

The Study on Talent Teaching Mode and the Optimization of Major Courses System in Electronic Science and Technology

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Abstract. In order to correspond with the regional economic development in Tianjin and make characteristics of applied engineering major outstanding, a series of teaching reforms are carried out in our department, such as the target of electronic science and technology professional talents training mode, train reform ideas and the direction of professional curriculum system. All of the measures were made in the basis of investigation to understand the demands of domestic photoelectric information enterprises for undergraduates of this major and the ministry committee of education professional for the request of the curriculum system. At the same time, two courses: laser machining application and optical transmission technology were constructed as the core demonstration courses to improving practical ability of students. From the long-term development of students even after their graduation, the curriculum structure and the talent training scheme are improved and optimized, and the concrete implementing scheme and some suggestions were put forward in the end of the paper. All of these results will provide some good references for cultivating application-oriented professional construction.

1. Introduction

Since the 1980s, educators in the international higher education are paying more and more attention to improve the practice teaching of students and strengthen the applied talents training. In particular, China was accept as a normal membership of Washington Accord in June 2016, which means that we will strengthen the practice ability of students, and gives the cultivation of talent in the long run in engineer education fields. In 2017, our ministry of education has issued "a notice from ministry of education higher education section about to start a new engineering research and practice", which hopes all colleges and universities in our country to carry out "New Engineering Science" research practice. Thus, the reform of engineering education will be more deepen, and promote for the construction and development of new technology. Actually, lots of domestic researchers already have paid more attention in the education teaching reform of the exploration practice methods and the improved experimental process for a long time [1-4]. According to "National Medium and Long-Term Education Reform and Development Plan Outline (2010-2020)" requirements, China's Ministry of Education has clearly put forward the direction of reform in 2014: during the 1200 ordinary undergraduate colleges and universities, there will be more than 600 units gradually transforming to technology application universities. Based on this background and under the guidance of the ministry of education, the application technology university (college) league has been established in Tianjin University of technology and education in 2013 [5]. As one of the organizers, Tianjin University of technology and education is mainly corresponding with the goal of the league to promote technology applications and service the local economic development.

Combining the reality situation of our school, electronic science and technology profession, as one of the professional pilot, was adopted preferentially to the application of technical transformation in 2015. And it was also selected to improve the Integration of Production and Education in 2016. So, in

the basis of the investigation to understand the demands of domestic photoelectric information enterprises for undergraduates of this major, the request of the curriculum system of ministry education professional committee, and the characteristics of our university, we adopted some methods, such as enterprise question, market research, and expert argumentation, to optimize the talent training mode and professional curriculum system in this study, which was just following the instruction of student's succession after future graduation and improvement of their practical ability. Our optimization of talent training mode and professional curriculum system construction reflect the wide basis of knowledge, the important training of ability for practical skills. Photoelectric technology typical application will be used to stimulate students to study hard and master professional knowledge, which will guide undergraduate student's innovative initiative and better match the requirements for engineering and technical talents of the photoelectric information enterprises.

2. The Guiding Ideology and the Reform Ideas

The so called applied technology major should take the application of professional knowledge as the goal, mainly matching with the demands of production and really life practice. Then a large number of practice-oriented advanced professional personnel can be cultivated for society. Therefore, it is a common design to strengthen the practice teaching and the cooperation between enterprises and universities [6-8].

2.1 Guiding Ideology.

Combining with *The National Medium and Long-Term Educational Reform and Development Program 2010-2020*, Tianjin University of technology and education proposes guiding ideology of talents training as: the theme is the scientific development, strengthening morality education is the fundamental, improvement for student's quality is the core, deepening our characteristics is the key. Main idea is to highlight the characteristics of talent training.

2.2 Reform Idea.

So Electronic Science and Technology construction should combined with national "thirteenth five-year" plan and talents long-term development, our reform idea is mainly as: Engineering Education is our guide; professional technology development and application is our fundamental goal, we should pay more attention to improve comprehensively the quality of our students; at the same time, the cultivation of student's practice ability is set highlight position all the time. Enhancing the university-enterprise cooperation and deepening the integration production and education will be adopted in order to achieve technological innovation and service to society from the procession of transformation and application of technological achievements.

2.3 Our Training Objective.

Therefore, our professional training objectives is designed as: training our undergraduate students to have a good citizen consciousness, moral standards and social responsibility, have a certain competition ability, practical ability and innovation spirit, and have an all-round development in moral, intellectual, and physical aspect. They should grasp the related natural science and technology knowledge such as: the electronic technology, intelligent control technology, information processing technology, photoelectric devices and application technology, laser processing application and optical communication technology, and so on. And they should learn and obtain a broadened professional knowledge and some good experimental skills. Even they will become an applied style and senior specialized talents during their long-term of engaging in the research, design and innovation for various electronic, optoelectronic devices and their applications, for example, laser processing application and optical fiber communication technology fields.

