Research on Cultivating Practical Innovation Ability of Vehicle Engineering Master Students with Integration of Production and Education

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Abstract. It is the realistic requirement of talent training to enhance the practical innovation ability of graduate students through the integration of production and education. It is not only the objective requirement of the law of education, but also the mission requirement of the development of higher education. Combining with the practical innovation ability training plan of Wuhan University of Science and Technology, this paper explores the training objectives, training requirements, training standards, training models and enterprise training plans for professional master's degree graduates, and establishes a professional master's degree talent training model focusing on strengthening practical innovation ability. Through close cooperating with the industry enterprises of the integration of production and education personnel training mechanism, it provides reference for improving and perfecting the training mechanism of engineering high-level automobile talents.

Keywords: vehicle engineering master students; practical innovation ability; integration of production and education; talent training mechanism

1 Introduction

In recent years, with the gradual expansion of the scale of graduate student enrollment, the number of majors and enrollment of professional degree students are also gradually increasing. An important feature of the training goal of professional degree postgraduates is to enable students to have a strong ability to solve practical problems. However, in many domestic colleges and universities, the training objectives, curriculum settings, teaching concepts, training modes, quality standards, and teacher team construction of professional degree graduates are not clearly distinguished from the training of academic graduate students.[1] The characteristics of professional degree education are not prominent, the training mode and training concept are not clear enough, and the cultivation of students' practical innovation ability is not strong enough. Therefore, under the requirement of "new engineering", it is of great significance to deeply explore

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the teaching reform to enhance the practical innovation ability of engineering graduate students and build a practical innovation teaching system for professional degree graduate students with the help of the relevant concepts of international engineering education professional certification. [2].

As the pillar industry of China's national economic development, in order to better meet the needs of strategic transformation and independent innovation, it is urgent to train a large number of high-level innovative talents who are skilled in using scientific methods and innovative means to solve practical engineering technical problems. The major of vehicle engineering in Wuhan University of Science and Technology is one of the engineering series established earlier in our school, and it is a key professional master's program in the School of Automotive and Traffic Engineering. In 2014, it was approved as the pilot major of the "Excellent Vehicle Engineer Program". Therefore, we must closely focus on the adjustment of national policies and the goal of cultivating high-level innovative professionals required by economic construction, actively adjust the education structure of master's degree students, and build a full-time training model of master's engineering in vehicle engineering that conforms to the law of professional graduate education and reflects the cultivation of practical innovation ability of master's engineering.[3]

2 Training Objectives, Training Requirements and Training Standards Proposed in the Talent Training Program

The master of engineering professional degree is a practice-oriented degree type, and the development of training programs must be based on the needs of engineering talents in today's engineering field. The training objectives of master excellent engineers in vehicle engineering in our school are as follows: training students with specialized knowledge in mechanical engineering, vehicle engineering, information science and technology, solid basic theory, reasonable knowledge structure, strong adaptability, innovative and entrepreneurial spirit and practical ability, and competitive advantages in the design, manufacturing, application and management of new energy vehicles; high-quality innovative senior engineering and technical personnel who can engage in product development, manufacturing, testing, technology application and management in the fields of automotive, new energy, mechanical engineering, etc.

According to the requirements of engineering practice and the specific consideration of engineers' ability, the evaluation standard of professional master's training is put forward by our university. Utpon meeting the requirements of the training program, a master's degree can be obtained; After 1 to 2 years of engineering practice, you can apply for and obtain senior engineer technical qualification. The master excellent engineer graduated from the major of vehicle engineering can be engaged in the basic theoretical research of vehicle engineering, the vehicle science and technology work in engineering construction, and can also undertake the design, research and development of new products and new processes.

3 Problems Existing in the Training of Practical Innovation Ability of Professional Degree Postgraduates

With the help of the evaluation mode of engineering education professional certification, the author conducted a survey on some graduate students, graduates, supervisors and employers in Wuhan University of Science and Technology by means of questionnaires and interviews. In particular, the author paid special attention to the graduate students and made a return visit to the training and cultivation they received in school. Collect the opinions of employers on talent training from the perspective of talent demand and employee creativity. The survey found that there are some common problems in the cultivation of practical innovation ability of professional degree postgraduates, which are concentrated in the following six aspects.

3.1 The Curriculum System in the Training Program Needs to be Further Optimized

At present, the development of professional degree graduate personnel training programs in many colleges and universities is modified from the academic personnel training program, and only a few changes have been made in the course setting, course nature and proportion, and most of them have not carried out in-depth research on the talent needs of society, industry and enterprises. Therefore, although the proportion of practical courses in the curriculum system of professional degree postgraduates has increased, the setting of practical courses lacks the support for the needs of industries and enterprises. In recent years, the engineering education professional certification actively carried out by undergraduate engineering majors in universities across the country has adopted the concept of OBE, and industries and enterprises have participated in the revision of talent training programs and curriculum systems, as well as the formulation of training objectives and graduation requirements, which can provide references for further optimization of the graduate curriculum system.

