

# *Exploration and Practice of Professional Degree Graduate Student Training Method Based on Industry-University-Research Collaboration*

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**Abstract:** In order to improve the quality of professional graduate training, the graduate training method based on the cooperation of industry-university-research is explored according to the practical experience on graduate training for so many years. Guided by the need of industry, the personalized training scheme is planned for graduate as soon as they enter university according to their characteristics and interests. Based on study in university, their field knowledge and skills to support their research are trained by the method of task and interest driven. Their abilities to plan project, to analyze and solve problems are trained by undertaking research projects. Close coordination of industry-university-research can form a closed loop from beginning demand in industry to targeted training in university and then to problem solving by graduate, and it effectively improves the quality of graduate training.

With more specific and clear professional expectations and cultivation requirements, professional degree postgraduates are an important part of the national research and education development strategy and a specific measure for the current development problems that need to be solved in China, which plays an important role in national development [1,2]. According to the spirit of the document "Professional Degree Graduate Education Development Program (2020-2025)", by 2025, two-thirds of the master's degree students in China will be professional degree students [3,4]. The practical experience of other developed countries also proves that professional graduate students are the inevitable product of socio-technical development, and professional graduate education is an indispensable and important part of graduate education and one of the core driving forces of professional technological innovation and renewal.

However, in the current cultivation process of professional graduate students, there are still problems such as unclear positioning of professional graduate students, lack of relevance of cultivation methods, and gap between cultivation effect and demand. There are various reasons for such problems, such as the lack of unified and in-depth understanding of the interpretation and understanding of policies, the imperfect teaching, research and practice environment for professional graduate training, the lack of individuality in teaching contents, and the disconnection between industry, university and research. The causes of these problems come from different levels such as decision-making management agencies, institutions, enterprises, and students, which are complex

and intertwined and interact with each other, and require in-depth research. Scholars at home and abroad have paid great attention to this issue and have carried out certain studies with fruitful results. On the basis of the previous research, we discuss the cultivation method of professional graduate students from the perspective of industry-university-research collaboration, combining our own experience of cultivating graduate students for many years. With "industry" as the guide, we formulate personalized training programs according to the characteristics and employment wishes of postgraduates; with "learning" as the basis, we cultivate the knowledge and skills in the field that can support their research directions through interest-driven and task-driven approaches; with "research" as the grasp, we develop the knowledge and skills in the field that can support their research directions. By taking "research" as the grasp, students can cultivate the ability of planning, analyzing and solving problems by undertaking specific research projects. The close collaboration between industry, academia and research forms a closed loop from demand to targeted training and then to problem solving, so as to effectively improve the quality of postgraduate training.

### **1. Formulating personalized cultivation plan with "production" as the guide**

The cultivation goal and characteristics of professional degree graduate students are "professional", which should focus on the cultivation of students' professional ability and solve the complex problems in the profession. Research topics that are detached from the needs of production practice are just like working behind closed doors, which will easily lead to the undesirable result of "research for the sake of research", making the research problems float in the air but not on the ground and unable to produce practical value. The pain points and problems of the profession come from enterprises, from all aspects of social life, so enterprises are most sensitive to the needs of the profession and have the most willingness to solve the problems. The "production"-oriented training method targets the training of postgraduates at the needs of enterprises, which captures the key and pain points of the problem. Based on the above logic, we select enterprise problems suitable for each graduate student for follow-up research according to their characteristics and research interests when they first enter the university to formulate their training plan. These enterprise problems that need to be solved come from the long-term research and communication with enterprises by the teaching and research team, and the corresponding information on the needs of enterprises is collected in the daily work and timely organized and analyzed for the research of graduate students. In addition to the research problems provided by the supervisor, the graduate students are given the opportunity to contact the enterprises and carry out a lot of practical research in the enterprises, in the process of finding the research direction of interest and reaching their own research goals while solving the problems of the enterprises. After determining the research direction and research goal, we will take the realization of the goal as the guide, reverse the various needs to complete the goal, formulate a systematic and perfect cultivation program, and constantly revise and optimize the program in the later practical work to make the program more scientific and perfect. The cultivation program should firstly focus on highlighting the industrial demand as the guide, and the goal must be put into practice and supported by specific engineering application background. Secondly, it should highlight personalization. The training program for different students of the same major may be different, and the training program for each person should not only be oriented to solve complex problems, but also be of interest to students and can give full play to their specialties.

### **2. "Learning" as the basis for the development of professional knowledge and skills**

The training program is a blueprint, and one of the keys to achieving it is "learning. Traditionally, "learning" takes place in colleges and universities, where instructors guide students to learn relevant theoretical knowledge, do experiments, conduct research, write papers, and so on. The concept of

graduate training advocated in this paper expands the place of "learning" to enterprises and society, encouraging students to go deep into enterprises and society to carry out practical learning, learning the demand and use of theoretical knowledge in society, learning specific technologies in enterprises and workshops, and learning how to develop and improve products. Traditionally, the content of "learning" is usually the content of the selected course, and the completion of the assessment and full credit. However, when we train graduate students, we require them to complete these basic learning tasks, but also to learn extra in a targeted way. According to their own training objectives, they must learn individual knowledge and skills according to their own characteristics, and each graduate student has a different focus on the content they study. The traditional way of "learning" is teacher-oriented, where teachers arrange learning plans and tasks, and students implement learning plans. The "learning" we advocate has become student-oriented, with students defining their own learning goals, planning their own learning plans, and mastering the methods of self-study, and instructors controlling the direction of the process, correcting students in a timely manner when they make mistakes in direction, and giving students targeted guidance when they encounter problems, encouraging them to guide. Students will be encouraged to guide their self-study, and students will report their learning results regularly. With clear goals, students' learning is more focused. With the task requirements, students' learning has a certain degree of discipline, and they will make their own learning plans, find suitable learning methods, and increase their learning initiative. In summary, the characteristics of this link is that firstly, the learning should be targeted, closely targeting the training objectives to start learning, not aimlessly to complete the credits and learning. The second is to highlight the technical training and improvement, in addition to conducting experiments, but also in-depth production and research in the enterprise front line, in the actual improvement of their skills. Third, we must highlight the students' self-learning, themselves as the leading learning.

