

Exploration and Practice of Practice Curriculum System Reform based on New Engineering and Engineering Certification¹

— Taking Navigation Engineering Major as an Example

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Abstract: Under the dual requirements and standards of new engineering construction and engineering education professional certification, this paper explores the construction and reform of the practical curriculum system of Navigation Engineering Major of Civil Aviation Flight University of China. By reforming the training objectives, reconstructing the practical curriculum system, and connecting with the requirements of industry standards, the five-level of practice curriculum system of “labor, cognition, foundation, specialty and innovation” has been constructed. and then through the multi-dimensional instructional modes such as virtual reality integration, online and offline integration, opening integration and stimulating innovation, School-Enterprise Cooperation and collaborative education, we can cultivate professional students’ ability of active exploration, practice innovation and engineering application in stages and all directions. The professional recognition and employment competitiveness of students has been improved, which can be used as a reference for the practice curriculum teaching of new engineering and engineering certification majors.

Keywords: New engineering; Engineering certification; Navigation Engineering; Practical teaching; Instructional model

Introduction

In 2016, China became a full member of the Washington Agreement, the International Undergraduate Engineering Degree Mutual Recognition Agreement, marking that the quality and guarantee of engineering education in China can be recognized by the international engineering education community, which means that it can provide engineering education students with a “pass” for international mutual recognition of quality standards. The core of China Engineering education professional certification (hereinafter referred to as engineering certification) is to confirm that engineering professional graduates meet the established quality standards recognized by the industry, which is a kind of qualification evaluation oriented by training objectives and graduation requirements^[1]. As of January 2021, the China Engineering Education Professional Certification Association has 2, 473 majors that have passed the certification^[2]Other universities and majors are also actively preparing for or applying for certification, and there will be more majors from the main evaluation stage of self-evaluation into a new stage of quality improvement. Therefore, the professional curriculum system, teachers, practical training and practice conditions in the professional construction should be carried out based on the requirements of engineering certification. On the other hand, since February 2017, the Ministry of Education has actively promoted the construction of new engineering projects. New engineering is in the new technological revolution, the new industrial revolution, engineering education under the new economic background of the reform of major strategic choice, represents a new round of technological and industrial revolution, represents the fourth indus-

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trial revolution and engineering education, with khalid ents lead, to cope with change, shape the future construction concept, to inheritance and innovation, cross and integration, coordination and sharing as the main way, cultivate the future diversified, innovative outstanding engineering talents^[3]. Therefore, under the background of "duplex", the majors and majors of engineering colleges face both opportunities and challenges. We should not only closely focus on the connotation of new engineering construction, pay attention to structural optimization and mode innovation, but also pay attention to standard project certification, pay attention to standard requirements and quality assurance.

1. The Necessity of practical curriculum system reform

China's traditional engineering talent training mode is generally divided into two steps, theory before practice. Theoretical teaching and practical teaching are a kind of dialectical relationship. Through theoretical teaching, students can systematically master the professional knowledge of subjects and obtain logical and rational thinking ability^[4]. For professional students, especially those majoring in engineering application, practical teaching is a full verification of theoretical teaching and a concrete embodiment of applying what they have learned. However, the traditional engineering education is generally dominated by teachers, take the textbook as the center, heavy content, heavy method, light evaluation, simply to teachers output as the main content of practical teaching, ignored the students in the practice process of learned and to conform to the demand of industry, industry, and advocated against the concept of modern education output orientation^[5]. Practical courses not only play a relatively light role in the professional training program, but also students cannot give full play to their subjective initiative in the practical training link, and can only passively accept classroom teaching, and the education quality of engineering application-oriented talents is greatly affected. Under the background of the double reform of "new engineering" construction and engineering certification, colleges and universities should re-examine the relationship between teaching process, teaching mode, teaching mode, teaching relationship, teaching system, teaching quality and other important elements, and explore and practice the reform of experimental teaching environment, practical curriculum system and practical teaching mode.

