Exploration for Professional Degree Postgraduate Education at Military Academy

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Abstract—**Professional degree postgraduates at military academy are served to the demands of national defense and military development. With regard to current demands of troops for high-level talents, military postgraduate education shall focus on both academic abilities and military occupational abilities. In this paper, we investigate state-of-the-arts of professional degree postgraduate education in America, Britain, Germany and Japan, and compare them from four main influencing factors. Then, we analyze the current problems of professional degree postgraduate education in military academy. Finally, we propose several strategies to tackle the problems and to promote the military occupational abilities.**

Index Terms—**postgraduate education, professional degree postgraduate, competency based education, military occupational abilities**

I. INTRODUCTION

Professional degree postgraduates at military academies are cultivated to get adapted to and satisfy demands of national defense and military development. With regard to current demands of troops for high-level talents, military postgraduate education shall not only target at education of academic abilities, but shall focus on scientific overall consideration of the relationship between academic abilities and military occupational abilities. The objective of professional degree postgraduate education shall target at better military occupational abilities of postgraduates at military academies, namely that professional degree postgraduates shall be equipped with required occupational abilities. Hence, through exploration of education state-of-the-arts and problems for professional degree postgraduate education at military academies, we try to propose new strategies and methods to promote the concerning education of military occupational abilities.

Education of professional degree postgraduates is the occupational education which aims to cultivate senior applied talents who can help solve practical problems in economic production and social development. In comparison with education for academic postgraduates, the education for professional degree postgraduates pays more attention to education of occupational abilities. Occupational abilities refer to overall action capabilities of knowledge, skills and attitudes possessed by a laborer as requested by a job. Specifically, occupational abilities can be divided into professional ability, method ability, social ability and physical ability. Only with occupational abilities, a laborer can be qualified for an occupational position [1].

Developed countries realized the importance of occupational ability education very early. In the 1960s, the ideological trend of occupational abilities, represented by "Competency Based Education (CBE)" emerged in North America, which centered on demands of occupational posts and emphasized post abilities. In view of local propagation of this idea, the Canadian government set up a postgraduate diploma course falling in between undergraduate and postgraduate courses, focusing on occupational ability education. In the 1980s, such course was generalized to Australia and Europe. The Australian government established a national training department to guide development of national ability standards and set up a competency based training system which highlights occupational abilities possessed by learners. It is worth mentioning that occupational ability education has been practiced in Germany for a long time. Course contents of German occupational education emphasize education of occupational action abilities and require development of personalized and innovative abilities besides mastery of occupational qualifications. Relatively speaking, education of professional degree postgraduates fell behind in Britain, but developed very quickly. From 2007 to 2008, the total number of professional degree postgraduates exceeded that of postgraduates with academic degrees [2]. France is similar with Britain in the development, or to say, as the late comer, it surpassed the former. In 2006, granted professional master's degrees accounted for 69.36% of the gross master number [2].

Developed countries started exploring the education modes of professional degree postgraduates relatively early and have accumulated abundant experience during exploration and practice. Table I summarizes characteristics of education modes for professional degree postgraduates in America, Britain, Germany and Japan [3].

As of 2009, the Ministry of Education of China started recruiting professional degree postgraduates distinguished from academic degree postgraduates [4]. In 2010, the Ministry of Education initiated comprehensive reform pilot work for professional degree postgraduate education. Thanks to years' exploration, education of

professional degree postgraduates has developed benign trends despite many problems during the development [5], [6]. In recent years, in response to occupational demands, military academies keep adjusting proportions of postgraduates of academic and professional degrees, tending to increase quantity of the latter. A lot of military academies initiated education of professional degree postgraduates. However, as an emerging education project, it still requires continuous exploration in many aspects [7].

TABLE I.   CURRENT EDUCATION MODES OF PROFESSIONAL DEGREE POSTGRADUATES IN AMERICA, BRITAIN, GERMANY AND JAPAN [3]

