Research of Fusion Innovation of "Excellence Program 2.0" and "Engineering Education Professional Certification" for Major in Electrical Engineering and Automation

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Abstract: "Excellence Program 2.0" and" Engineering Education Professional Certification "are the higher quality requirements for higher education personnel training in China. And it is also a major measure to promote our country from a large country of engineering education to a powerful country of engineering education. This paper analyzes the relationship between "Excellence Plan 2.0" and "Engineering Education Professional Certification" in professional construction. In view of the promotion of "Excellence Plan 2.0" in electrical engineering and automation major, the development idea of" Excellence Plan 2.0" talent training is put forward in our school. Only when the two achieve the integration of innovation in the aspects of training objectives, curriculum system, teaching staff and practical links, innovative and outstanding engineering and technical talents for new engineering can be cultivated.

Keywords: electrical engineering; personnel training; excellence plan 2.0; engineering education professional certification; new engineering

1. Introduction

The excellent engineer education training program (abbreviated as the excellence program) is a major measure to promote our country from a large country of engineering education to a powerful country of engineering education. The excellent engineer Education and training program 2.0 is an upgraded version of the "Excellence Program ", that is, the construction of new engineering, which mainly refers to the new engineering research and practice project plan implemented by the Ministry of Education. Since the launch of China's "Excellence Program" in 2010, various institutions of higher learning have introduced various measures to promote the reform of engineering education, and comprehensively improve the quality of personnel training in engineering education of all specialties, and to provide outstanding engineering talent support for the country to take the new road of industrialization development, building an innovative country. After ten years of exploration and practice, colleges and universities have made remarkable achievements in the reform of talent training mode, cooperative education between schools and enterprises, construction of engineering teachers and engineering education facing the world, and the practical ability, innovation ability and comprehensive quality of college students have been obviously improved [1].

In September 2018, the Ministry of Education, the Ministry of Industry and Information Technology and the Chinese Academy of Engineering jointly issued the "Opinions on speeding up the construction and development of new engineering to implement the education and training plan for outstanding engineers 2.0", which aims to speed up the development of new engineering and strive to promote China to become a powerful country in engineering education [2]. With the further development of the upgraded version of "Excellence Plan 2.0", engineering majors in colleges and universities have met new opportunities and challenges. Based on the background of engineering certification, this paper discusses the construction of "Excellence Plan 2.0" training system for electrical engineering and automation major in our school.

2. The Construction Relationship between "Excellence Plan 2.0" and "Engineering Education Professional Certification"

The plan of excellence is an important measure to promote China's transition from a large country of engineering education to a powerful country of engineering education in order to train a large number of high-quality engineering and technical talents who have strong innovation ability and meet the needs of economic and social development. It is an important demonstration and guidance for the country to take the road of new industrialization development, to build an innovative country and to strengthen the country with talents, to promote higher education to train talents for social needs and to improve the quality of engineering education personnel training in an all-round way. "Excellence Plan 2.0" is a continuation of" Excellence Plan 1.0", is to continue to promote the new engineering research and practice projects, constantly bring up a family home

country feelings, global vision, innovative spirit and practical ability of outstanding talent program. It is characterized by the construction of new engineering courses as an important grasp, the deep participation of industry enterprises in the training process, colleges and universities according to general standards and industry standards to train engineering personnel, pay attention to strengthen the cultivation of students' engineering ability and innovation ability, continue to deepen the reform of professional engineering education.