3.2 Teaching Methods Need to be Further Reformed

Most of the academic degree students are taught in lectured style. Influenced by this, most teachers also use lectured style for professional degree students. This traditional teaching method is not applicable to engineering disciplines that require high practical ability and innovation ability. Most courses of engineering disciplines require students to complete the design by hands-on operation of instruments and equipment. Therefore, it is necessary to reform the traditional teaching mode. For example, with the help of modern information technology, the practical teaching activities of postgraduates are carried out in a way that combines virtuality and reality.

3.3 The Ability of Tutors to Guide Practice Needs to be Further Improved

At present, most of the graduate tutors in colleges and universities have high academic qualifications, deep academic attainments, high level and large number of funds, awards, published papers, etc., but the common problem is the lack of a certain industry background and engineering practice background. Therefore, the instructors lack experience in cultivating the practical ability of professional degree students.

3.4 School-Enterprise Cooperation Needs to be Further Deepened

At present, some colleges and universities have adopted the university-enterprise joint dual tutorial system for the training of professional degree postgraduates, which provides practical scenarios recognized by students and helps to improve students' practical ability [4]. However, in the aspects of graduate project selection, internship and training, the closeness of school-enterprise cooperation needs to be further deepened. Schools should create opportunities for students to go deep into the research and development, production and management of enterprises, understand the actual production process of industries and enterprises in actual combat, improve their ability in the actual application environment, avoid the phenomenon of serious disconnect between ability and demand, and shorten the adaptation period after students leave school.

3.5 The Assessment and Evaluation Mechanism Needs to be Further Improved

For the assessment and evaluation of graduate students, the main methods are final examination, completion of course papers, publication of conference papers and graduation papers. In these evaluation mechanisms, there is a lack of examination of the practical ability and innovative ability of graduate students. For example, the participation of graduate students in the National Graduate Electronic Design Competition, the "Challenge Cup" national University student series science and technology academic competition, science and technology innovation competition, etc., is of great help to improve students' practical ability, but at present, from the actual situation of various universities, the participation only plays a role in the assessment system of graduate students. The degree of participation of postgraduates in various competitions is lower than that of undergraduates.

3.6 The Construction of Various Innovation Practice Platforms Needs to be Improved

The learning environment of graduate students is relatively monotonous, and the requirements of practical experiment courses for graduate students are often not as strict as that of undergraduate students. The construction of experimental platforms and practice bases is not complete, and some experimental equipment is backward and obsolete, which cannot keep up with the development of The Times. Graduate students often can only use the equipment of the research group to conduct experiments, and cannot use the equipment outside the research group to complete the experiment.

Therefore, the construction of innovative practice platform for graduate students, especially for professional degree students, needs to be further improved.

4 Countermeasures and Suggestions

4.1 Optimize the Curriculum System and Increase the Proportion of Practical Class Hours

In the process of formulating and optimizing the curriculum system of professional degree postgraduates, suggestions from corporate executives and engineers should be widely listened to, and demand-oriented and industry characteristics should be reflected in the course setting, the preparation of course outline, the selection of experimental projects, the evaluation of experimental results, and the cultivation of professional norms and engineers' literacy. At the same time, the proportion of class hours of practical courses is further increased, so that students can innovate in experiment and exploration, and do more work, practice, explore and summarize.[5] Take the training of graduate students majoring in vehicle engineering as an example, when learning advanced programming courses, they should practice programming on computers; When learning mechanical courses, we should use various devices to measure and design in the laboratory; When learning circuit courses, you should draw or simulate various circuits by hand, and measure and analyze them; When learning the communication course, we should use the communication module to realize the remote communication design. At the same time, with the study and understanding of the theory course, it can make the knowledge more systematic, the analysis more comprehensive, the algorithm more optimized, and the communication more convenient.

4.2 Combination of Schools and Enterprises, Complementary Advantages

Facing the problem of high academic level of graduate tutors and teachers, but lack of industry background, we should give full play to the advantages of industry-university cooperation and collaborative education. Continue to implement the school-enterprise dual tutorial system, students' learning location is not limited to the school's laboratory or study room, but moved to the enterprise's R & D center or workshop, so that students during the school not only learn scientific theoretical analysis methods, but also can personally feel the R & D environment and production environment of enterprise engineers.[6] In addition, for the graduate training of engineering disciplines, whether it is the design topic in the course or the graduation design topic, it needs to be combined with the actual production of enterprises in the front line to avoid working behind closed doors. Under the premise of actual needs, under the guidance of instructors or teachers, graduate students carry out research, analysis, design, discussion, realization, experiment and optimization around practical problems, so that graduate students can understand and participate in the whole cycle and process of enterprise design and production. In addition, drawing on the concept of engineering education professional certification, while teaching students to solve complex engineering problems, they can also cultivate their awareness of society, health, safety, law, and environmental pro-

tection, so that students can understand their responsibilities. For example, Wuhan University of Science and Technology adopts the mode of joint training of Wuhan University of Science and Technology and Dongfeng Passenger Car Company, Dongfeng Yuexhang Intelligent Car Company and other enterprises in the training of professional degree graduate students majoring in vehicle engineering. In the environment of joint training between universities and enterprises, students have a broader vision, exercise skills, and become more targeted in employment, and have achieved good results.