	America	Britain	France	Japan
Education Goals	Occupational orientation is clear and explicit and particularly emphasizes education of specialized senior applied talents for specialized industries or fields.	Cultivated talents can satisfy professional occupational requirements and obtain sustainable chances for professional development in related professional fields.	French education mode emphasizes combination of theories and practice, pays attention to professional practice, advocates occupational orientations and promotes united combination of schools and enterprises.	Cultivated talents can master solid fundamental theories and wide professional knowledge in a professional field and are capable of solving actual problems.
Course Teaching	There are various types of courses which are highly dynamic, namely highly real-time and flexible. Importance is attached to case-based, research and discussion based and problem oriented teaching, etc.	Courses are classified into types of teaching and research, specifically involving knowledge deepening courses, knowledge expansion courses, highly professional courses and practice-oriented courses. In general, modularized structures are used to organize teaching. Learning and contrast checking are conducted based on groups.	Courses include basic, professional and optional lessons. Case-based teaching plays a dominant role. Teaching contents are closely correlated with industrial basic theories, leading technologies and operational practice.	Public basic lessons, professional optional lessons and professional practice lessons are involved. The Japanese education mode emphasizes practice teaching closely correlated with jobs and focuses on case teaching, field survey, discussion teaching and remote learning, etc.
Tutors	A hybrid tutor system prevails. Tutors give specialized guidance in different aspects of learning, research, practice and thesis compilation.	The single-tutor system mainly prevails. The "two-tutor system" is mainly used in education of doctors of engineering, involving joint guidance of college academic tutors and corporate tutors.	In general, two tutors are assigned for one student. They come from the university and an external organization respectively. The campus tutor focuses on course teaching and graduation thesis guidance. The external tutor emphasizes guidance in internship and practical topic research.	A hybrid tutor system prevails, wherein a professional academic tutor and a practice tutor with specific experience are assigned. Guidance is given in cooperation and interactive learning based on the topic.
Professional Practice	Professional practices with various forms and different periods are carried out aiming at professional degree projects. In the project of "first professional degree", professional practice is a requested link with long practice duration and diversified forms.	Professional practice runs through course teaching and group project research based on practice topics. Professional doctor degrees and professional practice are separated. Corresponding education lasts for a long time. After internship, the cultivated talents can directly start product-oriented practice in enterprises.	Except for a lot of practice courses, simulation or analog practice trainings are set. Students are encouraged to work as interns in enterprises and public management departments.	Professional practice is incorporated into the overall training system. Specialized course and credits are set. Practice study plans and summarization reports shall be submitted for the practice.
Conditions for Graduation	Requirements for different types and levels of professional degrees are different. Some students are directly granted with degrees after course learning. As for some majors, graduation theses or graduation design shall be completed. Public defense is required for theses. Degrees are granted when the theses pass the defense.	Different certificates are granted for learning of different courses. In comparison with relatively low requirements for master's degrees, high requirements are proposed for doctor degrees, wherein specialized research training and degree thesis research themed by practice topics are required.	A themed degree thesis based on practice topic research, as well as a graduation design are required. Students must participate in degree thesis or graduation design defense convened collectively.	Students only need to learn all the courses, obtain required credits and submit a case research report based on professional practice, without completion of a specialized graduation thesis or corresponding defense.

At present, the quantity of professional degree postgraduates cultivated at our school is nearly equivalent to that of academic degree postgraduates. However, corresponding education course system, evaluation standard indexes and other aspects still adopt the education mode of academic degree postgraduates. Despite the lower graduation requirements for professional degree postgraduates, effective evaluation standards for occupational abilities are not put forward, due to which education of professional degree postgraduates lacks occupational abilities and education for these postgraduates is less practical, technical and

practical than it should be. Since 2017 when the university was founded, full importance has been attached to military occupational education; college education further emphasizes occupational particularity of soldiers; postgraduate education focuses on education of professional degree postgraduates so as to embody characteristics of professional degree postgraduate education at military academies.

II.   PROBLEM ANALYSIS

Based on the development of professional degree postgraduate education, for military academy, we analyzes and summarizes influential factors of four aspects directly correlated with professional degree postgraduate's occupational abilities, namely course teaching, tutor faculty, professional practice and graduation conditions and then discusses mutual relations between the influential factors.

A.   Course Teaching

As for education of professional degree postgraduate's occupational abilities, all the training schemes basically emphasize requirements for practical teaching. However, it is hard to effectively implement teaching in practice. At first, as for course teaching, there are various lessons with long class hours for campus postgraduates who spend nearly a year having lessons at class and thus lack efficient practice courses. Meanwhile, for a lot of cases professional degree postgraduates and academic degree postgraduates have lessons together. For this reason, the target of application for education of professional degree postgraduates is weakened. The finance of the corresponding education is insufficient. Course teaching focuses on academic aspects. As for course teaching, practical education based on the practical teaching mode is not implemented effectively. In addition, a lot of course contents are repeated and redundant. For example, the clustering algorithm is involved in the lecture of Big Data Analysis, Machine Learning and Artificial Intelligence. In view of introduction of it in other courses, sometimes teachers would only give a brief introduction to it and fail to make in-depth analysis, leading to poor learning effects of postgraduates despite the long time they spend on the study.

