

# STUDY ON JOINT TRAINING BASE CONSTRUCTION OF PROFESSIONAL DEGREE GRADUATE STUDENTS ADAPTING TO “NEW ENGINEERING”

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## ABSTRACT

*The joint training base construction is the key to promoting the scientific and standardized cultivation of the professional degree graduate students, which is an important starting point for the development of distinctive characteristics in the professional degree graduate education. However, the joint training base construction has encountered different problems in the process of cultivating the professional degree graduate students. By analysing the main problems faced by the joint training base construction of the professional degree graduate students, it can be clear that taking the path of the industry-education integration development under the background of “new engineering” is an important way to solve the bottleneck encountered in the joint training base construction. In this paper, the joint training base construction of the professional degree graduate students adapting to the “new engineering” has been studied. First, it establishes the management mechanism for the joint training bases construction of the professional degree graduate students, and then improves the management level for the joint training bases construction of professional degree graduate students, which can enhance the joint training quality of the professional degree graduate students under the background of “new engineering”.*

## KEYWORDS

*Joint Training Base Construction, Professional Degree Graduate Student Education, “NewEngineering”*,

## 1. INTRODUCTION

With the new industrial revolution and the new economic era, the electronic information has put forward the new requirements for the knowledge, qualities, and abilities of the talents in various fields. It not only requires college students to have the solid professional basic knowledge and innovation and entrepreneurship awareness, but also to have the certain self-learning and practical abilities to adapt to the rapid updating of the knowledge in the new economic era (Xing et al., 2022). Based on this, the new era calls for a new paradigm of talent cultivation models.

The Ministry of Education has held the relevant seminars to promote the reform of the higher engineering education, forming the “Fudan Consensus” (Ministry of Education, 2017a), “Tianda Action” (Ministry of Education, 2017b), and “Beijing Guidelines” (Ministry of Education, 2017c), which have pointed out the direction for China’s higher engineering education reform. The “new engineering” emphasizes the need for the new concepts, new structures, and new approaches, as well as the concept of a grand engineering perspective (Xie et al., 2021). It emphasizes the cross-border integration, integrated development, collaborative education, and capability cultivation (Xie et al., 2022). However, universities lack the teaching resources such as the faculty and experimental conditions and relying solely on a single training model cannot meet the needs of the social development. Therefore, in the context of the “new engineering” and the

new era, we should actively promote the cooperation among universities, enterprises, and research institutes, focus on practical engineering and scientific issues, use the innovation as the driving force, and build the new mechanism for the collaborative education between the industry, academia and research (Xie et al., 2023). On the path of promoting the of the “new engineering” education, the three parties should sincerely cooperate and achieve mutual benefits, deepen the new talent training model of the industry-education integration, science-education integration, and school-enterprise cooperation, which can cultivate the high-quality engineering and technical talents who are both virtuous and talented and adapt to the requirements of the new economic era.

A professional degree is a type of the degree designed to meet the needs of specific occupational fields in society, cultivate the high-level applied specialized talents with the strong professional abilities and qualities, and be able to creatively engage in the practical work. Due to the strong professional background attributes of the graduate students in this major, the training process requires the joint participation of the external resources such as industry, enterprises and social organizations. In 2015, the Ministry of Education issued the “Opinions on Strengthening Case Teaching and Joint Training Base Construction for Professional Degree Graduate Students”, which called for a full understanding of the importance of the strengthening case teaching and base construction, actively innovating the teaching methods and models, combining the smart teaching tools, promoting the joint training bases construction of the production, learning and research, and improving the quality of the graduate practical ability cultivation (Fan & Tian, 2021). In 2018, the National Engineering Master’s Professional Degree Education Guidance Committee organized experts to discuss and draft the “Guiding Opinions on Formulating the Training Plan for Engineering Master’s Professional Degree Graduate Students”, which has emphasized the requirements for cultivating the professional technical abilities and good professional ethics of the master's professional degree graduate students, and highlighted the characteristics of training the engineering master’s professional degree graduate students. In 2020, the Academic Degrees Committee of the State Council and Ministry of Education have released the “Development Plan for Professional Degree Graduate Education (2020-2025)”, which has emphasized the main idea of the master’s professional degree graduate education, in order to adhere to problem orientation, actively serve demand, and comprehensively improve quality. It proposes positive measures to optimize the structure of professional master's degrees, accelerate the development of doctoral professional degree education, and improve the quality of training. (Fan & Tian, 2021).

