

Research and Exploration on the Practice Mode of Mechanical Majors Under the Background of New Engineering

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ABSTRACT

Under the background of “new engineering” construction, in order to improve students’ innovative ability and engineering practice ability, the problems existing in the practice teaching work of mechanical majors in local colleges and universities are analysed, and the practice teaching system and practice teaching methods of mechanical majors are constructed. Some strategies for the practice of teaching mode are put forward, including deepening school-enterprise cooperation, innovating practice model, optimizing practice instructors, and strengthening practice assessment. By improving the practice teaching model, students can better apply the professional knowledge they have learned, thereby effectively improving the practice effect and improving the ability of engineering practice.

Keywords: *New engineering, Mechanical major, Practice, Teaching mode.*

1. INTRODUCTION

“New engineering” refers to the emerging, new and nascent engineering disciplines, and its connotation is the direction of engineering education reform proposed based on the new needs of national strategic development, the new situation of international competition, and the new requirements of establishing morality for students. In order to ensure that the engineering science and technology talents cultivated in the “new engineering” major can meet the current and future development requirements of the country and industry, universities need to establish corresponding talent training quality assurance system to cultivate high-quality talents with innovative capabilities, cross-industry integration capabilities [1].

Practice is an important link in the practical teaching system of colleges and universities. It plays an irreplaceable role in cultivating students’ practical ability and innovative consciousness. Practice is an important means and main way for students to integrate theory with practice and increase practical knowledge. The teaching effect of this link is very effective for the cultivation of students’ comprehensive application ability of theoretical knowledge and the cultivation of

the ability to discover, analyze and solve problems play an important role [2].

Mechanical majors mainly include mechanical design and manufacturing and automation, mechatronics engineering, vehicle engineering, etc. The mechanical major has wide range of adaptability, involves many interdisciplinary subjects, and requires students to have a certain degree of innovation and engineering practice capabilities. In order to meet the requirements of the construction of “new engineering”, the teaching requirements for practical links in mechanical majors should also be gradually improved. Practice is also an important link in the training of innovative and applied undergraduate professionals in mechanical majors. The universities and colleges should pay more attention to its teaching effect [3].

2. THE PROBLEMS EXISTING IN THE PRACTICE OF MECHANICAL MAJORS

Professional practice should be implemented on the basis of scientific research projects and the needs of enterprises. Students should integrate theory with practice in the hands-on process, which conforms to the basic laws of practice and epistemology. However, there

are some problems in the traditional practice teaching of mechanical majors.

2.1. The practice teaching concept lags behind

Under the traditional educational concept, the practice mainly focuses on the practical application ability of theoretical knowledge, while the students' ability to innovate and adapt to the requirements of the times development is less tested. Under the background of "new engineering", it is urgent to establish innovative, comprehensive and full-cycle engineering education concepts to enhance students' innovation and creativity and adapt to the development requirements of the times [4].

2.2. Incomplete reform of the talent training mode

At present, the domestic mechanical talent training model has good exploration and reform in the training models of outstanding engineers, CDIO, etc. The practice mostly adopts the collaborative talent training model with government, school, and enterprise. In the background of "new engineering", the professional practice should break the inherent disciplinary boundaries, focus on the integration of multiple disciplines, and promote a multi-form collaborative education model.

2.3. Few practice units

Under the conditions of market economy, enterprises focus on efficiency, and a large number of students who have not mastered professional skills and lack practical experience go to the enterprise for internships, which will inevitably affect the normal production order of the enterprise. In addition, problems such as reception and technical confidentiality have brought a lot of problems to the enterprise, additional burden and inconvenience. At the same time, the talent market is becoming more and more mature, companies do not need to find and retain talents through internships. Then many companies are unwilling to accept a large number of students for internships, which increases the difficulty for schools to contact internship units [5].

2.4. Students have fewer practice opportunities

When mechanical students are engaged in professional practice in mechanical processing enterprises, due to the strong operational skills of electromechanical production equipment, the operators of electromechanical equipment must be trained by relevant departments before they can work. Therefore, based on safety considerations, it is impossible for companies and schools to allow students to directly participate in the on-site processing during the limited

internship time of the production internship. This makes it impossible for the production practice of mechanical undergraduate majors to carry out effective equipment operation. Without hands-on operation, students' learning enthusiasm is greatly reduced, which severely restricts the improvement of the production practice teaching effect [6].

