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Reform and Innovation of the Training Method of Outstanding Software Engineers under the "Six Excellence and One Top-Notch" Plan

Houjun Liang, Rui Xie

Anhui University of Finance & Economics, Bengbu, Anhui 233030, China

Abstract

In the face of scientific and technological revolution and industrial transformation in the new era, China's engineering education is facing new requirements and challenges. In order to support the new development strategy of engineering education in China, the "Excellence Plan 2.0" provides an overall idea for actively exploring the engineering education system with Chinese characteristics, building a new talent training model, implementing diversified teaching methods, and building a high-level engineering education teaching team. In order to promote China's engineering education standards to the world and promote the improvement of China's engineering education status in the world, it is urgent to cultivate interdisciplinary talents with engineering practice ability and innovation ability. In view of the current situation and the main problems of the engineering talent training system in China's colleges and universities, this paper makes a preliminary analysis and reflection on the reform and innovation of outstanding engineer training from the aspects of practical teaching, reform and innovation of talent training mode, talent team construction, and school-enterprise cooperation.

Keywords

Engineering Education; Outstanding Engineers; Countermeasures; New Engineering.

1. Introduction

The "Six Excellence and One Top-Notch" Plan 2.0 (hereinafter referred to as "Plan 2.0") is a series of combined plans formed by the Ministry of Education on the basis of a single outstanding talent plan, which is the embodiment of the maturity of the reform and development of higher engineering education. It aims to further optimize the structure of majors, deepen the integration of multiple disciplines, stimulate students' interest and potential in learning, revitalize undergraduate engineering education, and improve the quality of talent training in colleges and universities. The release of the "Double Ten Thousand Plan" for the Construction of First-class Undergraduate Majors marks the full implementation of the "Plan 2.0". "Plan 2.0" has achieved a comprehensive upgrade of various plans through expansion, increment, quality improvement and innovation, further strengthened the intensity of various education and teaching reform measures, and enhanced the quality connotation of engineering education reform and development.

In order to adapt to the trend of scientific and technological and industrial transformation in the new era, actively respond to the national strategy and regional development needs, accelerate the construction and development of new projects, and promote China to further move towards a strong country in engineering education. The Ministry of Education has issued the "Opinions of the Ministry of Education on Accelerating the Construction of High-level Undergraduate Education and Comprehensively Improving the Ability to Cultivate Talents" to promote the implementation of the "Plan 2.0", which aims to cultivate a large number of innovative and diversified reserve talents who can adapt to interdisciplinary integration.

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Excellent engineers should have core competencies such as lifelong learning ability, information acquisition and career development planning ability, product development and design ability, technology upgrading and innovation ability, environmental adaptability, teamwork ability, organization and management ability, etc. At present, the training goal of engineering professionals in China's colleges and universities is not compatible with the "Plan 2.0", and the advantages of its own school-running characteristics are not obvious, and the school-running goals are homogeneous. The curriculum system does not fully meet the requirements of "new engineering", the interdisciplinary integration is not strong, and the research teaching such as case teaching and project teaching is weak. The talent training model of engineering education cannot meet the needs of the industry, and the depth of industry-university-research cooperation is insufficient, which makes it difficult for enterprises to integrate into the whole process of talent training. There is a shortage of "double-teacher" teachers, and the engineering practice ability of engineering teachers still needs to be strengthened. Based on the overall idea and goal of "Plan 2.0", this paper puts forward some thoughts on the cultivation of outstanding engineers.

2. Establish the Orientation of Engineering Talent Training that is Compatible with "Plan 2.0".

The overall goal of "Plan 2.0" is to serve the industry, go to the world, and face the future, cultivate outstanding engineering and technical talents who can adapt to and lead the scientific and technological and industrial changes in the new era, build China's engineering innovation center and high-level talent base, and enhance international competitiveness and engineering hard power. The "Plan 2.0" should first insist on cultivating talents with virtue, run ideological and political work through the whole process of engineering talent training, consolidate the basic position of undergraduate education, clarify the core position of talent training, focus on deepening the reform of engineering education and teaching, and comprehensively improve the quality of engineering talent training; secondly, we should focus on the international and future and highlight the ability of engineering innovation ability and the ability to serve the needs of national development.

The goal of engineering education is to cultivate all kinds of engineering and technical talents who can serve the national strategy and industry. In order to meet the needs of new technologies and new industries, colleges and universities play an important role in cultivating all kinds of engineering and technical talents. Colleges and universities first need to formulate the "Plan 2.0" professional training plan according to their own type of education, choose the appropriate engineer training type according to the current and future needs of industrial enterprises for engineering talents, shoulder the mission and responsibility of engineering talent training, give full play to their own advantages and potential resources, avoid the current goal of homogenization of engineering talent training, and improve many problems such as professional clustering, excessive concentration of types, and low employment rate. Secondly, different industries have different requirements for engineering talents with different academic qualifications. According to its own positioning, the school should consider the effective connection between the engineering talent training system with different academic qualifications and the future growth and development of students, continuously improve and adapt to the training goals of outstanding engineers, and fully mobilize students to participate in the reform and practice of engineering education, so as to lay a solid foundation for the subsequent formulation of professional training programs.