B.   Tutor Faculty

Competence of teachers directly influences teaching effects as well as education quality of talents subject to professional degree postgraduate education. In foreign countries, an academic tutor is called as advisor. Practical guidance tutor is called as supervisor. The tutor in charge of organizing discussion and Q&A is called as instructor. Project tutor in charge of specialized training plans is called as program director. Thesis tutor in the engineering field is called as thesis supervisor. It is thus clear that professional work of tutors must be distributed, while it is unscientific and irrational to assign a tutor for all-course academic education, most especially so for professional degree postgraduates who not only need theoretical guidance, but also request practical guidance. At present,

an advisor and a military supervisor are generally assigned for each professional degree postgraduate. Nevertheless, in study and specific guidance, the supervisor can hardly take an effective part in guidance due to military training tasks and other reasons, so the guidance effect is not that good. For most cases, the advisor will guide the postgraduate to finish a graduation thesis and finally reach the graduation conditions.

C.   Professional Practice

Professional practice is of particular significance for postgraduates of applied professional degrees. However, specific implementation is far from professional practice in the real sense. As surveyed, the accumulated practice time of professional degree postgraduates at our school is shorter than 3 months. In particular, due to the tough living conditions at most practice bases of corresponding troops and lack of efficient guarantee and management facilities, postgraduates are unwilling to initiate internship there. Meanwhile, a lot of students come from troops and generally work in troops after graduation, so they are less attracted and motivated by the professional practice bases. In addition, a lot of professional practice bases are established, but available time for practice is not enough due to training, maneuvering and other needs of troops. Construction of a lot of bases does not conform to the agreed goals of application. After signing of related agreements, they would be laid aside. Relatively speaking, only demonstration and reporting are applied at those campus practice sites that lack recording, independent standards and methods for assessment. In general, tutors only give scores hastily. Above practice related problems can be embodied obviously by the lack of sufficient, efficient practical data in postgraduate's graduation theses.

D.   Conditions for Graduation

At present, graduation conditions of professional degree postgraduates tend to approach those of academic degree postgraduates. Current evaluation of degree theses is mainly based on published academic thesis results, meaning that relevant work will be approved if a thesis is published. In the past, gradation theses were not requested, so a lot of students' graduation achievements could not be effectively verified. Management and examination by tutors play an indispensable role during this course. However, a lot of tutors afraid of being influenced by students' failure to graduate will ask them to publish academic theses so as to help them graduate. For this reason, graduation conditions of professional degree postgraduates start approaching those of academic degree postgraduates. Hence, professional degree postgraduates who should emphasize practice the most lack training and education of the most core abilities. A lot of professional degree postgraduates still lack the competence for application and practice even after they graduated.

E.   Correlation

It is implied by above analysis results that education of professional degree postgraduates is in fact guided by

graduation conditions, while course teaching, equipment of tutors and professional practice aim to make professional degree postgraduates capable in application and practice. Hence, rational standards and effective examination approaches shall be set during formulation of graduation conditions. In addition, except for above external influential factors, internal motivation for postgraduates to pursue competence of application and practice cannot be neglected. Only under boosting of internal motivations, external factors can give an effective play. Both the internal and external factors shall be motivated so as to maximize enhancement of professional degree postgraduate's occupational abilities, while tutors in charge of guiding professional degree postgraduates also need improvement.

III. APPROACHES

A. Reform Curriculum System

1) Setting of curriculum system

Courses of professional degree postgraduates shall be set according to current curriculum setting of diversified disciplines (fields) based on careful analysis of curriculum setting of similar disciplines in domestic and foreign famous colleges. In addition, the basic knowledge structure of professional degree postgraduates in corresponding disciplines and fields shall be confirmed according to training goals of professional degree postgraduates of the academy. Oriented by practical application, curriculum setting shall target at satisfying demands, cultivating comprehensive qualities and enhancing abilities of knowledge application [8]. Teaching shall focus on the ability of combining theories and practice.

The curriculum system of education proposal is constituted of basic knowledge, professional knowledge, comprehensive knowledge, etc. Basic courses of professional knowledge can be set with first-class disciplines of the field as reference, wherein education of the ability to apply basic knowledge in engineering shall be emphasized, while education of theoretical derivation ability needs to be weakened. Professional courses shall be set according to postgraduate's actual research directions and highlight further mastery of engineering knowledge and theories correlated with the research orientations. As suggested, various seminars and courses can be set to further expand the knowledge fields of professional degree postgraduates and help them master development trends of leading technologies in time.

