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Research on the Application of Virtual Simulation Training Platform in Construction-Type Higher Vocational College Education

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Abstract: Civil engineering provides fundamental support for military infrastructure construction, facility operation and maintenance, and mission support. Noncommissioned officer technicalskilled talents are frontline backbones for engineering construction, operation management and emergency rushrepair. Their comprehensive professional quality directly determines the stability of military facility systems and mission support efficiency. With the continuous upgrading of actualcombatoriented and diversified support requirements, civil engineering support work for military posts presents new characteristics of multidiscipline intersection, wholeprocess connection and highlevel confidentiality requirements. The traditional singlespecialtyoriented talent training mode can hardly meet the support requirements in the new era. Based on the actual post conditions of noncommissioned officer vocational colleges, this paper systematically sorts out core contradictions in cultivating compound multiskilled talents for civil engineering majors, including imperfect incentive systems, insufficient training resources supply and shortage of practical training scenarios. Combined with the policy orientation of noncommissioned officer team construction and the characteristics of military civil engineering posts, this paper explores compound talent cultivation paths that match post demands, conform to the reality of noncommissioned officer vocational colleges and follow the law of talent development from three dimensions: optimizing incentive framework, coordinating training elements and innovating training modes. It is expected to provide references for building highlevel multiskilled noncommissioned officer backbones and improving the comprehensive support capacity of military civil engineering talent training.

Keywords: Non-Commissioned Officer Vocational Colleges; Multi-Skilled Talents; Talent Cultivation Mechanism; Civil Engineering; Compound Talents

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1. Introduction

In the newera background of strengthening the military, the development of strategic military forces is accelerating. Military posts serve as key carriers for combat, test and combat readiness missions. Tasks including new engineering construction, daily maintenance, fault repair and emergency disposal have significantly raised requirements for professional depth, multiparty collaboration, confidentiality level and emergency response. Military civil engineering covers multiple interrelated fields such as building structure construction, electromechanical equipment installation[1], pipeline system laying,

security and confidential facility maintenance, hidden danger diagnosis and emergency rushrepair. All sectors are closely coupled and mutually supportive, requiring frontline noncommissioned officers to possess broader professional vision and crossdisciplinary operation capabilities.

Multiskilled noncommissioned officers occupy a pivotal connecting position in the military civil engineering support system. They are executors of commanders' decisionmaking intentions as well as specific implementers of onsite organization. Their professional breadth and practical proficiency directly determine the quality of military facility maintenance, duty safety standard and response speed under emergencies. As military forces undertake more diversified support tasks, core military areas are prohibited from employing external social labor or local engineering teams. All construction, maintenance and renovation work must be independently completed by internal noncommissioned officers. This rigid constraint requires noncommissioned officer students majoring in civil engineering not only to master solid expertise in their main specialty, but also to acquire practical skills of adjacent posts and undertake auxiliary crosstype work. Therefore, building a multicompetency ability structure has become an inevitable trend for talent construction of civil engineering majors in noncommissioned officer vocational colleges.

At present, noncommissioned officer vocational colleges are actively promoting the transformation and upgrading of technicalskilled talents[2]. Nevertheless, a closedloop compoundtalent training system targeting military civil engineering has not yet been fully formed. Deficiencies still exist in institutional driving force, teaching support and realscene training. These problems result in insufficient initiative of noncommissioned officer students to expand interdisciplinary skills, limited access to crossmajor learning and lack of comprehensive practical experience. There remains a gap between talent output and actual combatoriented support demands. Accordingly, identifying weak links in current cultivation and exploring practical and efficient paths for generating compound competencies possess prominent practical significance for enhancing the comprehensive support capacity of military civil engineering and serving the highquality development of strategic forces.

2. Value Analysis of Cultivating Multi-Skilled Talents for Civil Engineering Major in Non-Commissioned Officer Vocational Colleges

2.1 Meeting Military Confidentiality and OnSite Support Requirements

Military posts belong to military facilities of high confidentiality level. The whole processes of construction & reconstruction, equipment maintenance, system upgrading and fault disposal are directly related to core military secrets. In accordance with confidentiality regulations, external enterprise personnel and local technical forces are prohibited from entering key positions for onsite operations. All frontline practical work must be undertaken by activeduty noncommissioned officers. Under fixed staffing and shortage of fulltime personnel, if each noncommissioned officer is only competent for one single post, comprehensive engineering work featuring complicated types and frequent crosslinks will easily lead to manpower shortage, post vacancy and delayed response. Equipping noncommissioned officers with crosspost operation capabilities and realizing multirole undertaking for one person becomes an effective strategy to make up manpower gaps under closed military support conditions.