2.5. Students' enthusiasm is difficult to mobilize

In the new times, student employment is diversified, and job competition is fierce. Many students are no longer limited to employment in their own majors. If students' professional practice is only carried out in some enterprises with relatively backward technical conditions, there will form a greater psychological gap in students' hearts, which will affect their professional self-confidence, and their learning enthusiasm will be affected [7].

2.6. The quality of internships needs to be improved

The teaching content of professional practice lacks innovation, the training quality standard system is not perfect, and there is a lack of scientific and reasonable evaluation mechanism [8]. Under the background of "new engineering", the process of professional practice training program, supervision and inspection, and evaluation methods are in urgent need of improvement. The professional practice assessment is a mere formality, and the traditional assessment is based on practice reports and practice weekly journals. This kind of assessment mode makes students not pay attention to their thinking, and the practice content is not "into the mind" and cannot achieve the purpose of assessing the effect of students' practice.

3. PROFESSIONAL PRACTICE TEACHING SYSTEM FOR MECHANICAL MAJORS

3.1. Practice teaching system of mechanical majors

According to the strong practical characteristics of mechanical majors, with the background of the mechanical industry, in order to cultivate high-quality applied talents with innovative spirit and entrepreneurial ability, mechanical major talent training system with school-running characteristics is constructed, and the overall ideas and initiatives to cultivate students' innovative and practical ability is proposed. In order to carry out practical teaching reform, a practical teaching system of "one main line, two cycles, three levels, four series, and five platforms" is built.

3.2. Practice teaching of mechanical majors

In order to match the new requirements of “new engineering”, strengthen the practice teaching and reform the practice methods of students, a mechanical professional practice teaching mode is constructed, as shown in Figure 1. To effectively improve students’ practice interest and learning effect, and gradually cultivate students’ innovative thinking, a new mode of practical teaching for the “new engineering” is explored, and some reasonable measures are brought out.

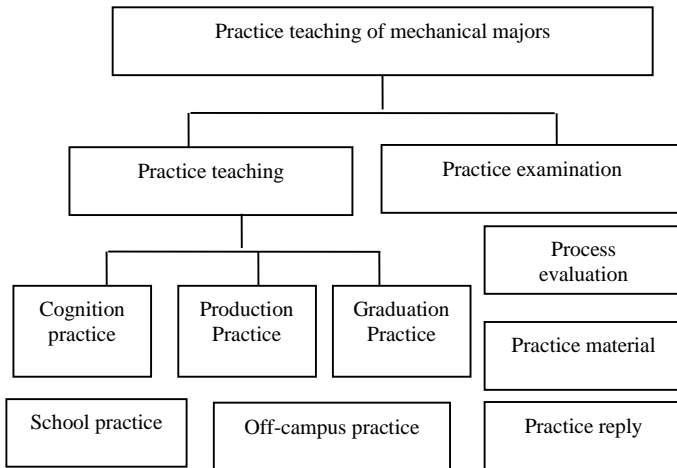


Figure 1 The practical teaching mode of mechanical majors

4. MEASURES FOR MECHANICAL MAJORS’ PRACTICE TEACHING MODE

According to the difficulties faced by mechanical students in the professional practice under the background of new engineering, the colleges and universities need to creatively provide specific measures to adapt to the situation of contemporary college students.

4.1. Deepen school-enterprise cooperation

On the one hand, the enthusiasm of enterprises to participate in practice teaching is affected by factors such as the overall social environment and national policies. On the other hand, it is also related to the strength of universities and the degree of enthusiasm of the school to participate in school-enterprise cooperation. The university must also actively connect with enterprises, and actively invite local enterprises to participate in internship teaching based on the principle of resource sharing and mutual benefit [9].

The universities and secondary colleges should attach importance to the construction of practice bases, and jointly establish school-enterprise cooperation councils with local enterprises. Under the condition of ensuring professional counterparts, it is need to make

every effort to develop local professional counterparts. Once the practice agreement is signed with an enterprise, a special person must be assigned to follow the corresponding enterprise for a long time. It can stabilize the cooperative relationship by arranging teachers to do temporary job in the company, jointly carrying out subject research, inviting company personnel to give lectures, and inviting senior technical personnel to participate in the formulation of the talent training program. Through in-depth school-enterprise cooperation, teachers are allowed to participate in enterprise production and understand the status of enterprise management, technology, and production, so as to lay solid foundation for practice.

