

Training Mode of Mechanical Professional Degree Graduates Oriented to the Integration Between Industry and Education

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Abstract. The traditional talent training mode restricts the cultivation of multi-level, high-quality and innovative postgraduates. This paper analyzes the main problems existing in the cultivation of postgraduates majoring in mechanical engineering, and summarizes the characteristics of the cultivation of postgraduates majoring in the integration between industry and education. This paper puts forward the training mode of mechanical degree graduate students, such as the reconstruction of training system and mechanism design based on the deep integration of industry and education, the construction of curriculum teaching system based on The integration between industry and education and demand-oriented integration, the construction of practical teaching system based on The integration between industry and education and the improvement of innovation ability, and the construction of school enterprise joint evaluation mechanism based on comprehensive application orientation, It is of great significance to improve the teaching quality and innovative practice ability of mechanical degree postgraduates.

Keywords: Integration between industry and education; Professional degree; Mechanical graduates, Training mode.

1. Introduction

The integration between industry and education is the inherent demand for the survival and development of professional postgraduate education, and the construction and improvement of the postgraduate training mode with the deep integration of industry and education, and the focus on cultivating professional degree postgraduates with both academic innovation spirit and engineering practice ability are the necessary way to meet the urgent demand for high-end engineering talents in the new era [1-2]. At present, driven by the national policy and market demand, the "new infrastructure" represented by high-end equipment, intelligent manufacturing, artificial intelligence, industrial robots, new energy vehicles, etc., has ushered in the development boom, which urgently needs a large number of new talents with high level of application, composite and innovation, and high-level professional degree graduate education is the best way to continuously release the dividend of "new infrastructure". High-level professional degree graduate education is an important guarantee and talent support for the continuous release of "new infrastructure" dividends. However, there are still many problems facing the integration of professional research and education, and the problem of "two skins" between talent training and industrial demand still exists [3-5], and it is the main trend of the current higher education reform to promote the establishment of a substantial and in-depth cooperative training mechanism of industry-education integration.

2. The main problems of traditional mechanical degree graduate training

2.1 The institutional mechanism of professional degree postgraduate training based on the integration between industry and education has not yet been truly established

The cultivation of mechanical professional degree graduate students is still not free from the cultivation mode of academic degree graduate students, and the selection of supervisors for professional degree graduate students, the design of curriculum system, teaching methods and modes, the selection of professional degree dissertation topics and professional quality assessment

are all converged with that of academic degree graduate students. The institutional mechanism of integration of education and industry for the cultivation of talents who can independently complete engineering planning, engineering design, engineering implementation, engineering research, engineering development, engineering management and have good engineering professionalism has not been thoroughly explored, and the matching degree between the cultivation orientation of professional degree talents and the demand of society for high-level engineering talents is not high.

2.2 Differences between the curriculum teaching system and the needs of enterprises, and the depth of industry-education integration training is limited

In the training of mechanical graduate students, there is a general pattern of classroom teaching, unified syllabus, unified academic system and unified curriculum, but the design of its curriculum and teaching system lacks deep connection with large enterprises, lacks accurate positioning of the knowledge, ability and quality necessary for mechanical engineering talents, the curriculum system is relatively closed, and the ability to solve difficult engineering and technical problems and major technical research needs is insufficient, and the depth of cooperative training of industry-teaching integration is limited.

2.3 The practical aspects of the integration between industry and education fail to penetrate into the core management and production system of enterprises, making it difficult to achieve practical ability enhancement

The country is vigorously developing smart manufacturing, green manufacturing and other manufacturing industries, however, the current mode of practical ability cultivation of mechanical professional degree masters only stays on the surface, failing to truly penetrate into the core management or production system of enterprises, failing to realize the real sense of practical skill enhancement, and the professional masters are lacking in practical ability cultivation, unable to realize the deep fit between the innovation ability and the industry industrial demand in the cultivation process, and the ability to solve the common engineering practical problems is seriously insufficient.

2.4 The appraisal and evaluation system is not comprehensive and does not fully reflect the voices and needs of the industry sector

The cultivation process of professional degree postgraduates in machinery involves the completion of academic papers, software, hardware, patents, industry standards, products and other forms. However, the main body of evaluation of the quality of professional degree graduate training is still limited to colleges or universities, the evaluation method of graduate training is too single, the assessment and evaluation system does not reflect the important role of industry and industry in the whole process of cooperative training of industry-education integration, and the all-round diversified evaluation system of professional degree graduate students needs to be further improved.

3. Characteristics of postgraduate training of professional degree in industry-education integration

3.1 Optimize curriculum teaching reform

Firstly, the integration between industry and education provides an important platform for the university to open up professional courses with strong practical and application for professional degree graduate students, and put part of the teaching contents of some courses in laboratories or production practice sites, so that students can receive new theories, methods and technologies in practical applications [6]; secondly, the integration between industry and education makes it normal to introduce enterprise technicians to teach at the university, and enterprise technicians mostly have rich practical experience. Finally, according to the existing curriculum and teaching system, the

cultivation program, syllabus and curriculum standards of existing professional degree graduate students should be further improved and optimized, so as to realize the close integration between the teaching of professional degree graduate students and the most cutting-edge science and technology.

