Research on the Main Problems and Improvement Strategies of Equipment Support Practical Training under the Background of Digital Transformation

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Keywords: Digital Transformation, Actual Combat Training, Equipment Support

Abstract: With the rapid advancement of digital technology, digital transformation has become a pivotal trend in the global defense sector, significantly impacting the field of equipment support practical training. This study delves into the primary issues and enhancement strategies within the context of digital transformation for equipment support practical training. The research highlights the utilization of cutting-edge technologies such as Virtual Reality (VR), Augmented Reality (AR), and Artificial Intelligence (AI) to enhance training realism and efficiency. The paper identifies key challenges, including lagging theoretical research, missing training subject elements, incomplete content settings, and partial environment construction. It further discusses the profound influence of digital transformation on equipment support practical training, focusing on the enhancement of intelligent equipment support levels, optimization of training conditions and environments, improvement of training efficiency and safety, and the promotion of innovative training methods.

1. Introduction

With the rapid development of digital technology, digital transformation has become an important trend in the global education field. At the same time, equipment support practical training is undergoing a transformation from traditional to modern. This transformation involves not only the renewal of training methods but also a comprehensive innovation of training concepts, content, methods, and assessment systems. The digital transformation of education provides a wealth of resources and tools for equipment support practical training, such as the application of virtual reality (VR), augmented reality (AR), artificial intelligence (AI), and other technologies, making training closer to actual combat and improving the efficiency and effectiveness of training[1].

2. Main Problems Faced by Equipment Support Practical Training

Equipment support practical training is a key link in enhancing the combat effectiveness of the military, but there are still some urgent problems to be solved in the current training practice. The existence of these problems not only affects the quality and effectiveness of training but also restricts the enhancement of the overall combat effectiveness of the troops. The main problems faced by equipment support practical training at this stage include:

2.1. Lagging Theoretical Research

The theoretical research on equipment support practical training is relatively lagging, lacking mature theoretical experience for reference, and it is difficult to use a complete theory to scientifically guide practical training, thereby affecting the training effect. "An Introduction to Equipment Support Practical Training" mentions that exploratory research has been conducted on the basic concepts, basic theories, basic methods, basic characteristics, basic laws, and basic principles of equipment support practical training, indicating that theoretical research is gradually advancing, but further development is still needed to better support practical training.

  DOI: 10.25236/eeha.2024.022

2.2. Missing Training Subject Elements

In equipment support practical training, the training subject elements are missing, making it difficult to meet the equipment support requirements needed in actual combat. The training subject should include factors of equipment support forces involved in actual combat to ensure the effectiveness of training[2]. The absence of training subject elements will damage the overall effectiveness of practical training, so it is necessary to better map the experiences in actual combat to the training subjects to improve the combat adaptability of training.

2.3. Incomplete Content Settings

The specificity, rationality, and completeness of training content need to be improved. There is a certain gap between the training content and the actual combat equipment support requirements, and the proportion of content settings lacks rationality. The content of equipment support practical training needs to be enriched and improved to enhance its practical specificity and rationality, ensuring that the training content matches the actual combat requirements.

2.4. Partial Environment Construction

There are shortcomings in the construction of the equipment support practical training environment, and the existing contract-type tactical training bases lack sufficient equipment support elements, which cannot meet the needs of practical training[3]. The training environment is the carrier and support of practical training, and it is necessary to fully utilize the latest modern scientific and technological means according to the characteristics of the informationized battlefield environment, to create a combat electromagnetic environment, network environment, confrontation environment, and guidance and evaluation environment that are close to actual combat, forming a complete and reasonably laid out practical training environment system.

3. The Impact of Digital Transformation on Equipment Support Practical Training

Digital transformation is profoundly changing the face of equipment support practical training. By introducing cutting-edge technologies such as digital twins, intelligent technologies, big data analysis, and virtual reality, the level of intelligence in equipment support training has been significantly improved, training conditions and environments have been optimized, training efficiency and safety have been enhanced, and training methods are continuously innovating. The impact of digital transformation on equipment support practical training is mainly reflected in the following aspects:

3.1. Enhancing the Level of Intelligent Equipment Support

Digital transformation, by introducing digital twin technology, promotes the digital, networked, intelligent, and service-oriented transformation and upgrading of weapon equipment support tasks. Digital twin technology can replicate the real world and interact with physical world entities, feeding back information to physical entities, bringing profound changes to equipment support. The application of this technology enables equipment to have the ability to accurately predict and detect faults through self-"learning" of detected and unseen events or raw data, accurately diagnose its own health status, and provide reasonable maintenance suggestions based on fault prediction results.

3.2. Optimizing Training Conditions and Environments

Digital transformation has promoted the construction of intelligent training conditions, including the construction of realistic battlefield environments and the development of advanced training methods. Through the application of big data analysis, intelligent wearable devices, and machine "deep learning," it is possible to simulate and display three-dimensional terrain, weather and meteorological conditions, and complex combat situations in an intuitive manner, constructing vivid and realistic intelligent combat scenes. This helps to improve the combat adaptability and effectiveness of training[4].

