and Publish Lectures: Synthesize all gathered and processed materials, build comprehensive lecture documents, and publish them in PDF format for easy distribution and access by students.

*The tools used include:*

- Hardware: High-performance computers capable of supporting advanced graphics processing. These systems should have powerful CPUs, ample RAM, and high-end GPUs to handle complex rendering tasks and ensure smooth performance during graphic-intensive operations.
- Software: Specialized software for designing and creating 2D images. Key tools include:

*Adobe Photoshop:* For editing and manipulating images, creating detailed graphics, and preparing visual content for lectures.

*CorelDRAW:* For vector graphic design, layout, and illustration, enabling precise control over graphic elements.

*Adobe Illustrator:* For creating scalable vector artwork, designing icons, logos, and other graphical elements used in educational materials.

*For training lectures in the form of simulation films, the tasks to be performed include the following steps:*

- Research and Conceptualization: Begin by thoroughly researching and understanding the

training content to be depicted in the 3D simulation. This step involves studying military tactics, equipment operation, and procedural protocols to ensure accuracy and effectiveness in the simulation.

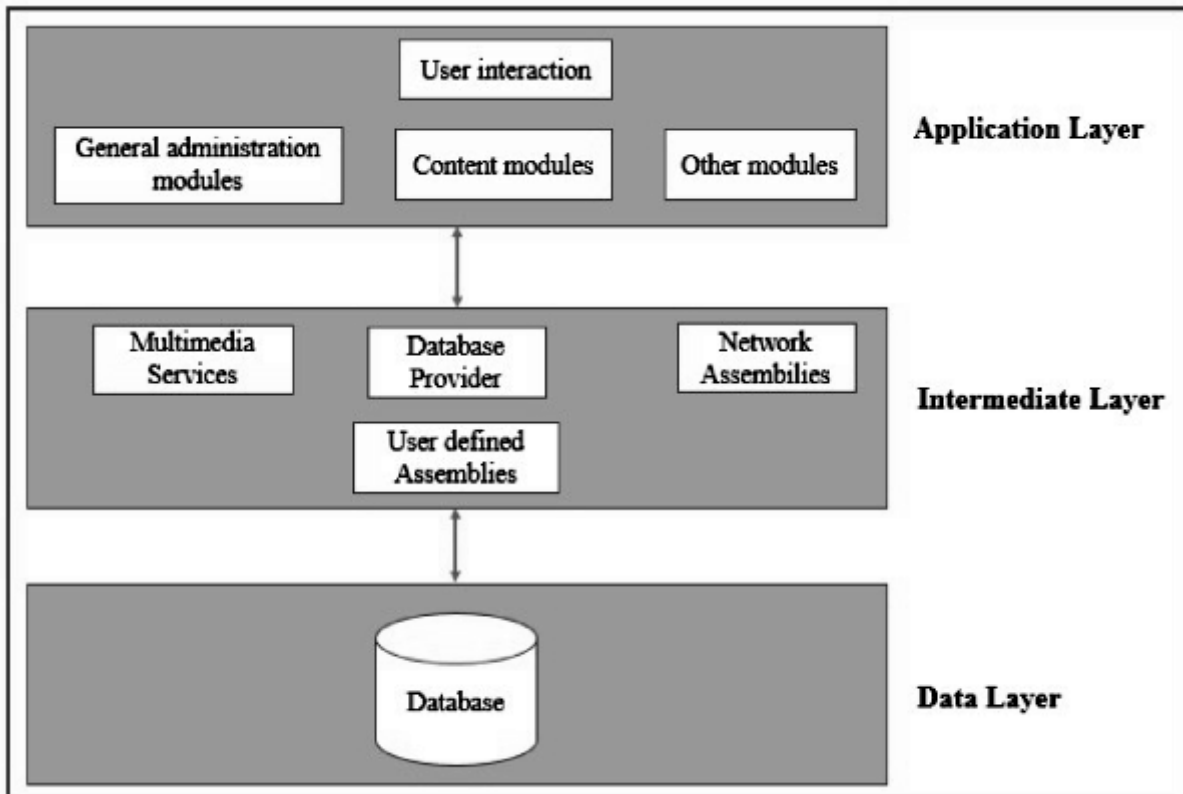
- Fieldwork and Data Collection: Conduct surveys, film, and photograph actual weapons and equipment used in military units. This fieldwork provides essential reference material for creating realistic textures and models in the simulation.
- Texture Creation: Generate image data by creating textures for various objects and environments within the simulation. These textures add depth, detail, and realism to the virtual training environment.
- 3D Modeling: Develop detailed 3D models of weapons, military equipment, and other elements relevant to the training scenario. Utilize specialized software tools to accurately model the physical attributes and functionality of each object.
- Animation: Bring the simulation to life by animating objects within the virtual environment. This includes animating movements such as weapon firing, vehicle maneuvers, and soldier actions to simulate realistic scenarios.
- Content Publication: Once the simulation content is complete, it needs to be compiled and published for use in current training lectures. This may involve integrating the simulation into existing training materials or creating standalone modules for specific training sessions.