The joint training base for the professional degree graduate students is a talent training platform established in conjunction with the external resources to meet this requirement, which has the natural advantages in cultivating the students’ practical abilities and other aspects (Liu et al., 2022). It is not only an important battlefield for the professional degree graduate student training, but also an important lever for deepening the reform of the graduate training models. The joint training base is a high-level talent training platform that involves the multi-party collaboration and cross-border operation. The “13th Five Year Plan” has pointed out that the establishment of the graduate joint training bases has played a positive role in integrating the high-quality social resources, exploring the new mechanisms for the interaction between supply and demand in talent cultivation, and improving the quality of the high-level talent cultivation. The proposal for the “14th Five Year Plan” and the long-term goals for 2035 require that the current and future important political task is to focus on building a high-quality degree and graduate education system (Wang et al., 2021). The joint training base construction can break down the barriers between the universities and enterprises, promote the improvement of the graduate engineering practical abilities, and have become an important platform for scientific research exchange and talent cultivation connecting universities and industry units, receiving the attention and recognition from all sectors of society. Establishing graduate joint training bases, practice bases, and a joint education platform that combines the industry, academia, and research through school

enterprise cooperation is an effective way to improve the quality of the professional degree graduate students (Peng et al., 2020).

Although the practice has proven that strengthening the joint training bases construction of the professional degree graduate is an important way to ensure the quality of the talent cultivation, and an important measure to promote the innovation in the professional degree graduate training concepts and deepen training the mode reform. However, it cannot be ignored that in the wave of the joint training base construction, more and more problems such as the unclear functional positioning, incomplete service environment and uncoordinated interests have been exposed, which begins to affect the high-quality construction of the professional degree graduate joint training bases, as well as the continuous improvement and enhancement of the quality of the professional degree graduate training. In response to the problems encountered in the joint training bases construction of the professional degree graduate at the current stage, the corresponding countermeasures and suggestions are proposed for the main content and management operation mechanism of the joint training base construction. In this paper, the joint training base construction of the professional degree graduate students adapting to the “new engineering” has been studied, which can be listed as follows. Section 2 introduces the current situation of the joint training base construction. Section 3 establishes the management mechanism of the joint training base construction. Section 4 improves the management level of the joint training base construction. Finally, a conclusion is given in Section 4.

## **2. CURRENT SITUATION OF JOINT TRAINING BASES CONSTRUCTION**

The joint training base construction of the professional degree graduate often involves the multiaspects, multi-types, and multi-level participants such as the government, enterprises, schools, mentors, and students, all of which have the different interests and demands, and there are many limiting factors. Thus, the joint training base construction mainly faces the following problems.

### **2.1. Joint Training Bases Number is Insufficient**

On the one hand, with the continuous increase in the number of the graduate students, especially the professional degree graduate students, the number of the existing joint training bases is relatively insufficient, which restricts the development of the graduate engineering practice work. On the other hand, there is a problem of the “more contracts and less cultivation” in the construction of some graduate joint training bases. Sometimes, they are simply shelved after signing the cooperation agreements, becoming mere formality. Although it may seem that many joint education bases have been built, there are few that operate, which makes it more difficult to improve the engineering practice ability of the graduate students.

### **2.2. Construction of Joint Training Bases is incomplete**

The construction of many graduate joint training bases comes from the personal resources of the enterprises or some teachers involved in undergraduate cognitive internships in the past. This kind of cooperation is largely due to the early cooperation relationship, which fails to reflect the real needs of both schools and enterprises. Correspondingly, the selection, establishment, daily management, learning, training, and even income of graduate students during the joint training base lack enough institutional support. There are risks and instability, which have led to the joint training base construction being “heavy on signing contracts and light on implementation”.