3.3. Improving Training Efficiency and Safety

The application of digital technology, such as simulation systems and augmented reality (AR) and virtual reality (VR) technologies, provides an unprecedented immersive experience for military training. These technologies enable soldiers to practice their ability to deal with various complex situations in a realistic and controllable environment, improving training effectiveness while reducing costs and safety risks.

3.4. Promoting Innovation in Training Methods

Digital transformation focuses on enhancing the immersion of training, integrating intelligent technologies with training methods and means, and narrowing the distance between the "training ground" and the "battlefield." For example, using interactive wearable devices based on virtual reality technology to simulate actual battlefield terrain and meteorological environments enhances the visual, auditory, and even tactile immersion of training operations. This method not only strengthens soldiers' intuitive understanding of equipment structure and business processes but also allows for the exploration of simulated training for dangerous support subjects.

4. Strategies for Improving the Quality and Efficiency of Equipment Support Practical Training

Under the background of digital transformation, strategies for improving the quality and efficiency of equipment support practical training can be discussed from the following four aspects:

4.1. Construction of Intelligent Training Conditions

By integrating cutting-edge technologies such as big data, artificial intelligence (AI), and machine learning, a highly intelligent training environment can be constructed. Such an environment can simulate the complexity and unpredictability of real battlefields, including terrain, climate conditions, and enemy and friendly situations, providing trainees with a training scenario close to actual combat. Using virtual reality (VR) and augmented reality (AR) technologies, an immersive training experience can be created. Trainees can conduct operational training in simulated battlefield environments, improving their familiarity with equipment and operational skills, while enhancing their adaptability to battlefield environments. Intelligent training systems can collect training data in real-time, including equipment performance parameters and the physiological and psychological states of operators, providing immediate feedback through intelligent analysis to help trainees adjust their training strategies in a timely manner and improve training effectiveness.

4.2. Precision of Training Management

Using deep learning algorithms, training plans can be formulated and optimized to ensure precise matching of training content with capability requirements. These algorithms can analyze historical training data to identify the most effective training content, thereby formulating more targeted training plans. By dynamically adjusting training content, training can adapt to the different ability levels and needs of trainees, thereby improving training efficiency and effectiveness. Establishing an intelligent training management system that uses data analysis and machine learning algorithms to monitor and provide feedback on the training process in real-time. Such a system can promptly identify issues in training and provide corresponding solutions to ensure the precision of training management. At the same time, the system can also provide data support for instructors to help them better understand training effects and the needs of trainees.

4.3. Application of Digital Twin Technology

Digital twin technology creates virtual replicas of equipment, allowing the entire process of equipment design, manufacturing, testing, and maintenance to be mapped and managed in the digital world. This technology integrates various data such as design parameters, performance data, and maintenance records throughout the life cycle of the equipment, forming a comprehensive

knowledge database. This not only helps optimize the use and maintenance of equipment but also provides data support for equipment upgrades and transformations, achieving intelligent and precise equipment management. Digital twin technology collects real-time data from equipment through sensors, allowing for real-time monitoring of equipment health status. This real-time monitoring capability transforms equipment maintenance from traditional periodic inspections to condition-based maintenance, which means repairs are only carried out when the equipment is about to fail. This approach can reduce unnecessary maintenance work, lower maintenance costs, and improve the availability and reliability of equipment.

4.4. Construction of Actual Combat Training Environments

Through VR technology, a fully immersive training environment can be created, allowing trainees to "immerse" themselves in simulated streets or battlefields and flexibly handle various special situations set by instructors. This immersive experience can provide highly customized training scenarios, effectively respond to critical incidents, while reducing training costs and improving performance. AR technology can provide soldiers with enhanced targeting, improved navigation, and virtual training. For example, the HUD 3.0 headset system can provide tactical information for U.S. Army soldiers and accurately display the bullet's point of impact when the trigger is pulled. This technology allows troops to operate complex training scenarios at a lower cost and provides a new training method that brings training closer to actual combat. Selecting specific natural environments or utilizing military and civilian resources to build actual combat training sites can improve the combat adaptability of training. For example, by integrating resources to concentrate scattered sites and equipment, the service training function can be maximized. At the same time, with the help of technological means, the support platform can be expanded, fully utilizing intelligent training methods such as virtual reality, machine learning, and big data analysis, to implant more technological factors and inject technological strength into training support.

5. Conclusion

By using digital technology means, a training environment close to actual combat can be provided for the trained troops, greatly enhancing the authenticity and effectiveness of training. At the same time, through the combination of digital twin technology and intelligent training methods, not only can the digital management of the entire life cycle of equipment be achieved, but also a knowledge database can be constructed to assist in decision optimization. The integrated application of these technologies not only improves the response speed and accuracy of equipment support but also enhances the combat adaptability of training, ensuring a high degree of consistency between training and actual combat environments.

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