"Engineering education professional certification" is an international quality assurance system of engineering education, and it is also an important foundation to realize international mutual recognition of engineering education and engineer qualification. The core of engineering education professional certification is to confirm that engineering graduates meet the established quality standard requirements recognized by the industry, and it is a kind of qualification evaluation guided by the training goal and export requirements. Engineering education professional certification requires the establishment of professional curriculum system, the allocation of teachers, and the improvement of school conditions and so on, all around the graduation ability of students to achieve this core task, and emphasizes the continuous improvement mechanism of specialty to ensure the quality of professional education and the vitality of professional education. Its characteristics are student-centered, result-oriented certification concept, pay attention to learning results, and emphasize the international substantive equivalence certification standards. The purpose of professional certification is to make colleges and universities more clear about the standards and basic requirements of engineering professional certification, improve teaching conditions, promote the construction and professional development of teachers, and promote the standardized management and monitoring of teaching quality [3]. And strengthen the link between higher engineering education and industry, industry deeply participate in the development of training program, training process improvement and training results acceptance. Through the evaluation of students' comprehensive ability of communication, cooperation, professional knowledge and skills, lifelong learning, the reform of engineering education is promoted, and to promote international exchanges and cooperation in higher engineering education and enhance the international competitiveness of engineering and technical personnel. From the point of view of professional certification, it coincides with the goal of "Excellence Plan 2.0", both of which aim to create outstanding engineering talents with family home country feelings, global vision, innovative spirit and practical ability.

3. Synchronic Link between "Excellence Plan 2.0" and "Engineering Education Professional Certification"

(1) Synchronization of training goals and standards

Engineering education certification is mainly to check whether the major has the training objectives and graduation requirements to meet the needs of social and economic development, whether there is a perfect talent training system, and whether there should be conditions to support the continuous improvement of the major. At the same time, engineering education certification emphasizes the participation of industry in engineering education and examines the achievements of students in about 5 years of graduation. The plan of excellence requires the establishment of a cooperative mechanism between colleges and enterprises to jointly train talents, with the core goal of strengthening engineering practice ability, design ability and innovation ability, carrying out a variety of teaching methods based on problem, project, case and so on, and strengthening the training of cross-professional and interdisciplinary talents. It can be seen that both require the establishment of the talent training standard system in colleges and universities according to the general standards and industry requirements in order to ensure the achievement of the training goals [4].

In terms of training objectives and standards, engineering education certification and excellence program are very focused on practical links and integration of industry, university and research. According to the connotation of "Engineering Education Certification" and "Excellence Plan 2.0 ", and combined with the orientation and foundation of our university, the training goal of electrical engineering and automation specialty is worked out. That is, this major has solid basic theoretical knowledge and professional skills of mathematical and computer science and technology, good engineering practice ability and innovative research ideas and methods; and good humanities, social responsibility and professional integrity, international vision and teamwork spirit, able to play a role in the team [4,5]. And in the field of electrical engineering can be engaged in the design and development of electrical engineering equipment and power system operation and maintenance work, but also in domestic and foreign institutions of higher learning, scientific research institutes, or in government departments and enterprises engaged in management work.

(2) Synchronization of curriculum system

Curriculum system is the key way to achieve the goal of talent training. Both "Engineering Education Certification" and "Engineering Excellence Program 2.0" attach great importance to the curriculum system, but their focus is different.

In terms of curriculum types, engineering education certification has 8 modules for electrical engineering and automation courses. These modules are the public basic course compulsory module, the public basic course elective module, the engineering basic course compulsory module, the engineering basic course elective module, the specialized basic course compulsory module, the specialized direction class curriculum, the specialized practice module and the quality expansion module. In the public basic course selection module, there are three kinds of courses: physical and mental health, art and

economics, in which the art course is not less than 4 credits, and the students take it independently from the second semester. Art courses include public art, artistic creation and aesthetic experience, art and technology, art design, art theory and criticism, music appreciation. At the same time, the courses related to artificial intelligence are added in the elective module of engineering basic course, the optional course module of professional direction and the quality expansion module. Two courses of intelligent game and deep learning are added in the elective module of engineering basic course. Four courses including data mining, machine learning, uncertainty artificial intelligence and image cognition, are added to the optional course module of professional orientation class. Introduction to artificial intelligence and brain cognition are included in quality development module.

"Engineering Excellence Program 2.0" emphasizes strengthening engineering ability as the core, following engineering characteristics, vigorously reforming curriculum system and teaching form, and requiring colleges and universities to jointly formulate training objectives, jointly build curriculum system and teaching content, jointly carry out training process, and jointly evaluate teaching quality.