4.2. Innovative practice mode

In order to change the phenomenon of students’ lack of interest and practical ability, it is should to explore the new internship mode of mechanical majors [10]. It mainly includes the learning strategies of task-driven, independent learning, cooperative communication and common progress, following the principle of “teaching as supplement and guidance as main”.

Task-driven is to make task closely related to teaching as basis and to stimulate students’ interest and interest in learning, and it is a teaching method in the process of solving tasks to improve students’ enthusiasm and initiative. According to the practice tasks, students set their own learning plans, arrange their own learning content and management time, actively seek learning resources and learning methods, set the learning environment to broaden their learning ability and self-supervision. Cooperative communication is the main way to solve problems. While guiding students to learn independently, they also advocate the concept of teamwork, break down tasks, and jointly complete the design and production of works through cooperation and communication. Team members jointly set work tasks and learning goals, cooperate with each other on an equal footing, respect each other, share resources, and jointly complete the design and production of works.

In the practice process, students are the main body, and teachers are not “lectures of knowledge” but “task guides”. Students acquire task-related professional knowledge and resources and solve practical problems by themselves. The teaching format is mainly based on teacher-student exchanges, with team guidance and individual tutoring as the main forms, guiding students to grasp the design and production process of workshop works, arrange activities by themselves, encourage students to challenge themselves, and cultivate their own expertise and expertise.

4.3. Optimizing practice instructors

At present, young teachers in colleges and universities lack on-site training, and their theoretical level is generally higher than practical ability. In order to improve the effect of practice guidance, it is necessary to ensure the number of instructors, instruction time and instruction ability. Only under the guidance of a strong team of teachers with reasonable combination of theory and practice, it can run the training of professional theory learning and engineering application ability through the whole teaching process and cultivate high-level professionals.

The learning content of the professional practice should closely follow the actual production. The retired or more experienced technicians and first-line production workers can be invited to give special reports to the students before the practice, so that students can experience the sense of honor as country builder and cultivate the students' builder spirit with rigorous, realistic and hard-working.

With experienced and adaptable persons as the leading teachers, they can be familiar with the relevant production content of the enterprise as soon as possible, answer all kinds of doubts encountered by the students in the production practice, reasonably solve the emergencies, and ensure the professional practice run smoothly.

4.4. Strengthen practice assessment

The evaluation of practice performance should be able to objectively and comprehensively reflect students' mastery of knowledge and skills and learning effects. The characteristics of the practice determine the complexity of its evaluation methods. There should be a targeted scientific design of the evaluation method to comprehensively evaluate the practice effectiveness. Therefore, according to the new professional practice mode, the evaluation method is redesigned, focusing on the process evaluation management and the evaluation of students' hands-on ability, which is divided into two parts: process evaluation and result evaluation.

Process evaluation includes three parts: practice log, practice discipline, and practical process, which mainly evaluates students' attendance, work attitude, desire for knowledge, teamwork ability, practical hands-on ability, etc. during the internship process. The result evaluation includes summary report and the oral defense. The defense can not only exercise students' oral expression and communication skills, promote collaboration among students and further thinking about professional practice, but also help teachers master the degree of students' professional knowledge.

5. CONCLUSIONS

The education of "New Engineering" requires the cultivation of high-quality engineering and technical personnel with theoretical analysis, practical, and creative abilities. The professional practice is a very important part of the practical teaching of mechanical majors. It can affect the degree of professional recognition of students and the choice of employment direction to a certain extent. It is of great importance for student development and should be paid attention to by colleges and teachers.

In order to adapt to the "New Engineering" education needs under the new situation, the practice teaching reform of mechanical majors has continued to deepen. Aiming at the problems in traditional practice, the professional practice teaching system is rebuilt, the practice teaching mode and implementation strategy are reformed, which can effectively improve the teaching effect of mechanical professional practice, and help cultivate engineering and technical personnel with strong practical skills and high comprehensive quality.

ACKNOWLEDGMENTS

This study was supported by the Education Project of Industry-university Collaboration of the Ministry of Education in 2017 (No. 201702141001) and in 2019(No. 20190215034), the First-class Undergraduate Course Construction Project of Shandong Province in 2019 (Automobile Theory), the Undergraduate Teaching Reform Project of Shandong Province Higher Education in 2018 (No. M2018X062) and in 2020(No. Z2020072), the specific subject of China Association of Higher Education in 2021(No. 21ZJD30) and the Teaching Quality Engineering Projects of Linyi University in 2018 and 2020.

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