

# On the construction of characteristic specialty of the local applied undergraduate for the talent training of new engineering course

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**Abstract.** Combine the requirements of new engineering construction and required by China 2025 for professional personnel training, and meet the industry's demand for high-quality technical personnel. This paper takes the mechanical major as an example, puts forward the construction of characteristic specialty for the construction of new engineering course. Reforming the original talent training mode, strengthening the training of engineering application ability and innovative practice ability, and building a characteristic professional teaching and practice system that meets the needs of enterprises and serves local industries. Throughout the project teaching method and the whole teaching process, which is based on engineering practice education center, furthermore, it deepen cooperation between colleges and enterprises, production and education integration, which establishing an all-round quality guarantee and monitoring system. And it cultivates application-oriented engineering practice and innovation ability of the foundation.

## 1 Introduction

As China's economy has entered a new normal, and the "Manufacturing in China 2025" guideline has been put forward, China is making every effort to implement the strategy of building a strong manufacturing country, and the manufacturing industry as a whole is facing the historical task of transformation and upgrading. The global outbreak of the "COVID-19" epidemic has made this transformation even more urgent. At present situation, in order to promote the realization of the strategic goal of "Manufacturing in China 2025" and accelerate the transformation and upgrading of the manufacturing industry, it is imperative to reform the existing talent training system, which poses a challenge to the training of traditional engineering professionals.

Compared with traditional engineering talents, emerging industries and new economies need high-quality compound novel engineering talents with engineering practice capability, innovation capability and international competitiveness. "We urgently need to develop novel engineering talents to support the development of the new economy. At present, the goal orientation of engineering talents training in China is not clear, engineering education

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is too divorced from the reality of industrial enterprises, and engineering students have defects in comprehensive quality and knowledge structure." Zhang Daliang, director of the Higher Education Department of the Ministry of Education, commented on China's engineering education. Wu Aihua, director of the General Department of Ministry of Education of the People's Republic of China, also put forward "five deepening" to promote the implementation of new engineering education. Industry-education integration is an important part of the new engineering education, focusing on the cultivation of engineering education to meet the needs of the industrial field, which requires the coordinated promotion of universities and enterprises.<sup>[1]</sup>

The reform of integration of production and education was clearly put forward at the The 19th National Congress of CPC. In July 2019, at the ninth meeting of the Central Committee for Comprehensively Deepening Reform, the National Pilot Implementation Plan for the Integration of Industry and Education was adopted.<sup>[2]</sup>

Training methods of new engineering construction mainly include interdisciplinary, school-enterprise cooperation, repositioning of local universities, and evaluation of engineering majors.<sup>[3]</sup> This is of great significance to improving the quality of professional talent training and realizing the training requirements of "industry demand orientation, cross-border cross-integration, support and leading industry" for the training of new engineering talents.<sup>[4]</sup>

The employment situation of many engineering graduates is not optimistic because they don't meet the employment standards of enterprises. The reason for this phenomenon is that there is no practical ability training in the training of engineering professionals.<sup>[5]</sup> The practice places of universities in China are generally limited, students are not trained, and their hands-on ability is very poor, which can not meet the requirements of enterprises.<sup>[6, 7]</sup>

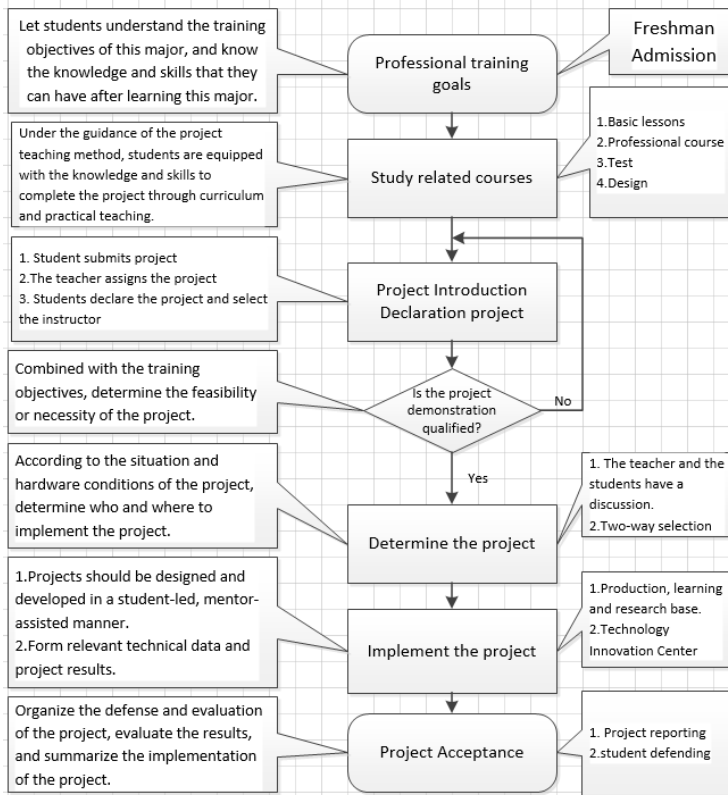
As a local university, Dalian Polytechnic University's graduates' scientific research ability is not as good as that of students from double-class universities, and their practical ability is not as good as that of students from vocational and technical colleges, which leads to the problem of low employment rate. Therefore, in the professional construction, it is necessary to meet the requirements of the construction of new engineering disciplines, promote the order-based training of talents, strengthen students' practical ability, and integrate production and education. Make the school's talent training goals consistent with the job needs of the enterprise, and suit the industrial characteristics and needs of the local economy. In this way, students can quickly adapt to the job position after graduation and meet the market demand for applied professionals<sup>[8]</sup>.