### **2.3. Universities Lack Emphasis on Graduate Joint Training Bases**

Some graduate supervisors are still accustomed to the traditional “Curriculum + Thesis” on-campus training model for the graduate education, believing that participating in the relevant engineering project practice work at the practice base hinders the development of the teaching and research work. They have the low enthusiasm for the joint graduate education and engineering practice, and even refuse to allow the graduate students to participate in engineering practice work at the joint training base. Besides, some teachers themselves rarely come to the base for the learning and communication. A survey has found that there is a common problem of the “inadequate understanding or low enthusiasm” in the joint training bases.

### **2.4. Enterprises Lack Motivation for Joint Training of Graduate Students**

Although establishing the joint training bases can strengthen the communication between the universities and enterprises, promote the implementation and transformation of the technology and scientific research achievements, due to the fact that the purpose of enterprise development is to pursue the economic benefits, while the goal of schools is to cultivate and educate talents, there is a significant difference in the purpose of the work carried out by both parties, resulting in many enterprises lacking endogenous motivation for the joint graduate training. On the one hand, the research topics of graduate students and on-campus mentors mainly revolve around the theoretical research and innovation and are in the middle and early stages of the production chain. To generate the practical economic benefits, a large amount of manpower and material resources need to be invested for the transformation, and enterprises are unwilling to bear the corresponding risks. On the other hand, in order to ensure the development of the practical work for the graduate students, the main target of the joint training bases established by various universities is large enterprises and institutions in the related industries. Many off-campus mentors themselves undertake the heavy scientific research and administrative work and have less communication and contact with the graduate students. The guidance time for the graduate students is insufficient, making it difficult to provide the practical guidance to graduate students and failing to fully play the role of the enterprise mentors.

### **2.5. Graduate Students have Low Personal Motivation**

At present, many professional degree graduate training programs in the universities still focus on the theoretical knowledge learning, with the insufficient practical and applied courses. Many teaching teachers also lack the relevant engineering practical experience, resulting in the insufficient preparation for the graduate students. After entering the engineering project practice, the work progress is not smooth, which undermines their enthusiasm. In addition, the graduate student's participation in the practical internships at the joint training base is only to meet the relevant regulations of the school and the needs of obtaining degrees, especially in most cases, the correlation between the graduate student's research topics on campus and the practical content of the enterprise is not high. Due to the limitations of the graduate student's academic system and personal energy and level, it is very difficult to successfully complete the research tasks of both the school and the enterprise in just over a year. Graduate students are more concerned with paper publication, patent application, and other aspects. They lack enthusiasm for participating in frontline practical work and have less active communication with external mentors, ultimately leading to insufficient improvement in their personal engineering abilities.

### **3. ESTABLISH MANAGEMENT MECHANISM OF JOINT TRAINING BASES CONSTRUCTION**

Some joint training base constructions have some problems such as the unclear development positioning, unclear responsibilities and rights of all parties, and lack of scientific management methods. The joint training base construction is basically in a state of the disorder, chaos, and free development, lacking a unified specialized management organization. The system in the overall planning, organization, construction, and operation of the base is not perfect. At the same time, the joint training base construction only focuses on the initial investment, lacking a standardized assessment mechanism in the future, and failing to provide timely feedback on the actual effects of the talent cultivation measures, dual mentor guidance, base management and operation, making it difficult to ensure the quality of the practice.

