

Evaluation and Analysis of the Implementation Progress of the "Excellent Engineer Education and Training Plan" in Universities

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Abstract: Based on the "Excellent Engineer Education and Training Plan" as the research foundation, this article analysis the implementation purpose, characteristics, and effectiveness of the Plan, and focuses on discussing the implementation path and problem analysis of excellent engineer education from seven aspects: the development of school training standards and professional training plans, reform of curriculum system and teaching content, implementation of research-based learning methods, construction of engineering teacher team, cooperation between schools and enterprises to cultivate excellent engineers, internationalization of excellent engineer training, and selection and quality improvement of student sources.

Keywords: Excellent Engineer Implementation Progress, Implementation, Path

1. Introduction

The "National Education Medium and Long Term Development Plan (2010-2020)" proposes to implement the Excellent Engineer Education and Training Plan. On June 23, 2010, the Ministry of Education, in collaboration with industries, enterprises, and other departments, proposed the "Excellent Engineer Education and Training Plan" for the engineering education reform project. On October 17, 2018, the Ministry of Education launched the implementation of the "Six Excellence and One Top" Plan 2.0. Building on the achievements of the "Excellent Engineer Education and Training Plan" in engineering education reform, it further strengthens its sense of responsibility in the new era, strengthens strategic thinking towards new changes, creates new models, strengthens innovative spirit, enhances new connotations, and enhances quality effects. It repositions and comprehensively improves the quality of higher education in China, and develops new engineering disciplines New medical science, new agricultural science, and new humanities.

2. The Implementation Purpose and Characteristics of the "Excellent Engineer Education and Training Plan"

The purpose of implementing the "Excellent Engineer Education and Training Plan" mainly includes two aspects: firstly, to cultivate a large number of high-quality engineering and technical talents with strong innovation ability. The second is to take the implementation of the plan as a breakthrough point [1].

The plan mainly has three training characteristics: (1) industry enterprises deeply participate in the process of talent cultivation in universities; (2) Universities need to integrate the organizational implementation requirements of the plan and the needs of employers; (3) Universities need to develop targeted measures to strengthen the training of weak link abilities based on students' different characteristics in theoretical knowledge, practical abilities, and innovative methods. The plan should follow the principles of "industry guidance, school enterprise cooperation, classified implementation, and diverse forms" in the implementation process. The plan has five key tasks: (1) exploring new norms for joint training of talents between schools and enterprises; (2) The cultivation mode of innovative engineering and technical talents; (3) Building a high-level engineering education faculty; (4) Enhance the degree of engineering education in line with international standards; (5) Develop the "Excellent Engineer Education and Training Plan" talent training standards [2].

3. Implementation effectiveness of the "Excellent Engineer Education and Training Plan"

The quality of graduates who participated in the plan has highly recognized by the industry. 16 ministries and 22 industry associations have participated in the construction. Currently, 626 national engineering practice education centers have been established. China has also officially joined the Washington Agreement of the International Engineering Education Alliance.

The implementation of the plan not only leads the reform of engineering education in China, but also plays an important role in promoting and demonstrating higher education reform. Among the graduates who participated in the plan, 98% of them continued to pursue graduate studies; 48% of them have entered the top 50 disciplines in the world to continue their studies, while 118 have entered the world's top ranked disciplines or institutions [3].

4. Implementation Path and Problem Analysis of the "Excellent Engineer Education and Training Plan"

(1) Development of school training standards and professional training plans

The formulation of training standards for various universities mainly focuses on the qualities and abilities that talents should possess from different perspectives such as school level, professional level, and degree level. When formulating standards, they should comply with national general standards and industry standards, and combine the talent training positioning and characteristics of the school, as well as the feasibility and evaluability of the standards.

The basic situation of the development of professional training plans in various universities: firstly, participating universities have basically put forward the overall idea or guiding ideology of formulating professional training plans; Secondly, practice is the soul and foundation of engineering, and it is also the essential requirement of engineering education.

The existing problems are mainly reflected in the following aspects: firstly, when formulating school training standards, insufficient consideration is given to national and industry standards; Secondly, when formulating school training standards, it did not fully consider the situation of school level talents and majors; Thirdly, the standards formulated are relatively macro abstract; Fourthly, the standards formulated do not fully consider non-academic requirements [4].

(2) Reform of curriculum system and teaching content

The overall evaluation of the curriculum system and teaching content reform in various universities mainly includes: participating in the formulation of professional training plans, and doing a lot of work in curriculum reform and integration, which is mainly reflected in: firstly, aiming to comprehensively improve abilities in the curriculum system and teaching content reform; Secondly, highlight the "engineering" nature of the curriculum; Thirdly, emphasis should be placed on the modularization of the curriculum system; Fourthly, increase the proportion of practical class hours in the curriculum system; Fifth, leverage interdisciplinary advantages in curriculum design; The sixth is to significantly integrate and restructure the original curriculum.