*The tools used include:*

- Hardware: High-performance computers for building 3D data, equipped with graphics and video editing hardware to design 2D and 3D models.
- Software: Specialized software from renowned brands such as Adobe, Autodesk, and Maxon to design and create 3D data. These tools, used by architects, technicians, or technical experts, support the design of 3D models according to technical drawings in various formats, tailored to each design and use requirement.

### **2.3. Software architecture and technology platforms** **a) Software architecture**

The software is built according to a 3-layer architecture (figure 2):



**Figure 2.** Three-layer architecture of the software

**Application Layer:** The top layer, also known as the presentation layer, includes the main modules responsible for handling user requests, managing user interactions, and providing the user interface. It communicates with the service layer to process and display information effectively. This layer ensures a seamless user experience by managing the application's logic and workflow.

**Intermediate Layer:** Also referred to as the business logic layer or service layer, this intermediary layer connects the application layer with system services. It contains classes and libraries that handle the core functionality of the application, such as business rules, data processing, and validation. This layer is crucial for maintaining the separation of concerns, allowing the application to scale and adapt more easily.

**Data Layer:** The bottom layer, known as the data access layer, is responsible for interacting with the database. It manages data storage, retrieval, and updates. This layer abstracts the underlying database system and provides a consistent interface for the intermediate layer to access and manipulate data. Ensuring efficient and secure data transactions is a key function of this layer.

By employing a 3-layer architecture, the software achieves better modularity, making it easier to develop, maintain, and scale. Each layer has a distinct role, which helps in managing complexity and enhancing the overall robustness of the system.

#### **b) Technology platforms**

The software is built on the following technology platforms:

**Programming Languages:** The primary programming languages used are C# and JavaScript. C# is utilized for its robust, object-oriented capabilities and seamless integration with the .NET Framework and Unity3D. JavaScript is employed for client-side scripting and enhancing interactive functionalities.

**Development Environment:** Development is carried out using Visual Studio 2010 and MonoDevelop, which provide comprehensive IDE support for C# and .NET applications. Additionally, Unity3D serves as the game engine for developing 3D simulations and interactive content.

**Database Management System:** SQLite is used as the database management system, chosen for its lightweight, serverless architecture, which is ideal for embedded applications and rapid development cycles.

**Database Connection Technology:** The .NET Framework data providers are utilized for connecting and interacting with the SQLite database, ensuring efficient data handling and transaction management.

**3D Data and Animation Tools:** 3DS Max and Cinema 4D are employed for creating and animating 3D models. These tools provide advanced features for modeling, texturing, and animating complex scenes and objects.

**Video and Audio Creation:** Adobe Premiere and Adobe After Effects are used to create lecture videos and incorporate sound and image effects. Audacity is used for audio editing and sound effects, ensuring high-quality multimedia content.