2.2 Satisfying Diversified and Integrated Mission Support Requirements

Current military civil engineering support has evolved from early simple civilconstruction maintenance to a fullspectrum work chain integrating new construction & reconstruction, inspection & maintenance, hiddendanger elimination, safety protection, emergency risk disposal and combatreadiness upgrading. Tasks become more diversified, professional boundaries are increasingly blurred, and emergencyresponse characteristics grow more prominent. During daily duty, agingfacility renovation and periodic equipment inspection often require multitype work types to cooperate simultaneously. When emergencies occur, suddenfault disposal or temporary structural reconstruction demands onsite personnel to make rapid judgments and independently implement multidimensional operations. Personnel merely mastering single skills can hardly cope with such intertwined tasks. Only by cultivating compound multiskilled noncommissioned officers can manpower complementation and skill interconnection be realized, so as to strengthen the elasticity, efficiency and emergencyresponse capacity of the whole military support system.

2.3 Promoting the Professional Development of Non-Commissioned Officers

With the indepth implementation of the Interim Regulations on NonCommissioned Officers and the Interim Provisions on the Vocational Development and Administration of NonCommissioned Officers, the construction of noncommissioned officer teams keeps advancing toward professionalism, specialization and standardization. Compound, highquality and combatoriented talents have become the core orientation of noncommissioned officer team building. The multiskilled training mode breaks traditional professional barriers. It can effectively broaden noncommissioned officers' post performing scope and improve comprehensive working competence, providing capability support for job promotion, post rotation and backbone appointment. It not only meets the demands of military combatcapacity building, but also conforms to the longterm careerdevelopment appeals of noncommissioned officer students. It serves as an important path to realize winwin outcomes between the improvement of military combatsupport capacity and individual growth.

3. Existing Problems in Multi-Skilled Talent Cultivation

3.1 Imperfect Incentive Mechanism System

Incentive measures act as critical leverage to guide noncommissioned officer students to take initiative in learning auxiliary specialties beyond their main major and improve comprehensive competence. However, current evaluation systems including promotion, regular assessment, merit appraisal and reward are basically set around mainmajor requirements, showing an obvious tendency of "attaching importance to main specialty while neglecting extended competencies". Existing rules set rigid thresholds for promotion focusing on mainmajor skill certificates and qualification authentication, and mainmajor performance serves as hard benchmarks for career development. By contrast, there are no clear quantitative assessment rules, bonus items or reward clauses for auxiliaryspecialty knowledge, crossdisciplinary operation skills and relevant qualification acquisition.

From the perspective of noncommissioned officer students, extra study of auxiliaryspecialty courses consumes plenty of spare time and energy. If such inputs bring no substantial benefits for promotion, merit reward or treatment improvement, and even squeeze study time for core major, a negative situation of "no benefit for extra learning" will emerge. Consequently, most noncommissioned officer students are unwilling to sacrifice mainmajor study time to expand peripheral skills, and the conservative mindset of "being satisfied with reaching mainmajor standards" prevails. In addition, noncommissioned officer vocational colleges have not established priority mechanisms favoring multicompetency students in post arrangement, groupleader selection and task allocation. Contributions made by compound talents cannot obtain full recognition, which further weakens internal motivation for students to expand skills and becomes the primary obstacle restricting compoundtalent cultivation.

3.2 Insufficient Resource Supply and Limited Learning Channels

Sufficient time resources and systematic teaching resources constitute fundamental guarantees for noncommissioned officer students to carry out multispecialty study and improve compound abilities. At present, insufficient cultivation resources seriously restrict the implementation of multiskilled talent training, which is mainly reflected in two aspects.

Firstly, time resources are severely scarce. Noncommissioned officer students majoring in civil engineering bear heavy workload of daily combatreadiness duty, mainmajor operationmaintenance and mission support. Most of their time and energy have to be devoted to mainmajor learning and practical exercises to meet coremajor assessment standards. There is barely spare time for skill study and research of noncore specialties. Meanwhile, annual training plans and postlearning plans are formulated centering on main majors, without reserved special time for auxiliaryspecialty learning and crossmajor training. Shortage of time resources makes it difficult to carry out multicompetency cultivation on a regular basis.