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3. Strengthen the Practice of Engineering Teaching

Practice is an important means to cultivate engineering and technical talents, and it is also an indispensable key link in higher engineering education. One of the goals of Program 2.0 is to solve complex engineering problems by addressing the disconnect between theory and practice in the process of training engineering and technical personnel. In order to cultivate engineering and technical talents to meet the needs of new industries, it is necessary to build a training system with interactive support for curriculum experiments, engineering training, engineering design, enterprise practice, graduation design and other links, and comprehensively improve students' ability to solve complex engineering problems through practical teaching.

Innovate the combination of industry and education and the school-enterprise cooperation mechanism, deepen the cooperation between industry, government, academia and research, cooperative education and cooperative development of employment, break through the traditional practical teaching mode, and combine the engineering characteristics of the major to optimize and improve from the following two aspects. The first is to establish a tutor system, select tutors inside and outside the school, and guide students from admission to graduation according to their personalities, such as course selection, professional development direction, and career planning, pay attention to cultivating students' healthy psychology, pay attention to the guidance of students' moral level, and promote the coordinated development of students' knowledge, ability, and quality. It is necessary to give full play to the comprehensive role of teachers' personality charm and professional quality, emphasize the affinity and guidance of tutors to students, and achieve the unity of preaching, teaching, and solving doubts. Guide students to participate in various innovation and entrepreneurship competitions, improve students' advanced thinking, innovation awareness, practical ability and comprehensive quality, provide favorable conditions for students to become outstanding engineers, let students have more understanding of the future industry, and broaden students' career planning ideas.

The second is to build a school-enterprise cooperation practice platform, divide the training process of engineering talents into two stages: on-campus and off-campus enterprise practice, and broaden the space for colleges and universities in the reform and innovation of talent training mode. Compared with a single campus learning mode, colleges and universities need to carry out reform and innovation in the division of labor, cohesion, and complementary advantages at different learning stages according to their own positioning and professional advantages, including the allocation of teaching and research resources, the selection of the organizational form of the teaching process, the innovation of the training mode, the arrangement of courses and teaching links, the assessment methods and time allocation of students, etc., so as to realize the organic combination of on-campus learning and off-campus practice. Establish practice, training, innovation, and entrepreneurship incubation bases, constantly update teaching facilities and equipment, and establish training practice workshops with actual working environments. With the goal of "solid foundation, practice, wide caliber, and fine specialization", the school's experimental teaching center is used to complete the cultivation of basic professional abilities and skills, and the application of project teaching in practical teaching is increased. Carry out comprehensive and designed experiments, advocate independent and cooperative experiments, adopt student-centered enlightening and guiding teaching methods, and stimulate students' initiative to participate in practical teaching. The use of modern information technology to build virtual factory, virtual workshop, virtual process and other simulation teaching, expand the teaching mode and method of engineering practice courses, so that students can get an immersive learning experience, and play a role in the cultivation of engineering students' practical ability and innovation ability.

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4. Reform and Innovate the Talent Training Model

"Plan 2.0" clarifies the guiding ideology, goals, overall ideas, key reform tasks and organizational safeguard measures for a new round of scientific and technological revolution and industrial transformation, accelerates the construction and development of new engineering courses, and explores breakthroughs and innovations to form a talent training model with Chinese characteristics in engineering majors. When revising the professional training plan, colleges and universities should start from the guiding framework constructed by "Plan 2.0", and flexibly and independently reform and innovate the training mode of engineering talents according to the objective reality of the school. Combined with the analysis of the current situation of engineering and technical personnel training in colleges and universities, the following considerations are given. Establish an innovation experiment platform, and carry out an innovative experiment plan for college students based on the project. Establish an open system of scientific research resources for undergraduates, and cultivate talents with top-notch innovation ability. It is necessary to establish a system to recruit undergraduates to join the research group in advance, guide students to participate in the project, and grow from research assistants to independent research. The university can set up corresponding special funds to support college students' innovation and entrepreneurship, enhance students' innovation and practice ability, let the frontier of disciplines enter students' field of vision, and at the same time, cultivate students' practical research interest in engineering and the spirit of scientific research exploration through the edification of scientific research atmosphere.