2) Reform of curriculum teaching

Deepen teaching reform of basic courses: Application of basic knowledge mastered by professional degree postgraduates shall be highlighted. Math knowledge mainly focuses on math theories and methods commonly seen in engineering technologies and shall be correlated with research orientations. Teachers shall be encouraged to positively optimize course contents and delete those out of date. Foreign language lessons shall be targeted and simplified, while it is necessary to motivate students' positive participation in various foreign language related activities and reading of foreign literatures for a wider horizon.

Add contents of practice courses and target at improvement in practice ability: Education of application ability is the major target for education of professional degree postgraduates. Playing a significant role in education of professional degree postgraduates, practice courses are also quite necessary for improvement of practice ability. The academy shall make full use of existing lab resources, seize the opportunity of academy "dual" construction to improve current experiment platforms and establish new platforms, and thus lay a solid foundation for senior practice courses of professional degree postgraduates. Meanwhile, based on full use of military-local combined school running policies, the academy shall cooperate with scientific research institutions, local enterprises and troops to set senior practice courses through exertion of respective advantages and integration of resources.

3) Reform of teaching contents

Playing an important role in education of postgraduate's abilities, course teaching shall conform to leading research technologies and research hot topics of the field in contents as much as possible. Through introduction to the latest researches, students will be motivated to learn about leading technologies and development trends of the field and perform better in program selection and research. Based on own research contents, teachers shall emphasize ideas and methods of scientific research, help students further their acquaintance with related theoretical knowledge and know how to make scientific research and innovation, and finally help them realize self-improvement in comprehensive qualities and abilities.

B. Enhance Cooperation between Tutors

Cultivate better tutors for professional degree postgraduates and implement the tutor employment system: Besides the quality, tutors selected shall also conform to actual situations of professional degree postgraduate's education. A flexible selection standard shall be formulated to ensure scientific and rational construction of tutor faculty for professional degree postgraduates. The incentive system for tutors shall be strengthened as tutors' enthusiasm and positivity in work will directly influence education quality of professional degree postgraduates. They shall be motivated in both material and spiritual aspects. Through internal and external long-acting incentive, they will perform more positively and proactively in work. The tutor evaluation mechanism shall be perfected. In view of the application orientation for professional degree postgraduate's education, besides academic abilities of scientific research of tutors, other aspects such as practice experience and professional skills and qualities shall be evaluated [9]. In addition, the evaluation is also applicable to tutors outside the school.

Give full play to the "bridge" role played by organs and establish an effective communication mechanism: Essentially, the "two-tutor system" aims to make up the deficiency in insufficient "application" abilities of

campus tutors. It is necessary to give full play to the "bridge" role played by organ management departments, coordinate responsibility division of tutors both inside and outside the school, set up a linkage system for them, promote their effective communication and cooperation and establish a communication mechanism of colleges.

C. Build Professional Practice Resources

On one side, the campus practice base shall be built. Based on full play of "three assistances" and according to characteristics of professional degree postgraduate's research directions, students shall be assigned for profound practice at positions such as related topic programs, so that they will be more competent in solution of practical problems. On the other side, construction of practice bases outside the school shall be enhanced. It is necessary to make full use of resource advantages of partner academies, scientific research institutions, enterprises and troops so as to make up deficiencies of the campus practice base. Tutors shall be made to play a more effective role. Students will be provided with a better practice environment, and guided to further combine theoretical knowledge and practice abilities. Based on new problems and situations fed back by tutors outside the school, course teaching contents and the curriculum system will be further optimized.

IV. CONCLUSION

In this paper, we investigate state-of-the-arts of education of professional postgraduate's occupational abilities and compare the difference among four foreign countries from education goals, course teaching, tutors, and professional practice. And the problems of our military academies have been proposed and the corresponding methods have been proposed to improve the problems.

As suggested in the paper, it is necessary to deepen reform in professional degree postgraduate's education for our military academies. In the future, we should pay more attention to optimize curriculum system, and employ high-level technological innovation mentors and practical military coaches to ensure the quality of teaching. At the same time, we should adjust the index and orientation of teaching evaluation to encourage students and tutors to develop their abilities.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

Kai Kang conducted the research; Jiabao Wang analyzed the problems; Ning Qi, Yong Li, and Bin Wang collected the data and proposed the initial approaches; Xiaofeng Gu proposed the approaches and wrote the paper; all authors had approved the final version.

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