

Research on the Cultivation of New Engineering Talents in Electronic Information Engineering

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Abstract—The development of new economy challenges the talents cultivation of traditional electronic information engineering majors. It is necessary to actively lay out talents cultivation for the future technology and industry, and reform in talents cultivation mode and practice content. This paper has made a preliminary exploration on the cultivation of new engineering talents for electronic information engineering major in three aspects of teaching system, curriculum teaching standards, training places to promote the reform and innovation of electronic information engineering major. The research results can be extended to the majors in electric engineering.

Keywords—New Engineering; Electronic Information Engineering; Talents Cultivation; Higher Education

I. THE DEVELOPMENT OF NEW ENGINEERING IN ELECTRONIC INFORMATION ENGINEERING MAJOR

Our country has the world's largest engineering education. In 2016, there were 5.38 million undergraduates, 1.23 million graduates, 17,037 major distributions in engineering. Engineering students accounted for 1/3 of the total number of students in Higher Education. But the target of engineering talents cultivation in our country is not clear. Engineering teaching is like as science teaching. The recognition of relationship and difference between general education and engineering education, practical education and experimental education is fuzzy. Engineering education is too disjointed with industry enterprises. Engineering students have the defects of comprehensive quality and knowledge structure.

The shortage of talents in new economic fields of current rapid developing big data, Internet of things, artificial intelligence and so on has exposed that there are some disjointed links between engineering education and emerging industries and new economy. The development of new economy challenges the talents cultivation of traditional engineering majors. Compared with traditional engineering talents, high quality compound new engineering talents with engineering practice ability, innovation ability and international competitiveness ability will be needed in the future new industries and new economy. They not only have a profound academic study in a discipline, but also have the characteristics

of "interdisciplinary integration". They not only can use the knowledge to solve the existing problems, but also can learn new knowledge and new technologies to solve the problems of future development, and play a leading role in the future technology and industry. They are not only excellent in technology, but also can understand economy, society and management, both have good humanistic quality. It can be said that the new talents orientation and demand from new economy provide an opportunity for "new engineering" and the development of new economy calls for "new engineering".

The construction of "new engineering" is an important measure of national economic transformation and upgrading. In 2017, the ministry of education issued the Higher Education Department of the ministry of education noticed on the research and practice of "new engineering", hope that the research and practice of "new engineering" will be carried out in colleges and universities so as to deepen the reform of engineering education and promote the construction and development of "new engineering".

"New Engineering" corresponds to the emerging industry, first referring to the new majors such as artificial intelligence, intelligent manufacturing, robotics, cloud computing and so on, also including the upgrading of traditional engineering majors. Compared with traditional engineering talents, high quality compound new engineering talents with engineering practice ability, innovation ability and international competitiveness ability will be needed in the future new industries and new economy. They know how to integrate technology with economy, society, and management, and play a leading role in the future technology and industry.

Compare with the old engineering, "new engineering" emphasis on practicability, cross and comprehensiveness of the discipline, especially emphasis on the integration of electronic information technology such as information and communication, electronic control, software design and traditional industrial technology [1-2].

For cultivating new engineering talents in electronic information engineering major and actively laying out talents cultivation for the future technology and industry, it is more

important to bring engineering practice to an unprecedented level. The combination of time and social development should be reflected in the practice of talents cultivation. What the contents of the talents cultivation mode and practice of new engineering of electronic information engineering major, what aspects of reform to cultivate students' innovation ability, these are all questions to be considered in the process of cultivating new engineering talents in electronic information engineering major.

This study has made a preliminary exploration on the cultivation of new engineering talents in electronic information engineering major from three aspects: teaching system, curriculum teaching standard and training ground.

II. ESTABLISH A NEW TEACHING SYSTEM OF DECENTRALIZATION AND RECENTRALIZATION

Establish a new teaching system of decentralization and recentralization [3-6] and establish the teaching philosophy of new engineering.

The new engineering construction of electronic information engineering major is not only a teaching reform, but an attempt of the cultivation pattern of full cycle and multi-orientation for students, which is the practice of new philosophy of talents cultivation, as shown in Fig. 1.

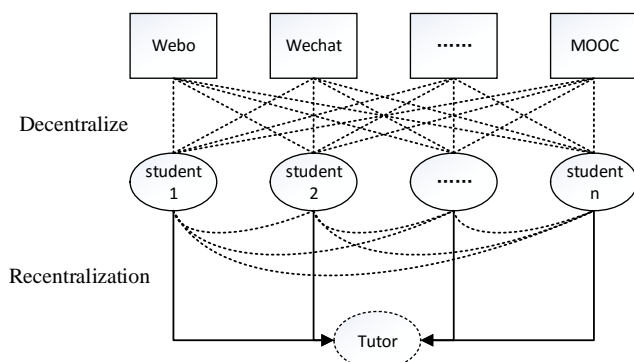


Fig. 1 "Decentralization - Recentralization" Teaching System

Decentralization. The traditional education is teacher-centered, students learn what teachers teach and students listen to what the teacher says. Education of new engineering can't be centered on teachers. Teachers should think more about developing students' potential, allowing students to gradually expand their problem space, and promoting students' group intelligent evolution. The key to being really good at learning is outside the class. The "new engineering" teaching system of electronic information engineering should incorporate the students' informal learning into the professional teaching system. In the current Internet age, students can easily access the large amount of information and knowledge fragments through microblog, WeChat and micro-class. Students can choose their own useful learning materials according to their actual learning situation and interest. The teaching system should guide students to carry out efficient and informal learning conducive to the formation of innovation ability, so that students can be used for life.