3.2 Improve practical innovation ability

The cultivation mode of professional degree graduate students should be oriented to enhance the professional practice ability, and the cultivation and improvement of their practical innovation ability largely depends on the internship practice link [7]. Using the integration between industry and education to cultivate innovative professional degree postgraduates based on the integration of industry-university-research is highly practical, and postgraduates can get practical teaching guidance in enterprises and learn knowledge that cannot be learned in schools and books. Postgraduates can practically carry out scientific research and innovation in the process of practice, which greatly improves their ability to think independently, analyze problems and solve practical application problems, and can experience the transformation practice of enterprises from technological innovation to economic results, which cultivates solid working style and rigorous scientific attitude of professional degree postgraduates and enhances practical and innovative ability.

3.3 Strengthen collaborative innovation mechanism

The integration between industry and education is a platform to further strengthen the strategic cooperation between schools and enterprises and promote the joint cultivation of top innovative talents by schools and enterprises, as well as an important foundation to improve the joint cultivation mechanism of school-enterprise collaborative innovation [8]. As a link between enterprises and schools, professional degree graduate students play an important role in promoting the combination of basic and applied research in schools and the transformation of research achievements and local economic development. By establishing the communication and coordination mechanism between schools and enterprises, real-time interaction and dynamic adjustment, the main contents of the work of professional degree graduate students are clarified. Usually, postgraduates are mainly responsible for the research of basic theories and common key technologies, demonstrating advantages and cultivating students' diversified abilities through the implementation of signed cooperation agreements; enterprises and their technicians are responsible for providing cutting-edge scientific problems and technological needs as well as practical conditions, and achieving technological innovation and talent training quality through collaborative innovation mechanism.

3.4 Improve the assessment and evaluation system

The assessment of professional degree graduate students should not only take the examination results as the only criterion to assess the research ability of graduate students, but usually a perfect assessment and evaluation system should be established, which should reflect the requirements of comprehensive ability cultivation of graduate students, but not be too complicated and lose operability [9]. The integration between industry and education is creating a good basic platform for this quality assurance system, which optimizes the quality system of professional degree graduate education, provides a large number of enterprise experts and scholars with practical experience for the selection of supervisors of professional degree graduate students, and also provides a large number of bottlenecks with practical application value for the selection of dissertation topics for professional degree graduate students. The comprehensive ability shown by the study and practice of postgraduates at workstations is recorded into the performance of postgraduates during their degree studies through an appropriate assessment and evaluation system, which is to a certain extent a reflection of the quality of education and cultivation of professional degree postgraduates.

4. Professional degree cultivation model of industry-education integration

4.1 Reconstruction of the training system and mechanism design based on the deep integration of industry and education

Build a new model of professional degree postgraduate training of "professional degree + ability development". Focusing on the development of wisdom steel, intelligent equipment, intelligent manufacturing, industrial robotics and other industries, we support industries and training units to explore the establishment of industry-education fusion education alliance, carry out the reform of professional degree postgraduate training mode "oriented to enhance vocational ability, focusing on cultivating practical ability, and taking industry-education fusion as the way", and build a new model of collaborative education. The new model of collaborative education is oriented by the needs of industry and industry, with the participation of universities and industry enterprises.

Smooth the way for industry enterprises to participate in the whole process of professional degree graduate training. Deeply expand the cooperation level of the integration between industry and education in graduate education, rely on the engineering background, the various aspects of cultivation are oriented to the research projects and technical research and development topics of national major needs, and formulate various policy systems for the cultivation of mechanical professional degree graduate students. The system is deeply penetrated into all aspects of the cultivation process, including the formulation of cultivation plan, teaching of cultivation courses, implementation of practical links, selection of thesis topics and assessment of graduation qualification. It establishes the mechanism of annual meeting and mutual supervision between the supervisors within and outside the university to jointly improve the quality of joint cultivation of graduate students.

Deeply promote the dual mentorship system of school and enterprise, and strengthen the construction of mentorship team of professional degree graduate students. Promote the "school-enterprise dual tutor system", actively employ enterprise personnel who have substantial scientific research cooperation with graduate tutors of the college as enterprise tutors, and employ a group of leading engineering talents and management talents in large enterprises as industrial tutors; lead teams to conduct research and practice in enterprises for at least three months each year; further study the mechanism of collaborative communication between dual tutors and explore the mechanism of "dual teacher and triple ability". The university will further study the cooperative communication mechanism of dual instructors and explore the construction mechanism of "dual-teacher and triple-competent" composite professional degree graduate instructors with teaching ability, practical ability and research ability.