#### **3.1. Strict Access System for Base Construction**

First, the selected cooperative units should have a leading position in their respective fields. These cooperative units often represent the mainstream trends of the industry development, can better gather the necessary resources for the talent cultivation, and have natural advantages in cultivating the high-end talents. Second, the training unit should be guided by the talent training objectives, starting from the alignment between its own educational positioning and the development of the cooperative unit, focusing on demonstrating the practical carrying capacity of the cooperative unit and conducting necessary on-site inspections, and then submitting a base construction application to the school. Third, after being reviewed by the school, the training unit should listen to the opinions and suggestions of the legal department, sign a joint training agreement with the cooperating unit, clarify the cooperation content, rights and obligations of both parties, as well as the definition of the achievements and property rights. Finally, it should enhance the sense of the ceremony and mission in the base construction, increase the communication between the construction entities, enhance their sense of the participation and acquisition, and stimulate the enthusiasm of construction entities by holding a series of activities such as signing the joint training base, awarding the base licenses, and distributing the letters of the appointment for the off-campus cooperative mentors.

#### **3.2. Standardize Operation and Management System of Base**

The joint training base should establish the management system characterized by the “Subject Collaboration and Cross Management”. First, the training unit and the cooperating unit must establish a specialized base management organization, jointly responsible for the planning, organization, and operation of the base, and then coordinate the key and difficult problems encountered in the construction. Second, it should establish the rules and regulations for the construction of the base, clarify the responsibilities and rights of all parties, improve the relevant management methods during the student practice, prevent management vacuum zones, and promote the scientific and standardized operation of the base. Third, it should assign the dedicated personnel to coordinate and implement the practical matters, strengthen the political and ideological education, safety education, and confidentiality education for practical students, and require them to comply with the relevant rules and regulations. Finally, it should establish a relevant protection system for purchasing the personal accident insurance during professional practice, to ensure the smooth implementation of the practical activities.

### **3.3. Implement Dynamic Management System for Base**

It should establish the multi-level linkage evaluation mechanism and implement the dynamic management of the joint training base construction based on the construction results. First, the training units and cooperating units should regularly carry out the self-assessment of the joint training bases, focusing on evaluating the actual effects of the base management and operation, talent training mechanisms, quality and supervision guarantees, and timely improving the deficiencies based on the evaluation feedback results. Second, the university is responsible for the phased and expiration assessments of the joint training base construction, evaluating the effectiveness of the base construction through a combination of the qualitative and quantitative methods. Those who have the significant effects on the joint training base construction will be commended and rewarded, and funding will be increased, which will be priority given to recommending the provincial demonstration bases for the project construction. For the joint training base with the unclear construction results, they shall be ordered to rectify within a specified period until their qualifications are revoked.

## **4. IMPROVE MANAGEMENT LEVEL OF JOINT TRAINING BASES CONSTRUCTION**

Based on the requirements of higher education developments, this project intends to introduce the theory of the total quality management to promote the sustainable and high-quality development of the joint training base, which can achieve the goal of the quality assurance and even improvement of the joint training base. The external quality improvement cannot be achieved without the government taking the lead in fulfilling its guiding function and third-party professional organizations improving the quality evaluation. The internal quality improvement requires universities to strengthen their education resource management system, improve the functional operation system of enterprises, and improve the organizational management system of the joint training bases. By actively reforming the various construction units of the joint training base, comprehensively improving the quality and efficiency of the joint training base through “all staff”, “whole process”, and “all-round” measures, the education quality of the joint training base can be effectively improved, and the output of the high-quality talents and technological innovation research results can be ensured to help the country, universities, and enterprises achieve the win-win results.

### **4.1. Improve External Quality Assurance System of Joint Training Base**

- (1) The government takes the lead in improving the laws and regulations to safeguard the legitimate rights and interests of the joint training bases.

Given the existing problems in the practical process of the joint training bases, the government must pay attention to them. First, it should improve the laws and regulations to safeguard the legitimate rights and interests of the graduate students. Regarding the safety risks associated with the graduate internships, the government should pay attention to the personal safety of the graduate students, clarify the responsibilities of each party in the base, and strictly stipulate that the base must purchase the corresponding personal safety insurance for students. At the same time, the government should establish a higher education quality standard system, establish the starting point and foothold of the evaluation work. Second, it should formulate relevant policies and systems to encourage the deep cooperation among all parties in the base. The government can require departments such as the science and technology, finance, and economic and trade to actively cooperate and support the Ministry of Education’s school enterprise cooperation, which is reflected in organizing and guiding the construction of the practical bases, positive public

opinion encouragement and publicity, and corresponding financial allocations, in order to stimulate the momentum of the school enterprise cooperation among all parties.