2. Reform of Navigation Engineering

2.1 Reform of talent training objectives

Engineering education has always been about cultivating students with engineering knowledge and ability. Therefore, practical courses to improve students 'engineering practical ability are one of the means to cultivate students' engineering thinking and practical ability^[6]. In the process of talent training, we should be committed to solving the two core problems of "what kind of people to train" and "for whom to train people". Only with this purpose can we formulate perfect talent training goals, and then specifically implement the training methods and modes. China civil aviation flight institute navigation engineering major in 2016 to become the only approved aviation navigation engineering, is in engineering certification and new engineering positive development in the construction stage of a multidisciplinary emerging engineering major, belongs to the undergraduate education level, mainly involved in civil aviation related fields of navigation planning and application, theory and methods of communication navigation monitoring technology, etc. In the formulation of the training program, based on the OBE (Outcome Based Education, OBE) teaching concept, adhere to the "student-centered, output-oriented, continuous improvement" to guide

Table 1 Comparison Table of Navigation Engineering 2016-2021

a particular year	Cultivate target keywords	Where to graduate
2016	Civil aviation industry, moral, intellectual, physical, American and labor, civil aviation and telecommunications field, civil aviation applied talents	Air traffic control bureau, airport, airlines, general aviation, universities, research institute
2017	Civil aviation industry, moral, intellectual, physical, aesthetic and labor, comprehensive ability, civil aviation and telecommunications field, civil aviation applied talents	Air traffic control bureau, airport, airlines, general aviation, universities, research institute
2019	Civil aviation power, moral, intellectual, physical, aesthetic and labor, engineering technology knowledge, cultural literacy, social responsibility, skills to solve practical problems, application-oriented talents	Air traffic control bureau, airports, airlines, domestic and foreign universities for further study
2021	Moral, intellectual, physical, aesthetic and labor, engineering and technical knowledge and cultural literacy, social responsibility, theory, technology and methods, knowledge and skills to solve practical problems, professional requirements in the field of civil aviation and telecommunications, and application-oriented talents	Air traffic control bureau, airports, airlines, enterprises and institutions, universities at home and abroad for further study

the formulation of the training program and training goals. From the initial training of senior specialized applied talents in the field of civil aviation and telecommunications and navigation planning and management career requirements, according to the requirements of engineering certification and new engineering construction, the training objectives are gradually accurately targeted to require the professional skills and engineering practice ability of professional students. Through the upgrade and reform, from three aspects of talent orientation, training, output of the navigation engineering professional is for civil aviation atc system, airport, airlines atc security facilities planning, management and maintenance post training to master the modern navigation engineering theory, technology and method, and have solid professional knowledge and practical application ability of senior specialized applied talents.

2.2 Refactoring of the practical curriculum system

The professional certification of engineering education requires that the professional curriculum system should focus on the fundamental task of cultivating morality, organically combine the ideological and political courses, and realize the all-round education of all the staff^[7]. Engineering training aims to train students to master professional theoretical knowledge, methods and technology, on the basis of strengthening practical ability and solving practical engineering problems, which is a necessary link to cultivate advanced applied talents with innovative ability^{[8][9]}. The construction of the curriculum system reflects the framework idea of system design, independent construction and characteristic implementation, and integrates the curriculum theme, curriculum structure, curriculum elements and curriculum resources to different degrees and levels to form a strong overall educational force of the curriculum^[10]. As the main part of the professional curriculum framework, the practical training curriculum system is a further extension and effective test of the basic curriculum system. The establishment of practical curriculum and system should be to improve the quality of students' training and change the teacher training mode as the main direction, to improve the students' creative consciousness and practical innovation ability training level, to realize the "phased, multi-level, all-round" comprehensive training of students' practical innovation ability of practical teaching system.