4.2 Construction of curriculum teaching system based on the integration of industry-education and demand-oriented integration

Insisting on the establishment of moral education, the university will collaborate to promote the construction of curriculum thinking and government in which "teaching" and "education" resonate at the same frequency. It strengthens the education of academic morality and professional ethics, improves the ability of practice and innovation and future career development, and promotes the all-round development of moral, intellectual, physical, social and aesthetic development of professional degree students. The special educational curriculum system of "Civic and Political Science Course + Intelligent Manufacturing" is created, and the Civic and Political Science elements are fully explored in the course objectives, teaching methods and evaluation system, and the Civic and Political Science objectives of the course such as national sentiment, innovation spirit and professional ethics are decomposed in layers according to course categories. The systemic view, macro thinking, large engineering view and cooperation view of the three-dimensional curriculum system supported by each other, to promote the same direction of the Civics and Political Science courses and professional courses.

Combining with the construction of special industries and double first-class, constructing the curriculum system of professional degree postgraduates. It constructs an all-round and high-level talent cultivation system and evaluation standards, implements a professional degree graduate training curriculum system that "highlights the orientation of engineering innovation ability", integrates mechanical, computer, information, management and other disciplines, constructs a common knowledge system, and promotes the organic connection between curriculum and professional and technical ability assessment.

Integrate national strategies and industrial needs, and promote the reform of diversified classroom teaching methods. Combining the characteristics of the postgraduate courses of this professional degree, relying on teaching methods such as online and offline, virtual simulation platform, and actively carrying out case bank teaching, taking the needs of enterprise talent training as the guide, adopting teaching modes based on problem situations such as case-based, discussion-based, guidance-based and special lecture-based, introducing enterprise resources to deepen students' understanding of actual engineering problems during the teaching process.

4.3 Construction of practical teaching system based on the integration between industry and education and the enhancement of innovation ability

Construction of multi-level and diversified on-campus practice teaching system for professional degree graduate students. Focusing on industries such as smart steel, intelligent equipment, intelligent manufacturing, industrial robotics, etc., the university builds a teaching platform for practice and innovation of professional degree graduate courses, develops corresponding characteristic experimental instruments and equipment, forms a multi-level practice teaching system combining course practice, comprehensive practice, innovation practice and social practice, and opens a series of theory+practice teaching courses integrating basic, skill, industry and innovation and entrepreneurship abilities. We also provide a series of theory+practice teaching courses that integrate basic, skills, industry and innovation and entrepreneurship, innovate experimental management and experimental teaching mode, and stimulate students' participation.

Establish an extra-curricular science and technology innovation activity system that integrates "academic competition and research". With the basic forms of professional academic lectures, professional academic discussions, postgraduate science and technology innovation forum and postgraduate extracurricular science and technology competition, the system combines openness, diversity and practicability with innovation and entrepreneurship education, and builds a multi-dimensional, all-round and all-process platform consisting of "academic forum, knowledge competition and science and technology competition" with the participation of enterprises. It is a platform for extracurricular scientific and technological activities for graduate students with professional degree, which promotes communication between university-enterprise, university-local, faculty-student and student-student, and enhances the practical and practical ability, teamwork ability and organizational communication ability of graduate students.

The construction of two types of off-campus industry-education integration practice teaching bases for technology research and development and technology application. Vigorously carry out the construction of joint training bases for graduate students. The company has built two types of off-campus teaching and learning practice bases for "technology research and development" and "technology application", giving full play to the advantages of professionalism and engineering of off-campus teaching and learning bases to build a platform for engineering practice, innovation and entrepreneurship, and dissertation research for professional degree students. In addition, the university will combine design-oriented, application-oriented, comprehensive and innovative research projects for the national high-end equipment manufacturing industry to drive scientific research with teaching and promote teaching with scientific research, so that scientific research resources can be rapidly transformed into education and teaching resources.

4.4 Construction of joint school-enterprise assessment and evaluation mechanism based on comprehensive application orientation

Establish and improve the evaluation system of professional degree postgraduates in a diversified and accurate manner. Aiming at the mechanical graduate students of different levels, categories and forms, it builds a comprehensive and multiple evaluation system combining "ideology and politics + professional knowledge + professional practice + innovation ability + professionalism + degree achievements". The evaluation of professional degree postgraduates is scattered to all aspects of the whole cultivation system, and the multi-objective evaluation method is used to evaluate students' professional basic ability, engineering practice ability, organization and communication ability, innovation and entrepreneurship ability, big engineering outlook and macro thinking according to the characteristics of cultivation links and courses.

Dynamic and diversified assessment and evaluation methods and mechanisms jointly by schools and enterprises. The school sets the basic standards for student assessment, and then designs a dynamic and diversified assessment and evaluation system according to the wishes of the enterprise and the learner. Likewise, enterprises design a dynamic and diversified assessment and evaluation system based on their own needs and development, and on the basis of the talent cultivation goals set by the university, which is "final report + enterprise certificate + school supervisor's opinion", and finally strengthen the quality of graduate talent cultivation through the joint efforts of the university and enterprises.

5. Summary

The thesis explores the new model of innovative industry-education integration in graduate education, builds a new mechanism of quality evaluation, and set up a professional degree graduate training system and quality assurance system that serves demand, has an optimized structure and distinctive features, and comprehensively improves the quality and level of mechanical professional degree graduate education.

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