4.3 Build A Platform for Postgraduate Practice and Innovation

In view of the simple practice platform and outdated equipment of most graduate students, The vehicle engineering major of Wuhan University of Science and Technology has integrated a number of experimental resources and built a practical innovation platform for graduate students of vehicle engineering focusing on the technology direction of new energy vehicles. Platform resources mainly include six aspects: "Electric vehicle electric drive and control", "New energy vehicle power battery technology", "vehicle vibration and noise control", "electric vehicle CAD/CAE/CAM" and "electric vehicle safety, reliability and fault diagnosis" and "automobile intelligent network technology". All kinds of instruments, tools or modules in the above practice platform are placed in an open management laboratory for the use of graduate students, breaking the barriers in the use of instruments and tools between different laboratories and different research groups, and strengthening the exchange, communication and collaboration between students of different majors.[7] The construction of the practical innovation platform provides a practical stage for the graduate students of vehicle engineering, and also provides a variety of options for the students' design. The graduate students can complete a number of tasks such as experiment, design and competition on this platform, and a number of application results have been achieved.

4.4 Change of Assessment and Evaluation Methods

In order to play the role of assessment baton more effectively, it is necessary to change the assessment method of engineering graduate students. Change the traditional final examination paper as a single assessment method, adopt a more diversified and flexible assessment method based on project completion effect. The performance of graduate students in experiments, design, literature report, design report writing, paper writing, division of labor, participation in competitions and other activities is taken as the basis for assessment and evaluation. The evaluation standards of the project are taken as the reference for evaluating the practical innovation ability of graduate students, and enterprise personnel are invited to participate in the evaluation and evaluation of students.[8]

4.5 Strengthening of Practical Training

Pay attention to practice training, pay attention to the combination with the industry and enterprises in the training process of professional degree graduates, not only in the choice of graduation design topics and daily training topics, in the daily management of graduate students, should also be project-driven as the starting point, exercise students' engineer quality, so that students develop professional habits.[9] According to the enterprise's management mode of R & D projects, the design standards, auxiliary documents, software code management, technology, design flow, etc., are standardized, so that students can meet the actual job requirements after graduation. Graduate students are encouraged to participate in enterprise research and development projects or process transformation projects to exercise their skills and improve their level in actual work.

5 Construction of Practical Innovative Teaching System for Professional Degree Postgraduates

When constructing the teaching system of engineering graduate students, we should focus on the training characteristics of engineering graduate students, grasp the main line of practice and innovation, attach importance to the cultivation of ability and quality, and attach importance to the participation of industries and enterprises. [10] Based on the OBE concept of engineering education professional certification, this paper takes the training of graduate students in vehicle engineering major of Wuhan University of Science and Technology as an example, and constructs a practical and innovative teaching system for graduate students of professional degree. Focusing on the goal of "adapting to social needs, strengthening vocational orientation, and cultivating socially applicable talents", the practical innovation curriculum system of professional degree postgraduates has been revised. From the perspective of knowledge accumulation in innovation practice, improvement of practical ability, and cultivation of engineer quality, with the support of practice innovation platform, and with the active participation of instructors and course teachers, it aims at teaching links such as basic knowledge of innovation, in-class experiment and training, course design, discipline competition, off-campus practice and training, and graduation design. Improve the practical and innovative ability of professional degree graduates in an all-round way, and take advantage of the guiding role of enterprise participation in the formulation of assessment and evaluation mechanisms to cultivate qualified graduates who are needed by society and can meet the requirements of enterprise positions.

6 Conclusions

Under the trend of a new round of scientific and technological revolution and industrial transformation, all industries are deeply implementing the innovation-driven development strategy. The core of higher education is the cultivation of talents, so that the exported talents have the innovative ability needed by the society. Graduate students

are energetic and creative groups, and are the main force of future scientific and technological innovation. It is the most important to cultivate the practical innovation ability of engineering graduate students. Based on the analysis of common problems, the author puts forward suggestions on how to improve students' practical innovation ability in the training process of engineering professional degree graduates. Under the guidance of the concept of engineering education professional certification, the author gives full play to the advantages of schools, industries and enterprises and builds a practical innovation teaching system. In the future, we will continue to try, explore and summarize, and strive to push the training of engineering professional degree students to a higher level.

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