Based on the concept of "new engineering", the knowledge structure and curriculum system are constructed, and the professional training standards are demonstrated and revised. According to the characteristics of the school and the direction of talent training, with reference to relevant standards, revise the engineering talent training program, and establish the program implementation matrix. From the perspective of "new engineering", the knowledge system of engineering talents is constructed, the knowledge structure is comprehensively and systematically designed and planned, and the basic conditions for students to have corresponding professional qualifications and the basic qualities of engineering technology research and development are cultivated. According to the different training modes, formulate corresponding training plans. Reform the traditional scientist training model, and divide the curriculum system into three modules: basic theory module, professional technology module and engineering background knowledge module involving humanities and social sciences. Set corresponding credits in proportion to different modules, increase the content of enterprise practice, systematically cultivate engineering thinking, and carry out "engineering practice, educational innovation, and enterprise cooperation continuous line", so that students can master the ability to do and understand the definition of what can be done. According to the requirements of the training objectives, according to the characteristics and potential of students, strengthen the cultivation and development of students' personality ability. It is necessary to focus on cultivating students' ability to practice engineering design, engineering innovation ability, lifelong learning ability and self-development ability, and promote the all-round development of students. It is necessary to strengthen the individualized training of students and guide students to choose majors according to their personality development. Students are encouraged to actively participate in the formulation of individualized training programs, choose courses and arrange learning schedules independently. Strengthen guidance for college students' career planning, encourage students to learn in a variety of ways, and improve students' ability to adapt to society.

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5. Consolidate the Practical Experience of Engineering and Establish a High-level Engineering Education Teaching Team

Engineering education teachers should be not only scholars of engineering theory education, but also experts with practical experience in engineering. The construction of full-time teachers in engineering education can start from two aspects: system policy and appointment assessment. In terms of system and policy, on the one hand, colleges and universities should establish a system for teachers to work in enterprises, and regularly arrange full-time teachers to work in enterprise-related engineering positions to accumulate, update and enrich engineering practice experience; on the other hand, colleges and universities should formulate corresponding incentive policies to encourage full-time teachers to work in enterprises and participate in engineering projects or industry-university-research cooperation projects to accumulate relevant engineering practice experience. In terms of appointment and assessment, the assessment of teachers hired by colleges and universities should focus on the design, development and research of engineering projects, engineering teaching ability, engineering technology research and innovation ability, and carry out industry-university-research cooperation and technical services.

The requirements of the "Plan 2.0" for engineering education teachers and the engineering education team composed of full-time teachers from schools and part-time teachers from enterprises have broadened the way for the construction of engineering education teachers. There is both cooperation and division of labor between school mentors and corporate mentors. In terms of cooperation, they jointly formulated the training objectives, training standards and training plans for outstanding engineers at all levels, jointly designed the curriculum system and teaching content, jointly determined the topic of the graduation thesis, jointly guided the graduation thesis, and finally jointly evaluated the training quality. In terms of division of labor, they are responsible for formulating school training plans and enterprise training plans, and are responsible for the training and assessment of students in the school learning stage and enterprise learning stage respectively. Full-time teachers are mainly responsible for the teaching of professional basic courses and theoretical professional courses. Part-time faculty members are mainly responsible for teaching practical professional courses.

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Reform and Practice of "Cross-Integration" Finance and Accounting Talent Training Model in the Context of New Liberal Arts (2022SX005), Research on the Reform of the Teaching Mode of Cost Accounting Course under the New Economics and Management Strategy (ACJYZD2022017), Cost Accounting Course Ideological and Political Demonstration Course (ACSZSFK2022016), Computer Science and Technology Outstanding Software Engineer Talent Education and Training Program (2022ZYBJ008).

References

[1] Lin Jian. Challenging Learning for the Cultivation of "Six Excellences and One Top-notch" Talents[J]. Tsinghua University Education Research,2020,041(002):45-58.

[2] Lin Jian. On the Implementation of the "Outstanding Engineer Training Program" Triggered by Some Changes[J]. Higher Education in China, 2010(17):30-32.

[3] Bao Xiaomei. A Review of Research on School-Enterprise Cooperation Platform[J]. Cooperative Economy and Science and Technology,2017(20):106-107.

[4] Shi Meng. The dilemma and countermeasures of life values education for contemporary college students[D]. Yanji:Yanbian University,2018.

ISSN: 2710-0588

[5] Zhu Hong, Li Zhiyi, Liu Zhijun. Exploration and Practice of Higher Engineering Education Reform and Cultivation of Outstanding Engineers[J], Higher Engineering Education Research, 2013(06):74-77.

[6] Xin Jun. Thoughts and Countermeasures on the Cultivation of Outstanding Engineers[J]. Journal of South China University of Technology (Social Sciences),2012(03):117-121.

[7] Lin Jian. Research on the Professional Training Program of Outstanding Engineer Education and Training Program[J]. Tsinghua University Education Research,2011(02):52-60.

[8] Lin Jian. Focusing on the Essence of Engineering Education Excellence and Innovating the Training Model of Engineering Talents[J]. Higher Education in China,2011(6):19-21.

[9] Jia Li. Research on the talent training mode of higher engineering education in China[D]. Xidian University, 2013.