According to the adjustment of the existing personnel training plan of electrical engineering and automation major, the students of this major should take all kinds of courses according to the requirements of the training plan, with a minimum total credit of 164 credits, including 128.5 credits for theoretical courses and 35.5 credits for practical courses. The compulsory courses include public basic courses in mathematics and natural sciences, general education courses in humanities, social sciences and arts, basic courses in engineering, basic courses in specialty, engineering practice and graduation design, quality development, etc. The required courses account for 84.15% of the total credits. Elective courses include general education courses in humanities, social sciences and arts, basic engineering courses, courses in professional direction, etc. Elective courses account for 15.85% of total credits. The credit settings for each course are shown in Table 1.

Table 1. The credit settings of courses for electrical engineering and automation.

Project			Credit		Percentage share
Total graduation credits			164		100
Theory courses	(Public basic) mathematics and natural science courses	Required courses	26	26	15.9
	(Public foundation) general education course in humanities, social sciences and arts	Required courses	31.5	37.5	22.9
		Limited courses	6		
	Basic engineering courses	Required courses	28	32	19.5
		Optional courses	4		
	Professional basic courses	Required courses	17	17	10.4
	Professional courses	Limited courses in professional orientation	14	16	9.7
		Professional orientation optional courses	2		
Practice links	Engineering practice and graduation design	Required practical courses	31.5	35.5	21.6
		Required courses in professional orientation	2		
	Quality development	Required courses	2		

(3) Synchronous convergence of teaching staff

Both "Engineering Education Certification" and "Excellence Plan" require teachers to possess lofty professional spirit and professional ethics, rich engineering experience and outstanding practical teaching ability. Both can employ engineering technicians and managers with rich engineering experience as part-time teachers from enterprises. Some schools require full-time teachers to have 1-2 years of practical experience in enterprise engineering. Therefore, the school formulates the related measure to encourage the young teacher to go to the enterprise exercise, encourage in-service teachers to cooperate with enterprises to undertake projects. On the one hand, improving teachers' practical ability, on the other hand make production, learning, researching integration. At the same time, the introduction of new teachers to the engineering background and practical ability its purpose is to achieve a reasonable allocation of teachers [4-7].

(4) Synchronization of practice links

Engineering education certification and excellence program pay great attention to the cultivation of students' practical ability. In order to meet the requirements of "Engineering Education Certification" and "Excellence Plan 2.0", the practical teaching links are divided into four categories: in-course practice, curriculum design, in-school practice and out-of-school practice. Practice runs through four years of undergraduate studies. First of all, the course "Introduction to Major" is arranged in the first semester of students' admission. The purpose is to give students a preliminary understanding of their study and work status after graduation, and to establish a clear learning goal and academic planning. In the teaching of a series of basic courses and professional courses, in-class experiments and multi-course design are set up for the main courses, in order to make the students better apply the theoretical knowledge to practical problems. In the third year of university, comprehensive practical links

such as cognitive practice and production practice were set up to further improve students' comprehensive application and practical ability. In the last academic year of the university, a graduation project was set up to further enhance the students' practical operation ability, problem-solving ability and innovation ability. In addition, college students' innovation and entrepreneurship competition, electronic design competition and other extracurricular activities are also effective ways to cultivate students' practical application ability and innovation ability [4,8].

4. Conclusions

"Excellence Plan 2.0" is an important part of quality engineering of higher engineering education, an effective way to train outstanding engineering talents, and plays a very important role in the formation and development of China's industrial system. With the further advancement of the new revolution of science and technology and industrial change, The implementation of "Excellence Plan 2.0" of electrical engineering and automation major in our school should be combined with "Engineering Education Professional Certification", and the construction of "New Engineering" should be taken as the starting point to realize synchronous convergence and innovation integration in the training goal, curriculum system, teaching staff and practical links. In order to train innovative and outstanding engineering talents to the new engineering, give play to the vanguard role of electrical engineering and automation specialty in the construction of new engineering in our school.

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