- (2) Third party professional organizations improve the quality assurance systems to ensure the evaluation quality of the joint training bases

At present, the supply side structural reform is gradually integrating into various levels of the country, and government functions are gradually transforming. The various non-profit social organizations with the legal personality, professional ability, and good social reputation are taking over the various social affairs. With the gradual improvement of the social governance system, the evaluation, supervision, and assessment of the quality assurance of the joint training bases need to rely more on the third-party professional organizations. The participation of thirdparty professional organizations in improving the quality assurance system of the joint training bases is an inevitable result of the social development and progress, a necessary requirement for the information technology updates, and a necessary choice for the gradual systematization and professionalization of the education industry. First, the third-party evaluation should comply with the laws and regulations, adhere to the intermediary position, and evaluate the quality of the joint training base before and after, and after the completion of the professional practice, focusing on the factors such as the student source information, mentor team, course teaching, student management, training conditions, and professional practice. Second, the third-party intervention should play a supervisory role by establishing a base construction committee, fully utilizing resources from all parties, and ensuring the safe implementation of student professional practice. At the same time, the third parties should also provide the timely feedback on the shortcomings of the training base, such as organizing both schools and enterprises to sign a legal agreement on the ownership of the intellectual property in advance, clarifying the responsibilities and cooperation content of both parties, reasonably playing the role of the news media in the public opinion supervision, and opening up channels for student feedback. Third, the third-party assessment should adhere to the professional theoretical guidance, apply interdisciplinary knowledge such as the education, statistics, and law to the different types of the training bases, formulate assessment plans based on the reality, adhere to the principle of the survival of the fittest, and strive to transform the phenomenon of “one monk has water to drink, and three monks have no water to drink” in the base into a harmonious scene of “government building, school enterprise singing”.

#### **4.2. Implement Internal Quality Assurance System of Joint Training Base**

- (1) Universities adhere to the principle of the “student-centred” and strengthen the management system of the educational resources

Universities should actively respond to the government’s call, and the fundamental starting point for building the joint training bases is to the “cultivate virtue and cultivate talents”. The purpose is to the educate students, enable them to learn and achieve success, adapt to the needs of the social and industrial development, cultivate the students into the high-level applied and vocational labour force, and promote the social development and progress. First, it should fully leverage the disciplinary advantages of universities and form a “point + surface” cooperation model. Universities should integrate the development strategy and disciplinary prospects of the cooperative enterprises into their talent training plans, fully utilize their own high-quality resources such as the research teams, experimental equipment, and research venues, and require university mentors to conduct the practical inspections or on-the-job training at the base. Enterprise mentors should participate in the graduate enrolment, selection, and thesis guidance at cooperative universities, so that students can understand the reasons behind it, and achieve a combination of theory and practice, in order to deepen the deep integration between the talent cultivation and enterprise technological innovation. The admission criteria for the joint training

include whether graduate students have obtained qualifications related to their major, experience in participating in the research projects, and achievement of the relevant academic achievements, in order to strengthen their professional knowledge foundation and practical experience. Second, it should improve the allocation and management of the graduate training funds, and timely tilt towards the base. Universities should establish a professional mentor team for the joint training bases, in order to allocate the training funds reasonably. The mentor's base allowance, transportation subsidy, insurance cost, and project fund should be split in half, while enhancing the development advantages of the base and optimizing systematic guidance for student training. In addition, universities should improve the graduate scholarship system by incorporating the subject leaders and corporate funds into the scholarship system. This not only strengthens the corporate consciousness, but also deepens the cooperation between universities and enterprises.