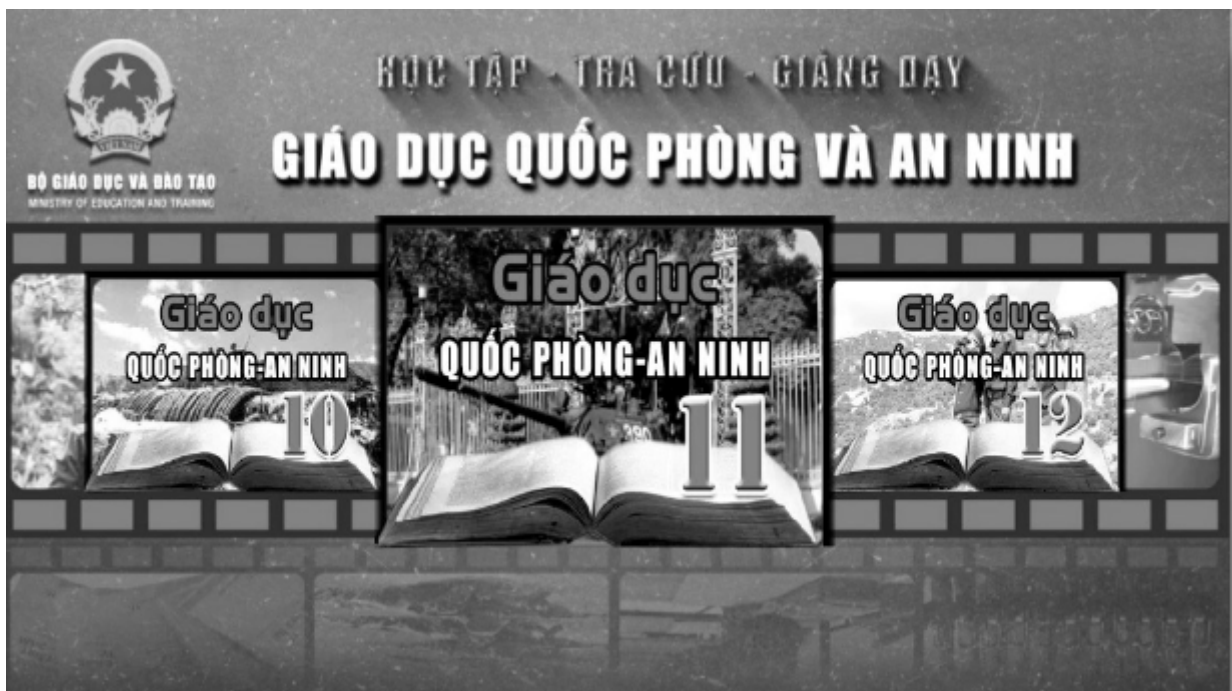
**Text Lecture Creation:** Photoshop is used for designing graphics and visual content, while Microsoft Word is utilized for composing and

formatting textual lecture materials.

### 3. RESULT AND CONCLUSION

#### 3.1. Result

The main interface of the software is shown in Figure 3. The software encompasses key functions, including displaying a comprehensive directory tree containing lecture titles and details within the 3D weapon models. It showcases detailed lecture content, comprising theoretical, practical textbook, and 3D simulation lectures. Users can interact with 3D simulations of weapon structures, exploring each detail independently. The software facilitates image publication for printing, teaching, or archival purposes. Additionally, it supports user management by functional role and enables testing of general knowledge, specific content, and individual topics within the training curriculum.



**Figure 3.** Main interface of the software

The theoretical lectures integrated into the software are meticulously crafted from standard content textbooks and authoritative documents, enriched with vivid and illustrative images (figure4). Each lecture is meticulously curated to ensure clarity and comprehensiveness, providing learners with a robust understanding of the subject matter. These theoretical lectures, meticulously assembled from trusted sources, are meticulously formatted and published in PDF file format. This format ensures accessibility and

portability across various devices and platforms, allowing learners to access the educational content conveniently at their own pace and convenience.

By leveraging standard content textbooks, authoritative documents, and clear visual aids, the theoretical lectures encapsulated within the software empower learners to delve deep into the subject matter, fostering critical thinking, problem-solving skills, and knowledge retention.



**BAI**  
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## LỊCH SỬ, TRUYỀN THỐNG CỦA LỰC LƯỢNG VŨ TRANG NHÂN DÂN VIỆT NAM

Sau bài học này, học sinh:

- ❖ Nêu được những nét chính về lịch sử, bản chất, truyền thống anh hùng của Quân đội nhân dân Việt Nam, Công an nhân dân Việt Nam và Dân quân tự vệ.
- ❖ Từ những truyền thống anh hùng của lực lượng vũ trang rút ra được nét cơ bản của Nghệ thuật quân sự Việt Nam qua mỗi giai đoạn.