Secondly, systematic learning resources are deficient. Noncommissioned officer vocational colleges have not yet built matching training systems and teaching resource libraries targeting multispecialty integration requirements of military civil engineering. On the one hand, there lacks regular and centralized training mechanisms for auxiliary specialties. Annual training projects mostly focus on core majors, while special training covering civil construction, pipeline engineering, equipment application, securityconfidential maintenance and emergency rushrepair related crossdisciplines are extremely insufficient. Noncommissioned officer students have no platform for centralized and systematic improvement. On the other hand, standardized teaching materials, practical guides and courseware are insufficient, and there is no regular mentoring

mechanism relying on skill backbones. When conducting autonomous study, students face problems including no available learning content, lacking implementation standards and no accessible instructors. Fragmented learning can hardly form systematic compound competencies, greatly lowering multiskilled learning effects.

3.3 Inadequate Practical Exercise

Military civil engineering is a highly practiceoriented discipline. Proficiency, integration and practicalcombat application of all skills rely on regular, scenariobased and combatoriented practical exercise. Practice serves as the core carrier for noncommissioned officer students to transform theoretical knowledge into compound practical skills. Current multiskilled cultivation presents prominent problems of "valuing theory over practice, valuing single specialty over interdisciplinary integration". Practical exercise for auxiliary specialties is seriously insufficient.

For one thing, post division is highly solidified. Noncommissioned officer students are long arranged to complete practice of singlemajor posts, while mechanisms for post rotation, crosspost operation and collaborative practice are imperfect. Few opportunities are provided for students to participate in construction, maintenance and rushrepair tasks of auxiliary specialties. Even if students master partial auxiliaryspecialty theoretical knowledge via autonomous learning, they lack practicalexercise scenarios. Theoretical knowledge cannot be transformed into operational capabilities, making it hard to adapt to comprehensive military post demands.

For another, noncommissioned officer vocational colleges have not set combatoriented training subjects and comprehensive exercise scenarios for auxiliary specialties. Daily practical training is limited to singlemajor exercises, without practical drills integrating multiple specialties and posts. Compound skills of noncommissioned officer students cannot be examined and tempered. Besides, restricted by military facility safety, mission stability and confidentiality requirements, largescale regular practical training faces obstacles. Substitute practice paths such as virtualsimulation training have not been fully popularized. Multispecialty skills of students merely stay at theoretical level, forming the shortcoming of "understanding theories but incapable of real operation". Multiskilled cultivation becomes formalistic and fails to satisfy combatoriented support requirements.

4. Implementation Paths for Cultivating Multi-Skilled Talents

4.1 Perfect Supporting Incentive System

Based on the military institutional system and noncommissioned officers' careerdevelopment demands, construct an allround incentive mechanism of "consolidating main specialty, empowering auxiliary competencies, implementing clear rewards and punishments". Remove institutional drawbacks of "valuing main specialty while ignoring auxiliary competencies", and fully mobilize noncommissioned officer students' initiative in auxiliaryspecialty study.

Firstly, improve assessment and evaluation mechanisms. Incorporate mastery of relatedspecialty skills, practical capabilities of auxiliary specialties and multipost performing effects into noncommissioned officer students' annual assessment, promotion and meritselection systems. Clarify bonus weights for multispecialty qualification certificates, crosspost practice experience and comprehensivemission performance. Break the single mainmajor assessment mode and make multiskilled students gain advantages in evaluation and development.

Secondly, establish priority appointment mechanisms. Give priority to multiskilled compound noncommissioned officer students in backbone selection, post adjustment, mission assignment and skill rating. Define post advantages and development priority for compound talents and highlight the value of multicompetency talents.

Thirdly, implement special reward incentives. Set special rewards for multiskilled talents and skillcompetition awards. Grant material rewards and public commendation to noncommissioned officer students who finish auxiliaryspecialty training voluntarily, obtain multiple professional qualifications and deliver outstanding performance in comprehensive support missions. Foster a sound talentgrowth atmosphere of "mastering core specialty, being proficient in auxiliary competencies and excelling in compound application", and fundamentally solve insufficient learning motivation for multiskill development.

4.2 Integrate Cultivation Resources and Build Talent-Training Platforms

Targeting shortages of time and learning resources, coordinate training, teaching and postsimulation resources of noncommissioned officer vocational colleges. Build regular, systematic and standardized multiskilled cultivation systems to

break resource constraints.