Recentralization. After acquiring these pieces of knowledge, students will feel at a loss and not know how to deal with them. Teachers need to reorganize these scattered knowledge, teach to students, and allow students to re-build the personalized knowledge system in their own way. Because such knowledge system is the most conducive to innovation and the most consistent with personal needs. Teachers should teach students the method how to form their own personalized knowledge structure, not the structured knowledge itself. Teach students how to search, how to choose, how to think, how to communicate and how to write so that the students can effectively face the challenges of the future.

Let the teaching of innovative thinking permeate into every aspect of teaching. The organic integration of basic knowledge and basic skills in the process of teaching should be paid attention to for the cultivation of new engineering talents. Vigorously promote general education, to improve the humanities. Develop students' ability and habit of continuing learning. The cultivation of cooperation ability, communication ability and leadership must be carried through the whole process of teaching.

III. ESTABLISH NEW TEACHING STANDARDS FOR ELECTRONIC INFORMATION ENGINEERING

First, formulate the talents cultivation plan and standards of electronic information engineering adapting to the needs of new engineering. According to the requirements of new engineering construction, develop the quality standard of electronic information engineering and formulate and optimize the talents cultivation plan. Integration with the certification system of Engineering Education, guide the teaching with the international substantive equivalent standards and continuously improve and improve the quality of the talents cultivation. Formulate the teacher evaluation standards and the teacher development mechanism with the characteristics of my major's engineering education, explore the construction path of teaching staff matching with the new engineering and strengthen the engineering background of teachers.

Second, build a new curriculum system. The "new engineering" study of electronic information engineering needs to re-examine the boundaries of the major. The current development of new technologies ask the students of this major to have a concept of Internet of things, big data analysis, artificial intelligence, 5G network and so on. It is necessary to incorporate the content of artificial intelligence in the design course of this major. In terms of intelligent optimization, case studies, swarm intelligence, etc., with advanced software instead of routine work of engineers, future engineers are freed from some of the tedious routine tasks, so that they have more energy to focus on creative work. The curriculum system of this major needs reconstruction, adding new courses such as big data and so on, turning some required courses into elective courses or combining some required courses. Specific practices need further research.

Third, encourage multidisciplinary integration in terms of curriculum teaching content. Under the background and trend of new engineering construction, encourage the competition among disciplines, and promote the synergy of engineering, the

integration of art and technology and the penetration of liberal arts and science.

Set up interdisciplinary courses, explore the curriculum model for complex engineering problems, promote interdisciplinary cooperative learning, strengthen the innovation and entrepreneurship ability of engineering talents, and improve the "originality - innovation - entrepreneurship education system. Elevate students' innovative spirit, entrepreneurial consciousness and innovative entrepreneurial ability by innovation leading to entrepreneurship, entrepreneurship driving employment.

Fourth, set up new technology courses. Taking 3D printing as an example, now 3D printing technology can produce any shape object based on computer graphics data without mechanical processing or molds, and its excellent advantage is applicable to various majors. Our department has been purchasing small 3D printing devices in recent years, strengthening the cultivation of 3D printing teaching talents, and setting up 3D printing courses for students, similar to laser engraving. This training course with the development of the times, makes students contact with new things, so that they can broaden their horizons, develop new thinking, improve students' ability to adapt to society and is conducive to cultivating their innovation and entrepreneurship ability.

IV. ESTABLISH ELECTRONIC INFORMATION ENGINEERING TRAINING GROUND

Open up teaching sites and add equipment to meet the needs of new engineering teaching. The traditional training equipment is still indispensable in training the most basic practical ability of students. In addition, in order to cultivate students' vision of the times and social practice ability, social mainstream equipment in accordance with the development level of the times must be used to supplement teaching, such as 3D printer, CNC engraving machine, virtual reality system, Internet of things system. Ensure that each student has a relatively abundant time to understand the equipment, to master the operation and to innovate practically.

In order to allow more students to have an opportunity and a place to bring their own ideas into reality, our department has been opening existing college innovation laboratory to students. Most students have the idea and action of innovative practice, and college students' innovation laboratory is rich enough in resources to meet the needs of students' innovation practice. The college students' innovative laboratory implements unified management of students after safety training, adopts a fully open teaching mode, opens them the place all day, including weekends, holidays and night, provides them with tools and equipment. At the same time, provide training programs and financial support to interested students, and arrange guidance teachers to train them. Organize competitions, encourage innovation, support practice, and fully explore students' innovative and entrepreneurial potential. The fully open teaching model allowing students to practice independently is conducive to forming the habit and exercising the ability of their innovation and entrepreneurship.

In addition, introduce talents energetically based on flexible use of existing teachers. A series of management systems need to be formulated to encourage and motivate teachers' enthusiasm so that they can devote themselves to the teaching of new engineering. In particular, teachers should be encouraged to take various professional skills certificates to improve their awareness of engineering practice and teaching skills of engineering training practice. It not only gives full play to the characteristics of teachers, combination of theory and practice and mastering many skills while specializing in one, also improves the overall level of teaching team of engineering training practice.

V. CONCLUSIONS

Based on the characteristics of new engineering construction, this paper promotes the reform and innovation of electronic information engineering. Actively lay out talents cultivation for the future electronic information engineering technology and industry, build teaching system of electronic information engineering with innovative, integrated, full cycle new idea of engineering education and explore the model of talents cultivation of engineering education in this major. The research results can be extended to the majors similar to electronic information engineering, such as Internet of things engineering, photoelectric information science and engineering, network engineering, etc. The application scope and benefit range of the research results are wide.

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