**KHỞ ĐỘNG**

1. Quan sát hình 1.1 và cho biết: Lực lượng vũ trang nhân dân Việt Nam gồm những thành phần nào?
2. Hãy kể về những người thân hoặc người xung quanh hoạt động trong lực lượng vũ trang nhân dân mà em biết.



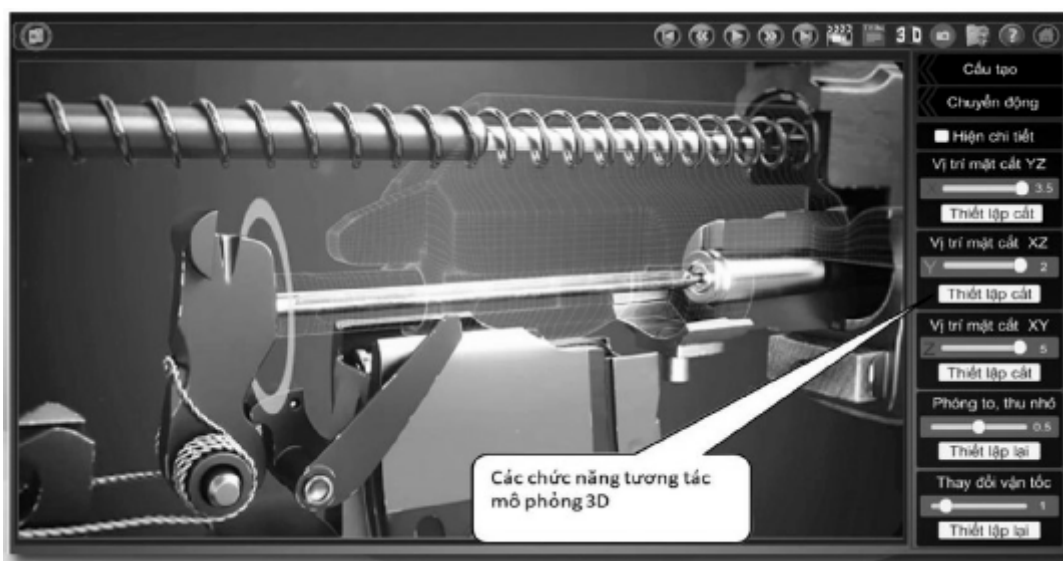
Hình 1.1. Lực lượng vũ trang nhân dân Việt Nam

**Figure 4.** Theoretical lecture features of the software

Furthermore, the software boasts an innovative 3D simulation teaching feature, providing immersive experiences that elucidate the intricate operating principles of various weapons. Through this interactive module, users can engage directly with 3D weapon models, gaining a deeper understanding of their mechanisms and functionalities. The simulation allows users to manipulate the 3D weapon models with ease, offering intuitive controls for rotation, movement, and zooming in and out (figure 5). This hands-on approach enables learners to explore the intricate details of each weapon, fostering a deeper comprehension of its components and operation.

Moreover, the interactive nature of the simulation encourages active engagement and experimentation, allowing users to test different scenarios and observe the outcomes in real-time. This experiential learning approach enhances retention and mastery of the subject matter, empowering users to apply their knowledge effectively in practical situations.

By integrating 3D simulation technology with direct interaction functions, the software provides a dynamic and immersive learning environment that promotes curiosity, exploration, and mastery of weapon systems.



**Figure 5.** Interactive and 3D simulation features of the software

### 3.2. Discussion

Utilizing multimedia technology to create educational tools for teaching national defense and security presents several challenges. One major issue is ensuring data security and protecting sensitive information from cyber threats and unauthorized access. Content development is another critical area, requiring accurate, up-to-date, and relevant material that conveys complex concepts in an engaging manner [6, 7]. User training and support are essential to ensure instructors and students can effectively use these tools, which also entails ongoing technical support and updates. Cost and resource allocation are significant concerns, with high initial development costs and continuous maintenance expenses. Pedagogically, it's crucial to create content that enhances learning and provides effective assessment methods. Moreover, scalability is important for large-scale deployment without performance degradation. Finally, continuous evaluation and feedback mechanisms are necessary for the ongoing improvement of these educational tools [8].

