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Exploring the Training Mode of Engineering Disciplines in Chinese Colleges and Universities to Meet the Needs of an Innovative Society

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Abstract

Aiming at the training mode of engineering disciplines in Chinese Colleges and the need of an innovative society, This paper analyzes the problems existing in the cultivation of engineering talents， explores the training mode and development ideas of engineering professionals under the new situation. This paper points out its specific measures in major orientation and training objectives, curriculum system and knowledge structure setting, as well as practical teaching, and puts forward specific measures for the reform of training mode of engineering disciplines in colleges and universities. This work can be used as a reference for the reform of discipline education and teaching in the training mode of engineering majors.

Keywords

Training mode, Engineering disciplines, Reform.

1. Social Background

China's economy and society have been undergoing rapid changes and development. The concept of mass entrepreneurship and innovation has become widely accepted. It is necessary to train a large number of talented individuals with entrepreneurial skills and a desire to use them innovatively. This is the driving force underlying the current move toward reform of higher education for engineering [1]. Higher education resources are being reallocated, providing important opportunities for colleges and universities to serve the overall national development by focusing on local needs.

2. Competence Elements for Engineering Students

Although the socio-economic development exhibits regional differences across China, the intense requirements for the overall quality and ability of innovative talents are common to all regions in the country [4]. To this end, we refer to the Washington Accord accreditation system to set clear training goals and graduation requirements [3]. Here, training goals are achievements that students are expected to make in the social and professional fields within 5 years after graduation and are supported by specific graduation requirements. Graduation requirements include 12 categories: engineering knowledge, problem analysis, solution development, research, use of modern tools, engineering and society, sustainable development, professional norms, individuals and teams, communication, project management, and lifelong learning.

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In terms of engineering knowledge, China's rapid development has caused the country to accumulate a large number of practical cases in various fields. These can provide rich teaching resources for colleges and universities. Colleges and universities should focus on helping engineering students form a unique knowledge system that can address local needs.

In order to effectively cultivate the ability to analyze problems, colleges and universities should invite front-line experts from industry to participate in the curriculum design and describe significant and timely problems in practical engineering and so help academics determine the best proportion of exploratory content.

The ability to develop solutions is the most direct requirement for the type of innovative individual we wish our educational system to produce. Colleges and universities should guide the enthusiasm of young students toward innovation and encourage them to design and develop solutions focusing on the specific problems faced in their area.

Preliminary research skills are essential to personal development, and they should built step by step. Students' interest in research should be stimulated, starting with introductory engineering courses that lay out the basics of the discipline. Courses covering theory and practical application should be closely connected to each other.

The current practice in engineering is increasingly dependent on modern tools such as the mobile Internet. Engineering education should pay attention to the ability to use network resources and encourage students to use modern information technology to acquire professional knowledge and accumulate professional resources.

Engineering ethics requires a proper understanding of the relationship between engineering and society. Colleges and universities should formulate syllabi for professional courses by studying practical cases so as to cultivate the correct values and engineering ethics imperceptibly.

One characteristic of innovative societies is accelerating knowledge renewal and technology replacement. Colleges and universities need to focus on cultivating students' ability to accumulate new skills through continuous problem solving [5].

The understanding and use of professional norms by engineering students is an important means of fostering the healthy development of an innovative society. The connection between standardized systems and professional theoretical systems should be emphasized in training regimens to ensure that enough courses cover professional laws and regulations.

Project management is an important soft skill. Training plans should incorporate Chinese cultural traditions, the essence of Western ethics as related to science and technology, and a strong capacity for professional development.

Lifelong learning ability is a basic requirement for the people we wish to cultivate in the innovative China of our vision. Colleges and universities can establish cutting-edge courses with training plans designed in accordance with national and regional mid- and long-term development plans to provide correct guidance for lifelong learning.

3. Training Methods for Innovative Talents

In order to cultivate diverse and innovative engineering talents, colleges and universities should learn from the teaching reform projects in other countries [6]. Possible measures include the following:

1. Renew ideas and innovate teaching methods. Leverage teaching methods such as the MOOC platform and flipped classrooms to impart knowledge of the process of teacher-student collaboration to solve problems, overcome communication barriers between teachers and students, render communication more efficient; integrate and condense teaching by using micro-lectures and designing themes based on the focus and difficult points in the course content.

2. Integrate hardware and technical advantages developed by large businesses into the coursework and establish a joint training mechanism. The front-line experts from industry should be invited to participate in the development of the syllabus. By regularly discussing research topics, the industrial

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experts and the teaching team can customize course content and teach students to address engineering problems in the real world and inspire passion for learning.

3. Establish innovative courses. Explore flexible assessment and alternative course credit options and give course credits to patent authorization, paper publication, contest awards, and support from innovation funds.

4. Conclusion

There are many colleges and universities in China that train a large number of engineering graduates. These individuals will constitute the main body of engineering talent in the innovative society that China is becoming. It is critical to reform the training model.

Based on the standardized training requirements inherent in accrediting engineering education programs at colleges and universities, we here proposed specific measures for the reform of the training mode of engineering disciplines in colleges and universities. This work can be used as a reference for the reform of higher education.

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