Firstly, scientifically coordinate time resources. Optimize annual training arrangements and practicaltraining schedules. On the premise of guaranteeing mainmajor teaching and combatreadiness tasks, reserve fixed time specially for auxiliaryspecialty learning, crossmajor drills and centralized training. Reasonably coordinate the relationship between study and practice to avoid conflicts between mainmajor tasks and multiskill expansion. Formulate personalized multiskill learning plans according to students' post levels and capability differences to realize precise and differentiated cultivation.

Secondly, enrich learning resources and build systematic training systems. Relying on military academy teaching resources, oncampus skill backbones and equipmentmanufacturer technical teams, implement the fourinone training mode of "academy joint training, backbone mentoring, manufacturer expert tutoring and autonomous research". Organize regular centralized training, special lectures and technical Q&A for auxiliary specialties, focusing on practical skills of military civilengineeringrelated specialties, collaborativesupport procedures and emergencydisposal methods. Meanwhile, sort out core knowledge points, practical essentials and safetyconfidentiality specifications of each related specialty. Compile easytouse teaching materials, practical manuals and courseware matching military post demands, and build online learningresource libraries to facilitate fragmented autonomous study. Establish pairedmentoring mechanisms for backbones, assigning senior noncommissioned officers and technical experts to provide oneonone tutoring so as to make up deficiencies in learning resources.

4.3 Innovate Practical-Exercise Modes

Adhere to combatorientation, promote competence improvement via exercises and integrate study with mission tasks. Break through insufficient practical exercise and weak skill transformation from dimensions including post practice, taskdriven exercise and simulation training, and comprehensively enhance noncommissioned officer students' compound combatsupport capabilities.

Firstly, implement crosspost rotation mechanisms. Combined with practicaltraining post vacancies, mission demands and individual capabilities, organize regular postrotation practical training and crossspecialty operation for noncommissioned officer students in auxiliaryrelated posts. Break solidified post barriers. Enable students to get familiar with multispecialty work flows, practical skills and support standards via handson experience in different posts, accumulate comprehensive performing experience and realize "being proficient in multiple posts through practice in one post".

Secondly, temper capabilities relying on actual missions. Take various practicaltraining projects, facilityrenovation simulation, faultrushrepair drills and comprehensive combatreadiness support missions as practical platforms for multiskill development. Arrange noncommissioned officer students to participate in collaborative operations of auxiliary specialties in a targeted manner. Temper multitype skills, polish collaborative capabilities and improve emergencydisposal level under actualcombatlike scenarios, so as to realize integration of knowledge and practice.

Thirdly, build substitute simulationtraining platforms. Aiming at problems of limited realsite practice conditions, strict confidentiality requirements and scarce actualcombat scenarios, introduce virtualsimulation training systems. Construct multispecialty integrated training scenarios for military civil engineering, simulating various conditions of engineering construction, equipment inspection, fault disposal and emergency rushrepair. Allow noncommissioned officer students to carry out auxiliaryspecialty practical exercises under safe, controllable and repeatable training environments, make up deficiencies in realmission practice, consolidate compoundskill foundations and ensure cultivated talents can fully satisfy actual military post demands.

5. Conclusions

Cultivating multiskilled talents for civil engineering majors in noncommissioned officer vocational colleges represents an inevitable choice to satisfy highconfidentiality, diversified and combatoriented support demands of military posts. It acts as a key measure to resolve manpower shortage and singlesided support capacity under closed military operating conditions, as well as an important startingpoint to promote the construction of compound and combatoriented noncommissioned officer teams. At present, multiskilled talent cultivation for military civil engineering still faces realistic problems including lagging incentive mechanisms, insufficient cultivation resources and inadequate practical exercise, which restrict the quality of

compoundtalent team construction.

Under the newera background of strengthening the military, we must base on actualcombat post demands, adhere to the unity of problemorientation, goalorientation and resultorientation. Activate talentgrowth motivation by improving multidimensional incentive systems, build talenttraining platforms by integrating highquality resources, and consolidate practical capabilities by innovating practicalexercise modes. Construct an allround, systematic and regular multiskilled talent cultivation system. Continuously break bottlenecks and difficulties in talent cultivation, comprehensively improve noncommissioned officer students' comprehensive performing, collaborativesupport and emergencydisposal capabilities. Strive to forge a compound noncommissioned officer backbone team with firm political quality, solid mainspecialty proficiency, multicompetency mastery and reliable combat performance, so as to provide solid talent support for the combatreadiness support and highquality development of military civil engineering.

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Conflict of Interests

The authors declare that there is no conflict of interest regarding the publication of this paper.

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