### 4. CONCLUSION

Overall, the product has facilitated officials and teachers in delivering knowledge to students in an intuitive and engaging manner, stimulating critical

thinking and creativity, thereby enhancing learning efficiency. It harnesses the unique advantages of technology, including multimedia capabilities, high interactivity, personalized learning activities, assessments, and timely feedback. These features serve as vital prerequisites for stimulating students' interest in learning national defense and security education. Consequently, the product helps students comprehend and appreciate the strength of our armed forces, nurturing aspirations to contribute more significantly to our nation.

The software has been implemented across 30 schools within the military, spanning institutions such as the Chemical Defense Officer School, the Information Officer School, and the Army Officer School. Feedback from users indicates that the software is intuitive, user-friendly, and highly effective, surpassing traditional teaching methods in yielding significant learning outcomes. Its ease of use and accessibility have contributed to its widespread adoption, facilitating enhanced comprehension and retention of critical concepts among military personnel. This success underscores the value of integrating technology into educational practices within military contexts, paving the way for more dynamic and efficient learning experiences.

### REFERENCES

- [1] Nunes, C., and Edmond Gaible. "Development of multimedia materials." *Technologies for education: potentials, parameters, and prospects*. Paris: UNESCO, 94-117, 2002.
- [2] Abdulrahman, M. D., et al., "Multimedia tools in the teaching and learning processes: A systematic review," *Heliyon*, 6,11, 2020.
- [3] Campbell, Keontra C., and Shuyan Wang, "Military Instructors' Perspectives on Interactive Multimedia Application in Military Classrooms," *Military learning*, 46, 2023.
- [4] Pargaonkar, Shravan, "Enhancing Software Quality in Architecture Design: A Survey-Based Approach," *International Journal of Scientific and Research Publications (IJSRP)*, 13, 08, 2023.
- [5] Khan, Arif Ali, et al., "Software architecture for quantum computing systems-A systematic review," *Journal of Systems and Software*, 201, 111682, 2023.
- [6] Pargaonkar, Shravan, "A Comprehensive Review of Performance Testing Methodologies and Best Practices: Software Quality Engineering," *International Journal of Science and Research (IJSR)* 12 (8), 2008-2014, 2024.
- [7] Pargaonkar, Shravan. "Advancements in Security Testing: A Comprehensive Review of Methodologies and Emerging Trends in Software Quality Engineering." *International Journal of Science and Research (IJSR)*, 12(9), 61-66, 2023.
- [8] Pargaonkar, Shravan, "Synergizing Requirements Engineering and Quality Assurance: A Comprehensive Exploration in Software Quality Engineering," *International Journal of Science and Research (IJSR)*, 12(8), 2003-2007, 2023.

# Ứng dụng công nghệ đa phương tiện trong xây dựng và phát triển sản phẩm phục vụ giảng dạy giáo dục quốc phòng và an ninh

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Lương Phan Quang và Nguyễn Thị Lan

## TÓM TẮT

Bồi dưỡng kiến thức quốc phòng và an ninh (QP-AN) là một chủ trương lớn của Đảng, Nhà nước nhằm góp phần xây dựng nền quốc phòng toàn dân, nền an ninh nhân dân ngày càng vững chắc. Tuy nhiên, các phương pháp truyền thống nhằm truyền đạt chuyên môn quân sự ở các trường trung học và đại học phải đối mặt với những thách thức đáng kể, khi các sách giáo khoa lỗi thời và các bài giảng tĩnh thường không thu hút được học sinh một cách hiệu quả. Bài viết này đề xuất giải pháp bằng cách tích hợp công nghệ đa phương tiện vào phần mềm giáo dục, cung cấp các mô phỏng tương tác, trải nghiệm thực tế ảo và thuyết trình đa phương tiện để đưa các khái niệm QP-AN vào cuộc sống. Thông qua việc áp dụng những công cụ đổi mới này, chúng ta có thể nâng cao chất lượng giảng dạy QP-AN trên toàn quốc, thu hút người học hiệu quả hơn, thúc đẩy sự hiểu biết sâu sắc hơn và cuối cùng là củng cố sự hiểu biết chung về các vấn đề quốc phòng và an ninh. Bằng cách giới thiệu công nghệ đa phương tiện vào phát triển phần mềm, bài viết này nhằm mục đích nâng cao việc giảng dạy QP-AN cho học sinh trên cả nước.

**Từ khóa:** đa phương tiện, an ninh quốc phòng, giảng dạy kiến thức quân sự

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