

Construnction of National First-Class Undergraduate Major of Electronic Information Engineering

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Abstract: The main problems of Chinese higher education are insufficient support for personality development, insufficient attention to the real world and weak grand and profound thinking. To this end, the Ministry of education implements the “double ten thousand plan” for the construction of first-class undergraduate majors with the notion of facing the future, adapting to the requirements, leading the development, advanced concept and powerful guarantee. With the construction of national first-class undergraduate major as the starting point, we carry out the following educational reform. (1) We make every effort to build and promote the five-elements talent training mode of “integration of knowledge and practice”. The five-elements talent training mode means “Sino US cooperation in running schools pilot class, excellent engineer program pilot class, strategic emerging industry program pilot class, Xiangtao talent program pilot class, ordinary undergraduate innovation and entrepreneurship special zone”. (2) We build the curriculum system of “transboundary and integration”. “Transboundary and integration” includes the cross-border of Chinese and foreign curriculum system, enterprise and school, professional integration and cross-border, humanistic quality and engineering quality, emerging artificial intelligence and traditional telecommunications. (3) We build the international double-certificated “first-class” teaching staff. (4) We implement the “student-centred” teaching methods. (5) We build the practical education system of “innovation and entrepreneurship”. (6) We improve the TQC (Total Quality Control) with national standard on the teaching quality and engineering education professional certification. (7) We build “first-class” teaching environment. In this construction process, we combine both innovative spirit and engineering practice ability of students, improve the quality of talent training, and cultivate a group of high-quality applied talents with “steel quality”. Our reform experience can be extended to the majors of computer and electrical engineering, even as a theoretical reference for the construction of other first-class undergraduate majors.

1. Introduction

The Sino-US trade war ^[1] reflects Chinese relatively weak position in the world economic system, that is, the lack of competitiveness in key fields. From the perspective of education system, the main problems of Chinese higher education are insufficient support for personality development, insufficient attention to the real world and weak grand and profound thinking. To this end, the Ministry of education implements the “double ten thousand plan ^[2]” for the construction of first-class undergraduate majors with the notion of facing the future, adapting to the requirements, leading the development, advanced concept and powerful guarantee. The concepts of ideological and political education, “emerging engineering education ^[3]”, collaborative education ^[4], student-centred, professional certification ^[5] and so on, which are involved in the construction of first-class undergraduate major, are not new topics and have been studied at home and abroad. In the last century, American educator John Dewey and Swiss educator Jean Piaget put forward the concept of student-centred education. Since 2005, China has carried out the pilot project of engineering education professional certification. In 2017, the Ministry of Education organized relevant enterprises to support colleges and universities to jointly carry out the cooperative education project of industry university cooperation, and began to actively promote the construction of “emerging engineering education”. A group of experts and scholars represented by Professor Wang Zhigong and Professor Lv Zhiwei put the new ideas and mechanisms into practice, and popularized the successful experience in electronic information engineering major. With the first-class undergraduate major construction as the starting point, we vigorously promote the ideological and political education into the classroom, “emerging engineering education” construction, collaborative education, student-centred, professional certification and other work, so as to improve the quality of undergraduate education in an all-round way.

Electronic information engineering major involves many strategic emerging industries, and it is one of the six largest specialties to be built in the national first-class undergraduate major. Local colleges and universities should seize the historical opportunity to promote the discipline and major construction by taking the opportunity of “first-class undergraduate major” construction.

Taking the electronic information engineering major of Wuhan University of science and technology as an instance, we expound the construction of national first-class undergraduate major in this paper.

2. Construction of National First-Class Undergraduate Major

Under the double background of engineering education professional certification and “emerging engineering education”, this project takes the first-class undergraduate major construction as an opportunity, takes “facing the whole, teaching by classification, strengthening practice and improving quality” as the teaching philosophy, takes cultivating high-quality engineering and technical talents with “thick foundation, strong ability, wide adaptability and innovation” as the goal, strengthens school-enterprise cooperation and implements open teaching mode, build “golden course”, eliminate “water course”, and build a talent training system to meet the requirements of economic and social development. Therefore, the contents of this project include: talent training mode, curriculum system, teaching staff, teaching methods, practice teaching system, TQC (Total Quality Control), teaching environment and so on.