The existing problems are mainly reflected in the following aspects: firstly, the integrity of the curriculum system still need to be improved; Secondly, the connection between professional courses and practical applications is not yet close enough; Thirdly, the interdisciplinary and comprehensive nature of disciplines and majors is not yet given enough attention; Fourthly, the pilot scope is relatively narrow and lacks coordination with other departments.

(3) Promoting research-based learning methods

The overall evaluation of the implementation of research-based learning methods in various universities is mainly as follows: firstly, adopting student-centered research learning has enhanced the initiative of learning; Secondly, adopting a multi-dimensional evaluation approach to objectively reflect students' comprehensive abilities; The third is to adopt a learning approach that combines theory with engineering practice, which is more conducive to stimulating learning interest.

The existing problems are mainly reflected in the following aspects: firstly, there are generally no textbooks or curriculum standards for research-based learning courses. Secondly, research-based learning can easily evolve into activity classes and fail to achieve corresponding training objectives. The third is the decoupling between research-based learning and practical aspects [5].

(4) Construction of engineering teacher team

The overall evaluation of the construction of engineering teacher teams in various universities is mainly as follows: firstly, a pilot professional teacher appointment mechanism for the plan has been established; Secondly, attach importance to the cultivation of teachers' research, practice, and innovation abilities; Thirdly, a comprehensive incentive mechanism and evaluation system have been gradually established; The fourth is to explore the direct introduction of teachers from enterprises or research institutions.

The existing problems are mainly reflected in the following aspects: firstly, the proportion of young teachers is relatively high, and they generally lack engineering practical experience; Secondly, the assessment and evaluation system still focuses on the level of scientific research, and teachers' energy is mainly invested in theoretical research, paper publication, and various project applications; Thirdly, the number of teachers introduced by enterprises or research institutions is relatively small. The collaborative mechanism between part-time teachers in enterprises and full-time teachers on campus is not yet perfect.

(5) Collaborating between schools and enterprises to cultivate outstanding engineers

The overall evaluation of the cooperation between universities and enterprises in cultivating outstanding engineers mainly includes: firstly, adopting various forms of school enterprise cooperation; Secondly, different types of participating universities have fully utilized their advantages and continuously innovated cooperation models with enterprises in various industries, achieving fruitful progress. Thirdly, both schools and enterprises have conducted in-depth cooperation in talent cultivation, practical training courses, training systems, enterprise empowerment, training guidance, and other aspects, effectively promoting the comprehensive integration of structural elements on the supply side of talent cultivation and the demand side of industrial development.

The existing problems are mainly reflected in the following aspects: firstly, the enthusiasm of enterprises is not high; Secondly, the cooperation between schools and enterprises is not in-depth; Thirdly, the cooperation between schools and enterprises is not comprehensive.

(6) Internationalization of Excellent Engineer Training

The overall evaluation of the internationalization of cultivating outstanding engineers mainly includes: firstly, hiring experts and scholars from renowned overseas universities to participate in teaching; Secondly, expand the proportion of bilingual teaching and full foreign language teaching courses in pilot majors; The third is to introduce overseas scholars and select teachers to study and exchange in foreign universities; The fourth is to implement multi- mode Sino foreign joint training for pilot major students; The fifth is to carry out overseas internship, exchange learning and other overseas learning projects; Sixth, hold an international engineering education conference to conduct in-depth discussions on common and cutting-edge engineering education issues; The seventh is to establish the international engineering education alliance to further deepen and expand international cooperation in engineering education [6-10].

The existing problems are mainly reflected in the following aspects: firstly, the actual situation of China's industry was not considered, the characteristics and traditions of engineering talents at our school were ignored[11-14]; Secondly, some universities have overlapping disciplinary knowledge systems; Thirdly, the existing curriculum system and textbooks are also difficult to align with international standards; Fourthly, there is a gap between the teaching organizational form and teaching methods; Fifth, the main focus will be on selecting students to go abroad. However, due to limitations in funding and foreign reception capabilities, it is not possible for students to benefit too widely; On the other hand, due to limited time spent studying abroad, students are unlikely to stay abroad for a long time. In addition, it is difficult for "introduced" teachers to quickly accept and integrate into China's engineering education practice mode[15-16].

(7) Student source selection and quality improvement

In terms of student source selection and quality improvement in various universities, through sampling sample statistics, 48.3% of the students participating in the plan have academic performance in the top 20 of the class, 48.3% of the students have received one or more scholarships, 21% of the students have a computer level 2 level, 34% of the students have a high learning enthusiasm, and 80% of the students have an English level 4 or above[17-18].

Selecting a group of high-quality students is the foundation for promoting the cultivation of

"outstanding engineers" and plays a crucial role in the final output quality of engineers. The theory of human capital proposes that population quality is the determining basis for the formation of human capital, and improving population quality is the key to achieving human capital. Similarly, the cultivation of outstanding engineers can't be separated from excellent student sources.

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