### **3. Take "research" as a grasp, innovative solutions to practical problems**

The research of postgraduates should have a certain depth, and the work should be innovative. In order to achieve this goal, we adopt the research-driven training method. Each graduate student is assigned specific scientific research tasks, which are derived from the ongoing research or pre-research projects of the teaching and research team, and the declared successful projects are evaluated by experts in terms of research value and feasibility of technical routes, so that the risk of the graduate students in selecting research topics is reduced and the research value is guaranteed. From the analysis of the basis of the research, the declaration of the topic and the pre-research work lay the foundation for the graduate students to carry out the research, they can quickly grasp the prior research knowledge, quickly enter the role, and improve the efficiency of scientific research. The task has a certain promotion effect on the work of postgraduates, because the topic undertaken by postgraduates may be a sub-topic of a scientific research project, and the progress of the project requires that each research link can be advanced at the same time, which is a kind of spur and encouragement for everyone, and each sub-topic group will try its best to exert its ability in order not to affect the overall progress of the team. From the perspective of the overall progress of the project, when difficulties arise in the progress of a certain link, other team members can assist in solving the difficulties and play the strengths of the team in tackling the problems to ensure the smooth progress of the whole research. The research project gives the graduate students very specific goals, which is a concrete application of combining theory and practice. Each link of the project is completed independently by the graduate students themselves, and the supervisor guides and assists the project, which cultivates the ability of the graduate students to engage in scientific research independently, develops their vision, enables them to master the process of scientific research, and improves their comprehensive quality. In the process of problem solving, innovation should always be the core requirement to

cultivate creative consciousness and innovative ability. In daily study and research, students are guided to think critically about problems, dare to try boldly in theory and technology, do not stick to the rules, do not easily follow blindly, and are good at innovating on the basis of digesting and absorbing the achievements of their predecessors. Give full play to the characteristics of young people's curiosity and divergent thinking, point out the frontiers and hot spots to them, and let them generate inspiration for innovation in the process of exploration by themselves.

#### **4. Industry-academia-research collaboration, forming a closed loop from demand to meeting demand**

Each practical problem has its root cause, its inner mechanism of formation, and its logic and technical structure to solve it. This is the basic logic of scientific research and the objective law of cultivating innovative talents. The above three links of industry-academia-research are closely interlocked in the process of postgraduate training, forming a closed loop from demand to meet demand. First of all, the cultivation goal of students comes from the demand of enterprises and society, which is a kind of result-oriented goal. With the needs of enterprises as the goal, it is back-propelled to the content, method and realization of postgraduate study in all aspects, which lays the foundation for realizing the needs. With the scientific research drive as the grip, the learning eventually solves the actual problems of enterprises and society, and opens the closed loop from the demand to the realization of the demand, in which the graduate students complete the process of improving their ability from discovering problems to analyzing problems and finally solving them. Industry-academia-research is not isolated from each other in the process of postgraduate training, they work in close coordination. The demand will be constantly adjusted according to the development of time and the ability of the graduate students themselves, while the knowledge and skills of learning are constantly improved according to the specific situation, and the solution to the problem of the scientific research project is constantly developed and optimized, and the change of each link will make the other links change accordingly, and the industry-university-research is always an organic whole, serving the common goal of improving the comprehensive quality of students. Enterprises have relative advantages in specific production technology, which is the weak link of institutions; however, institutions have better research conditions and research power than enterprises in theoretical research, and combining the two to take advantage of their strengths and avoid their weaknesses can give full play to their respective advantages and make up for their shortcomings. As the main body of research, postgraduates organically combine institutions and enterprises through research projects, so that industry-university-research can work in coordination and play a great role.

#### **5. Conclusion**

Professional degree postgraduate training is an important part of the national research and education development strategy, which is a specific measure for the current development problems that need to be solved in China, and has an important role in national development. However, in the current cultivation process of professional degree graduate students, there are still problems such as unclear positioning of professional graduate students, lack of relevance of cultivation methods and gap between cultivation effect and demand. In order to solve these problems, the method of cultivating professional degree graduate students based on the collaboration between industry, academia and research is proposed. With "industry" as the guide, we formulate personalized cultivation programs; push back the requirements of "learning" from cultivation programs, and cultivate domain knowledge and skills that can support the output of results through interest-driven and task-driven approaches; take "research" as the grasp, and cultivate the knowledge and skills of professional degree students by undertaking the task of "research". By taking "research" as the grasp

hand, students can cultivate the ability to plan, analyze and solve problems by undertaking specific scientific research projects. The close collaboration between industry, academia and research forms a closed loop from demand to targeted training and then to problem solving, which effectively improves the quality of postgraduate training. The proposed method has achieved good results in postgraduate training, and the trained postgraduates have achieved satisfactory jobs upon graduation.

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