## **2 Construction of teaching and practice system for mechanical specialties**

Reform the talent training mode, formulate talent training programs that meet the needs of the machinery industry, optimize the knowledge structure system, strengthen practical teaching, and cultivate students' professional basic knowledge and engineering practice ability. In order to meet the needs of talent training for the coordinated development of knowledge, quality, ability and literacy, the proportion of credits in practical teaching should reach more than 30% of the total credits, and a teaching system for special professional talent training suitable for the requirements of new engineering construction will be constructed.

Actively promote the combination of talent training for mechanical majors with production practice and social practice. Efforts should be made to form a practical teaching system based on experiments and engineering practice, with engineering design and production as the main line, relying on scientific research and engineering training, and boosted by comprehensive practice. Strengthen the integration of production and education,

rely on the Engineering Practice Education Center, further deepen school-enterprise cooperation, and establish a stable off-campus practice base. Finally, a practical teaching mode of "school-enterprise cooperation, combination of curricular and extra-curricular integration" is formed.



**Fig.1.** Project teaching method process.

## 2.1 Constructing a training mode of characteristic professional talents that meets the requirements of new engineering construction

"Mechanical Engineering" is one of the majors involving a wide range of knowledge and strong practicality. Mechanical design and manufacturing itself is a process, and each stage involves different aspects of knowledge, all of which are related to the teaching content of a certain course. Therefore, in the process of professional construction, according to the professional training objectives, an overall teaching project is formed, and each teaching link is an independent project, serving the overall project and realizing the unity of project and ability. The specific flow is shown in Fig. 1.

In order to expand students' knowledge and improve students' innovation ability and engineering practice ability, the professional curriculum system is divided into four levels: First of all, set up the necessary professional basic courses, build a basic professional knowledge and theoretical foundation platform for students, and guide students to enter the professional field initially. Then set up a series of systematic and professional elective courses to lead students to a deeper and broader field of expertise. Secondly, on the basis of the professional elective course group, special lectures are set up to further enrich and refine the professional knowledge and theories of students, making them truly become

"professionals". Finally, experts inside and outside the school will give various academic reports on the latest research results and applied technologies, so that students can enjoy the infinite scenery of the academic frontier, and demonstrate the basic procedures and methods of academic research for students.

Adopt broad basic education, fine professional knowledge and training characteristics that are closely combined with practical innovation. Focus on cultivating students' self-learning ability, able to find problems, analyze problems, solve problems and carry out innovative work. In the course setting, professional courses and practical teaching links with obvious industry characteristics are set up to strengthen the training of professional skills and practical ability, so that students can quickly be competent for technical work in the industry after employment.

Through this new application-oriented talent training model, it focuses on cultivating students' basic quality, professional quality, engineering practice ability and innovation ability, and improving their employment competitiveness and entrepreneurial ability.

## 2.2 Constructing a Practical Teaching System Supporting the Cultivation of Applied Talents

In order to meet the requirements of new engineering for talent training, strengthen the connection with the production practice of enterprises, and play the role of combining production, education and research, a practical teaching system as shown in flow chart 2 is constructed.<sup>[9, 10]</sup>

The reformed practical teaching system focuses on solving the problems of short, scattered, and unsystematic practical teaching and training, and the quality of practical teaching cannot support the cultivation of higher-level innovative and applied talents required by the construction of new engineering disciplines.