2.2.1 Multi-level and comprehensive practical curriculum system

The practical course system takes the cultivation of engineering ability as the main line, which focuses on cultivating students' engineering quality and practical ability, and directly reflects the importance of the two-way interaction process between theory and practice and innovative teaching^[11]. Professional students' practical ability, innovative spirit, and the ability to solve complex engineering problems independently have become the basic standards for major, industry and industry to verify students' comprehensive quality. Therefore, in the construction of practical curriculum system, we should pay attention to the inheritance of theoretical knowledge and form connection with practical ability, and gradually superposition and integrate. As shown in Figure 1, the multi-level practical teaching system of navigation engineering major. Underdesign labor practice course, cultivate the students' labor consciousness and the basic concept of practice, the second level of professional cognitive practice 1, students fully understand navigation engineering professional training objectives, training direction, jobs, employment units, etc. , improve the professional students' self-positioning, preliminary establish professional cultural accomplishment and social responsibility. At the third level, university physics experiment, circuit electronic basic experiment, metalworking practice, electrical practice and other basic practice courses. Through the basic laboratory and practice base of the school, the students can initially master the operation process and methods of electronic circuit and physical experiment, and cultivate the basic practical ability; the fourth level is implemented after the professional core theory courses, that is, the students can master the Digital signal Processing, Modern Communication Principles and Technology, Radio Navigation principle and System, and conduct independent practice courses for the future employment direction and job requirements. Through professional basic course design, CNS maintenance practice, comprehensive course design, production practice and graduation design, from simple to complex, from basic to professional, from school to school, layer by step, interlinked. Finally, the top-level design of innovation and expansion projects is designed to encourage professional students to carry out independent innovation, participate in the Internet + competition, college students' innovation and entrepreneurship activities, etc. , and provide full support from the experimental site, instructors and experimental equipment, so as to meet students' personalized learning and improve their innovative and entrepreneurial thinking, consciousness and ability. Therefore, throughout the whole navigation engineering professional practice curriculum system from labor, cognition, basic, independent, innovation 5 levels, respectively equipped with the corresponding practice courses, the professional students "knowledge, ability, practice innovation" training is integrated, forming an engineering innovation practice curriculum system.

2.2.2 Improve the proportion of practical training courses

Based on the new engineering construction requirements and engineering education training law, the traditional knowledge and ability training, navigation engineering first improve practice course credits, highlight the important role of the training course system in the professional curriculum system, complete graduation requirements decomposition and support matrix relationship, accurate positioning each training courses to support graduation requirements and quantitative coefficient. In the training plan in 2016, the total credits of practice courses accounted for 18% of the minimum graduation credit requirements, up to 23% in 2021, and practice innovation credits have been increased to encourage professional students to go out of the classroom and carry out innovation and entrepreneurship practice activities for majors, industries and industries, and give corresponding credit rewards. The proportion of practical courses and innovation activities of the navigation engineering training program, as shown in the figure below.

3. Conclusion

Under the background of new engineering construction, combined with the professional certification of engineering education, a practical curriculum system with the characteristics of navigation engineering major has been built. By reconstructing the navigation engineering curriculum system, it highlights the important role of practical courses, layered design and gradual integration, through labor, cognition, foundation, autonomy and innovation, and through multi-dimensional practical teaching mode. Since the specialty was created in 2016, In 2020, "Navigation Engineering New Engineering Talents Training and Practice Innovation Platform" was awarded the second batch of national new engineering research and practice projects; The Communication, Navigation and Monitoring Facilities (hybrid) course has won the first-class undergraduate course in Sichuan Province; From 2019 to present, Successfully applied for 4 industry-academic cooperation projects of the Ministry of Education; One educational talent project of Civil Aviation Administration in 2021; Construction achievements have won the first prize of teaching Achievement Award of Civil Aviation Flight Institute of China for two consecutive years; He has published more than 30 high-level academic papers, Obtained more than teaching research and research project fund more than 5 million yuan; Training courses on professional new navigation technology provided for various air traffic control bureaus, airlines and local airport groups, A total of 9 scheduled classes, Training for 1, 042 people; There are 21 professional teachers, Three of the professors are there, Doctor 12; Navigation Engineering Level 2016 Employment rate: 90%, Level 2017 Employment rate: 100%, More than 85% of the graduates work in airports, air traffic control stations and other air aviation operation units, To undertake the relevant technical work of communication, navigation and monitoring.

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