2.1 Five-Elements Talent Training Mode of “Integration of Knowledge and Practice”

According to the engineering education professional certification standards and the professional norms issued by the Ministry of education, according to the different requirements of social development and economic construction, according to the different characteristics and interests of students, the five-elements talent training mode of “integration of knowledge and practice” is

constructed and promoted. Learning from the advanced ideas and experience of engineering education at home and abroad, through the “integration of knowledge and practice”, we combine the basic theory and engineering practice, and implement the cultivation of innovation and entrepreneurship ability. Through the communication and collision between teachers and students at home and abroad, inside and outside the school, among majors, we further improve the innovative consciousness and inspiration of both students and teachers. We vigorously promote the five-elements training mode of “Sino US cooperation in running schools pilot class, excellent engineer program pilot class, strategic emerging industry program pilot class, Xiangtao talent program pilot class, ordinary undergraduate innovation and entrepreneurship special zone”.

2.2 Curriculum System of “Transboundary and Integration”

By enriching curriculum resources, the curriculum system of “transboundary and integration” is constructed. Through the introduction of nearly 20 high-quality theoretical and practical courses from the United States, the transboundary development of Chinese and foreign information curriculum system has been realized. Through the introduction of enterprise courses and the employment of enterprise teachers in the training program of information major group, the transboundary relationship between enterprises and schools is realized. Through the integration of training programs of different levels and different majors, the integration and transboundary of majors are realized. Through the introduction of engineering ethics, engineering laws and other humanities curriculum content, the transboundary integration of humanistic quality and engineering quality is realized. Through the introduction of artificial intelligence, Python and other courses, the transboundary integration of emerging artificial intelligence and traditional telecommunications is realized. Through transboundary, we can learn from each other, cross integrate, and further improve the innovation and entrepreneurship ability of students.

2.3 International Double-Certificated “First Class” Teaching Staff

Taking the Ministry of education's Sino foreign joint training program as the platform and the multi-level school enterprise high-quality talent training program as the carrier, it has laid a solid teacher foundation for the cultivation of excellent engineering and technological talents with strong innovation ability, adapting to economic and social development and international competitiveness. In order to expand the international vision of students and teachers, we learn international advanced teaching concepts and methods, and make use of advanced international teaching resources. Through the positive interaction and collaborative efforts of foreign teachers, excellent professional teachers, enterprise tutors and school tutors, we can lay a solid foundation of humanistic and engineering literacy for students' international innovation and entrepreneurship ability. At the same time, in order to enhance the ability of localized innovative engineering and entrepreneurial awareness, the teaching team gave full play to the role of the national engineering practice education base, provincial engineering training centre, provincial experimental demonstration centre and Engineering Research Centre of the Ministry of education, and built a linkage mechanism between enterprises and schools. We have established good cooperative relations with Moore8, Eefocus, Wuhan Easy Start Technology Company, Wuhan Guangting Information Technology Company and other enterprises. We have employed engineers who have worked in Silicon Valley and have rich practical experience as enterprise course tutors and internship training tutors.

2.4 “Student Centred” Teaching Method

We take “student oriented and student-centred” as the concept of the education reform. Through the analysis of students' learning psychology and process, we reconstruct the learning process, explore and implement the teaching methods including heuristic, inquiry, seminar and flipped classroom, actively implement micro class, MOOC (Massive Open Online Course), SPOC (Small Private Online Course) and other open teaching mode, use “smart classroom” and other advanced teaching facilities to realize “offline and online integration” teaching method. In view of the current electronic information class after 00 students' high comprehensive quality, strong subjective consciousness, self-confidence, active thinking, network lifestyle, yearning for deep-seated international exchanges and other characteristics, in the cultivation of students' innovation and entrepreneurship ability, we need to help students determine their learning dominant position. For conventional curriculums, we explore “smart classroom” and other advanced teaching facilities, drive teaching and guide students to actively participate in the teaching process. For online curriculums, through the national resource sharing course including MOOC, SPOC, micro class and other teaching means, we guide students to collect information, design solutions, and finally solve problems. By this means, students obtain the necessary knowledge, skills, and literacy reserves for innovation and entrepreneurship with an active attitude.