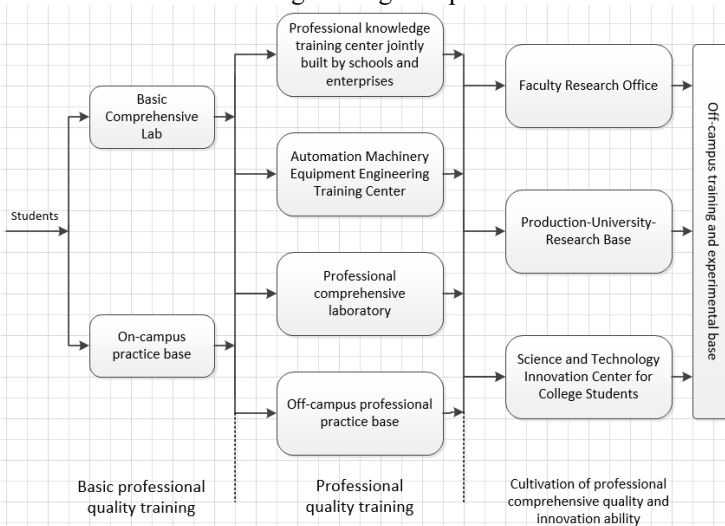


Fig.2. Practical teaching system.

## 3 Construction of teaching guarantee and monitoring system

The construction of teaching quality assurance and monitoring system has played an important role in improving the quality of personnel training.

### 3.1 Quality assurance model and system structure

The teaching quality assurance system structure is shown in flow chart 3. The teaching quality monitoring and guarantee system is constructed by teachers' evaluation of learning, students' evaluation of teaching, and leading experts' listening to lectures.

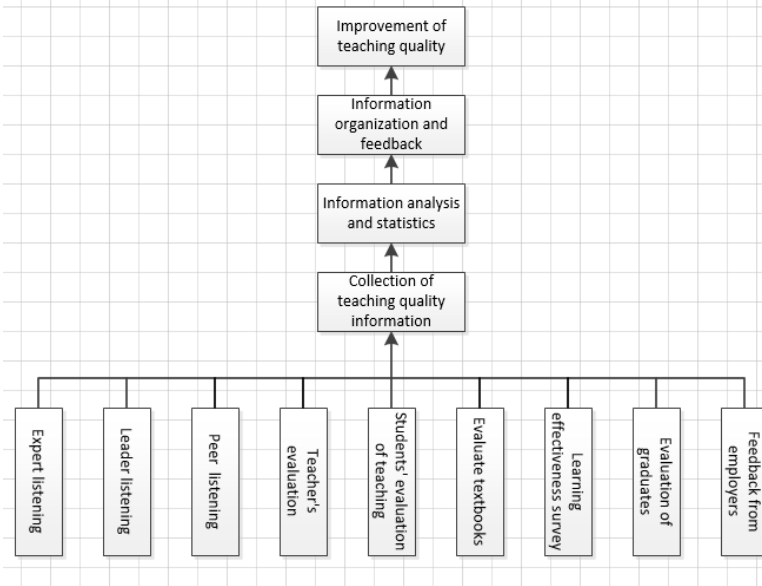


Fig. 3. Teaching quality assurance system structure.

### 3.2 Monitor the teaching quality of teachers

According to the quality supervision system, clear requirements are put forward for each teaching link. Make the teaching process have rules to follow, and the quality of work in each link is guaranteed.

The implementation of quality standards is collected from five perspectives, including leadership, supervision, students, peers, and graduates. Collect a lot of information through different monitoring planes.

### 3.3 Improve the teaching quality of teachers

The college verifies the collected teaching feedback information, and then gives feedback to each major or the corresponding teachers, and requires timely correction.

## 4 Conclusions

The construction and development of new engineering courses provide local colleges with new school-running direction and transformation goals. Through benchmarking the construction of mechanical specialty of new engineering courses, the professional characteristics of "adapting to the needs of enterprises, serving the development of local industries and deeply integrating production and education" are created. Implementing application-oriented education reform by implementing project teaching method; Relying on the construction of engineering practice education center by schools and enterprises, the cooperation between schools and enterprises will be deepened,

production and education will be integrated, students will be guided to actively innovate, and an all-round and multi-angle quality assurance and monitoring system will be established, which will lay the foundation for cultivating high-level applied engineering and technical talents with engineering practice and innovation ability. The next step is to constantly sum up and improve in the process of new engineering construction, so as to realize the high-quality development of mechanical specialty education.

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