(2) Enterprises proactively change their mindset and improve their functional operation systems

A high-level professional degree graduate is a necessary talent reserve for achieving the “Made in China 2025”, and enterprises, as an important component of China's economic development, play an important role in the talent cultivation. First, in the process of the jointly cultivating graduate students, enterprises should adjust the professional title evaluation and promotion system of the enterprise mentors, linking the guidance workload and results of the enterprise mentors to the professional title promotion system. Enterprise mentors mainly plan the research content of the students based on the base projects and provide guidance to students in multiple aspects such as the topic analysis, literature research, research ideas, and technical difficulties. Second, enterprises should sign contracts with universities in advance regarding the ownership and distribution of the technological achievements, in order to reduce the impact of the uneven distribution of benefits on the graduate education. Finally, enterprises should actively cultivate an educational attitude towards graduate students, combining their employment standards with the talent cultivation standards to alleviate their demand for talent. They should actively cooperate with the universities to establish a composite team of graduate guidance teachers that integrate academic and technical skills, and strive to have various high-level talents, which can provide the enough human resources and intellectual support for the construction of the base.

(3) Timely change the base position and improve the organizational management system

With the rapid growth of the China's graduate student team, the joint training of the professional degree graduate students by schools and enterprises is an innovative model for talent cultivation in the new era. In order to effectively integrate various teaching resources, it should fully tap into their potential advantages, improve the efficiency of the talent cultivation, and promote the development of new high-level talent cultivation models, the base must change its stance and do a good job in service. First, the joint training base for the graduate students should establish a management model with the director responsibility system as the core, and the management personnel should be composed of management personnel designated by cooperative enterprises and leaders of the university research teams. Based on the mutual benefit and joint undertaking of the scientific research projects, both parties will carry out the related work such as the graduate training and base construction. The base implements the operating philosophy of the “openness, cooperation, and sharing”, establishes an academic management committee for the graduate joint training base, and establishes the sound management system for the base. The Degree Management Office is responsible for coordinating and planning talent training program design, curriculum practice content planning, research project cooperation, and intellectual property ownership. The Comprehensive Management Office is responsible for formulating the daily management systems for graduate students, and coordinating the management of technical and academic data archives in the base. The Base Practice Office is responsible for providing practical training for students upon entering the base, and providing necessary practice venues



and related technical support. Second, the base management team should reasonably allocate the base fund, plan the construction of the base, and integrate the academic research achievements of universities with the complete technical foundation of enterprises. The sharing of resources between the two forms complementary advantages in the base, which can provide the theoretical and technical support for cultivating all-round technical backbone talents.

## **5. CONCLUSION**

In the context of the new era, the joint training bases construction of the professional degree graduate needs to follow a development path with the distinct characteristics of the industry education integration. The joint training base for the professional degree graduate students is an important educational carrier that is actively constructed by multiple parties in response to the current needs of the social, industrial, and economic development in today's rapidly developing society. This can not only enhance the ability and level of the base to carry out the student professional practice, enhance the student professional competence, accelerate the pace of deepening the reform of the professional degree graduate training mode, but also stimulate the enthusiasm of the different construction entities, promote the high-quality and sustainable development of joint training bases, promote the effective integration of talent training supply side and industry demand side, and enhance the ability of the education to serve economic and social development. Given the cross-border and open nature of the professional degree graduate joint training bases, based on the theory of total quality management, this paper focuses on the pain points and difficulties in the development process of the joint training bases construction of the professional degree graduate, discusses the inherent relationship and practical fit between them, and improves their quality assurance system from both external and internal aspects. It comprehensively analyzes the ways and methods to improve the quality of professional degree graduate joint training bases. It is of great significance to deepen the comprehensive reform of contemporary professional degree graduate education, ensure that the quality of the graduate education is in line with the expansion of quantity, improve the existing education quality issues, and promote the achievement of reform goals. Analyzing the issue of improving the quality of the joint training bases for the professional degree graduate students can promote the practical teaching of the professional degree graduate training to achieve the high-quality and connotative development.

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## **CONFLICT OF INTEREST**

All authors confirmed that there is no conflict of interest involve with any parties in this work.

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