Programming Ability Training Mode Reform for Engineering Education

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Abstract. New engineering and engineering education certifications have proposed a direction-oriented system capacity development direction. How to adapt to local conditions, teach students in accordance with their aptitude, and explore patterns suitable for students' training characteristics is very valuable and meaningful. This paper first discusses the problems existing in the current applied undergraduate education, and proposes a system of ability and orientation, with high-level employment as the goal, and driven by the discipline competition to establish a multi-level student training model. This achievement has certain universal value in the cultivation of students' ability in applied colleges.

Introduction

Under the background of rapid development of new economy characterized by new technologies, new formats, new industries, and new models, students trained in colleges must not only have the expertise, technical ability, and innovative ability to solve engineering problems, but also have a global perspective. The humanistic spirit must cultivate students' ability and habits to continue to learn new technologies. The education community put forward the concept of "new engineering", clearly showing the road map of the new engineering, playing the main melody of talent cultivation in the new era, and opening up a new path for engineering education reform.

In response to the new engineering, in the past two years, “Object-Oriented Education (OBE)” has been recognized by more and more experts and responded to by universities. As China officially joined the "Washington Accord" in 2016, professional construction in accordance with the international engineering education professional certification system will gradually become the only way for the majority of engineering majors in China [1,2]. The paper puts forward the "student-centered" construction of the teaching system, and strives to improve students' system ability and comprehensive strength.

Comprehensive Ability Training for Engineering Education

Practice Ability, Creative Ability is a concrete embodiment of the student's system ability, and is the inherent requirement of higher education talent cultivation in the new era.

Insufficient Innovation

The allocation of educational resources does not match the expectations of individualized growth of college students. At present, the professional training objectives are unclear and the cultivation process is homogenized. The main reason is that some colleges and universities aim to complete the teaching tasks and solidify the allocation of resources. In reality, only the established programs are used to transfer knowledge to the students collectively, and to mass-cultivate them, but lack the attention and input to the individualized growth needs. As a result, colleges and universities lack the initiative and effective feedback mechanism to improve their talent innovation ability. Because the individualized growth needs are not met, the students' innovative practice consciousness is greatly suppressed.
Practical Ability Needs to be Strengthened

The influence of the test-oriented education model is still prevalent in higher education, which results in the current lack of training in the practical ability of students. According to the society's demand for talents, higher education itself should not be limited to knowledge itself, but also the method of acquiring knowledge and the ability to put it into practice. However, under the exam-oriented education model, the teaching of knowledge is based on indoctrination, emphasis on theory, and light practice [3,4]. It only focuses on the theorem laws taught by book knowledge, without thinking about breaking new and deeper explorations, lacking practical opportunities and creating platforms.

Lack of Self-determination

The core goal of higher education is to cultivate the thinking and learning ability of college students in an all-round way, and to transform knowledge into abilities, so that the reserve of college students can adapt to the powerful forces of future development. At present, there is a widespread passive education in higher education [5,6]. Students lack the awareness of active thinking. Secondly, there is a lack of training in thinking about problems. It is a problem that is difficult to think about at a time. It is very anxious or voluntarily giving up, lacking the motivation to explore and think about problems. Also in the fierce social competition in the future, there is a lack of competitiveness and poor ability to solve problems independently. The subject competition can effectively provide a good entry point and provide an effective platform for students to learn and think independently.

Comprehensive Ability Training System

Program Competition Driven

Establish a long-term mechanism for disciplinary competition, improve the disciplinary competition system, form a broad-cover, multi-level, elite-advantaged complementary discipline competition system, and form a virtuous circle of discipline competition promotion. Improve the learning effect of basic knowledge through competition test; participate in provincial and national competitions by enriching and perfecting multi-disciplinary knowledge reserves, testing the comprehensive quality of talent training, and exercising core competitiveness; reflecting the highest level of professional training through national and international competitions Explore the potential of students and promote rapid growth.

Form a management system for the departmental competition department, clarify work responsibilities, standardize organizational structure, and increase publicity. Implement a mentoring system, pay attention to the echelon construction of the instructor team, and ensure the guidance role of teachers in academic competitions and innovation activities. Establish innovative credits and awards for evaluation of competition results.

Ability Development as a Goal

The combination of subject competition and teacher research, establish a platform for innovation in academic competitions, set up a special fund for scientific and technological activities, and fund
students in the form of project approval to stimulate students to participate in scientific and technological innovation activities. Organize cultural festivals and cultural festivals, organize competition exchange forums, etc., and create a cultural atmosphere of practical innovation.

Driven by the discipline competition, the evaluation and analysis methods of innovative teaching effects improve the level of teaching system planning and teaching method reform. Through the summary and analysis of the past training mode, the advantages and disadvantages of the competition training process are sorted out. Specifically, the first is to explore how to improve students’ comprehensive ability quickly and efficiently under the wide-coverage and multi-level system. By starting from the basic ability of students, we will establish a targeted competition team training program design and sort out the excellent competition problems. Cases, and in-depth analysis, explore excellent teaching and training methods; second, establish an echelon of reasonable competition teams, establish a long-term mechanism for discipline competition, improve the discipline competition system, and form a virtuous circle of four competitions to promote discipline competition.

**Evaluation**

Through the training of targeted abilities, the practical ability to solve problems, improve the students' innovative literacy, and form a competitive and cooperative learning atmosphere among students, and the participation and penetration of students have been greatly improved. The improvement of the effectiveness of teaching is reflected in the students' academic performance. The student's failure rate has dropped drastically. As shown in Figure 2, the failure rate per 100 people has decreased year by year in the past five years, and the average score has increased by about 10-20 points.

![Figure 2. Number of students failing in programming courses (per 100 students).](image)

Obtained in the ACM International College Student Programming Competition Asia Regional Competition, the National Undergraduate Electronic Design Competition, the Chinese University Programming Competition, the Zhejiang University Student Programming Competition, the Zhejiang University Student Electronic Design Competition, the Zhejiang Challenge Cup CCPC, the Software Competition, etc. The third prize (Bronze Award) has more than 100 awards, among which the participation of students has reached more than 50%; the project of the international college students’ innovation and entrepreneurship training program, the Zhejiang University Science and Technology Innovation Plan and the new seedling talent plan project, etc. A number of projects were established; students applied for patents and software copyrights, as shown in Figure 3. The number of awards in the past five years has increased year by year.
Summary

The educational concept of “all training to develop students' ability as the core” has been deeply rooted in the hearts of the people and formed a consensus. The training concept of “new engineering” and “engineering education certification” is the concrete implementation of this consensus. In the process of practicing these advanced educational concepts, adapting to local conditions, conscientious and practical teaching, based on the specific practice of the undergraduate applied undergraduate, actively explore the training mode suitable for the school's educational characteristics. In view of the key factors restricting the cultivation of talents, the analysis of the important role of the discipline competition in the cultivation of students' comprehensive ability is driven by the discipline competition, promotes the competition by the competition, promotes the teaching by the competition, explores the construction of the cultivation platform, strengthens the curriculum construction, and improves the transformation of the competition results. Form an interactive mechanism and other measures to build a comprehensive capacity training mechanism and model for students.

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