2.5 Practical Education System of “Innovation and Entrepreneurship”

Relying on the Ministry of Education Internet plus China made the 2025 production and teaching integration innovation base, we build the “Three carriers, three combinations” practical education system of innovation and entrepreneurship. In the process of cultivating the practical ability of students, we should break the traditional concept of emphasizing theory and neglecting practice, fully integrate and utilize the existing resources, and have formed a unique practical education system. This novel practical education system takes innovation and entrepreneurship projects, student competition, graduation design (Thesis) as the carrier, combining project training with base construction, combining in school competition with out of school competition, combining project training with out of school competition, and combining graduation design (Thesis) with engineering practice.

2.6 TQC with National Standard on Teaching Quality and Engineering Education Professional Certification

We should conscientiously study and implement the national standard on the teaching quality of “Electronic Information Engineering”, actively carry out the research and practice activities of “emerging engineering education” and the activities of “artificial intelligence into the classroom”, take the engineering education professional certification as the starting point, take the quality as the foundation, take the demand as the guidance, introduce the multi feedback mechanism, and continuously improve the training scheme.

The requirement of Engineering Education Accreditation for teaching quality management is a process of teaching quality control and continuous improvement through systematic teaching content, standardized teaching process and standardized teaching management, and finally to improve students' ability to solve complex problems and cultivate lifelong learning habits. The requirement of engineering education professional certification is different from that of traditional education. It needs to make the whole education process under control through quality management. Based on the guidance of engineering education professional certification, the links of teaching quality management in colleges and universities include: whether the formulation of training objectives and graduation requirements is reasonable; whether the teaching materials are of high quality and keep up with the frontier of the subject; how the quality of teaching is; whether the

teaching plan is in line with the standard; whether practical courses can effectively improve students' application ability; whether the examination conforms to the standard; whether the performance analysis is in place; and whether there is corresponding feedback from each link.

Under the guidance of the discipline committee and the Teaching Steering Committee, the major supervises and manages the teaching content, teaching process, examination and assessment of teachers, so as to ensure the teaching quality and continuous feedback and continuous improvement.

2.7 First-Class Teaching and Research Foundation and Environment

The Institute has the Ministry of Education Internet plus China manufacturing 2025 integration of education and innovation base, “experimental teaching demonstration centre of electrical and electronic province”, “intelligent technology and control”, Hubei university student innovation base, “Control Science and Engineering” Doctor Authorization Centre and Post-doctoral Research Station, engineering research centre of Ministry of education, provincial excellent courses including “Communication principle” and “Microcomputer Principle and application” and so on.

In 2019, our teaching team and its department were approved as the national first-class undergraduate major construction site, excellent grass-roots teaching organization of ordinary undergraduate universities in Hubei Province, and the teaching team of “series courses of signal and information processing” in colleges and universities in Hubei Province. Besides, we built an image processing laboratory.

The above platforms and achievements provide strong support and guarantee for the construction of national first-class undergraduate major.

3. Conclusion

In this paper, we take the electronic information engineering major of Wuhan University of science and technology as an instance, and expound the construction of national first-class undergraduate major. This project is an applied subject of combining theory with practice. Its research objective is to clarify the research ideas and guiding ideology through the analysis of relevant theories, and build and implement the national first-class undergraduate major construction of electronic information engineering. In this process, the cultivation of college students' innovative spirit and engineering practice ability should be organically combined to effectively improve the quality of talent training and cultivate a group of high-quality applied talents with “steel quality” in electronic information engineering.

The scope of implementation of this project is undergraduate majoring in electronic information engineering in Wuhan University of Science and Technology. The theoretical basis, theoretical framework and practical experience of the construction of the first-class undergraduate major of electronic information engineering reveals the internal mechanism of the electronic information engineering teaching system, and its conclusion has a high universality. Through the analysis and summary of the reform results of this major, our reform experience can be extended to the majors of computer and electrical engineering, even as a theoretical reference for the construction of other first-class undergraduate majors. The direct beneficiary groups of this project are undergraduate students and corresponding teaching teachers of the electronic information engineering major and the communication engineering major in our university.

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