3. Implementation Plan

Students is always the main body of higher education and the teaching object, any of the reformation of teaching is to offer a platform to improve and optimize the environment for students' learning and growth. Therefore, the implementation of some specific reform measure must be tightly

related to the healthy growth of students in all around aspects. Especially the professional construction of course system is an important part of talent training mode, which must be adapted to the growth process of learning, in harmony with the college students' growth factors, and meeting with the social demands.

3.1 Training Direction.

During 2015 to 2016 year, our department colleagues collected various information and suggestion through investigation and visiting to the universities of photoelectric enterprises of Yangtze river delta, the pearl river delta and the Beijing-Tianjin-Hebei region, participation in the course training, attending *The Fourth Session of Electronic Engineering Summit on Talent Cultivation 2016* and other various forms. In fact, some talent requirements are more important that came from the outstanding companies such as: Tianjin Photoelectric Group co., Ltd., Shenzhen Han's Laser Technology Industry Group Co., Ltd., Huawei Technologies Co., Ltd., following their professional prospects of market development. And the electronic science and technology undergraduate professional guidance issued by the ministry of education of electronic science and Technology commission is also an important factor. But all the factors should correlate with our university development plan and the specific teaching curriculum reform of our team members [9-14]. After several teaching seminars that some advisers from companies, the decision for the training direction is finally determined in Laser Processing Technology and Optical Transmission Technology to practice students' ability, which will become the demonstration project of professional knowledge and skills application. The training direction will guide and promote students' understanding of basic specialized knowledge and application.

3.2 Curriculum System Example under the Training Directions.

Therefore, in accordance with the key knowledge of application project, we can figure out the mainly professional courses and platform courses of electronic science and technology major, which is list in Fig.1.

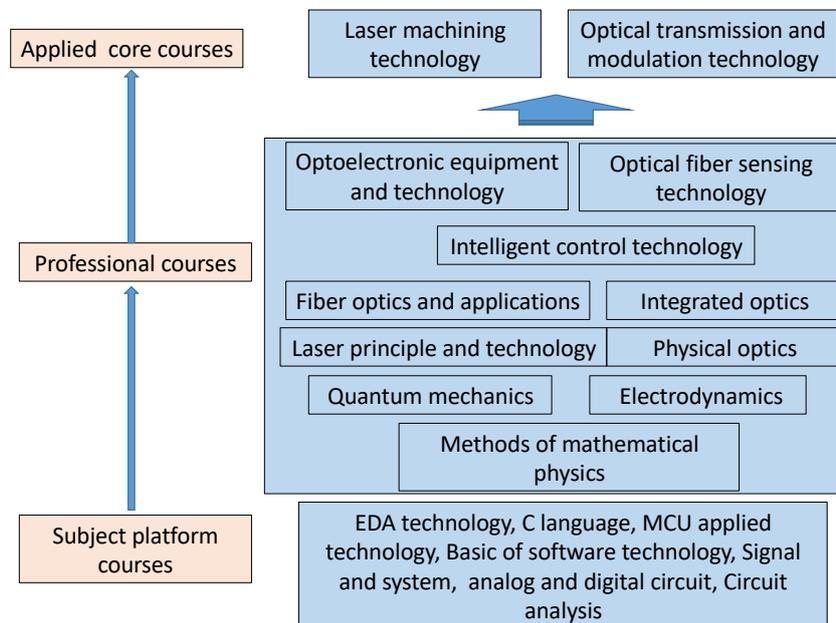


Figure 1. Curriculum group oriented by laser machining and optical transmission and modulation technology.

In the laser processing technique application, for example, there involves various aspects of comprehensive knowledge including: the laser generation, transmission and its principle and controlling technology (laser principle and technology, optical fiber optics), beam transformation (physical optics), the interaction between light and matter, the driving control of object stages, the processing effect of intelligent detection (photoelectric equipment, intelligent control technology),

image processing (Matlab software), compiling procedures through program (AutoCAD, C language, foundation of software technology), MCU application, signal transmission processing, signal and system, the circuit board design and print, and so on. Then all of the knowledge points should be reflected in the relative courses, which composes the course system for laser processing technique in Fig.1, which also shows us the sequence to teach.

Depending on the knowledge system, courses here is divided to three levels: subject platform courses, normal professional courses, and core application courses.

During the teaching process of subject platform courses and normal professional courses, all the teachers are required to mention the relevant knowledge points in combination with concrete project application in laser machining field. Beyond the courses, the experiment teaching link, professional design, and graduation practice procession will help students to further understand the professional knowledge and master them intuitively and visualization. That means the graduated students will be easy to grasp, absorb, and realize the technology innovation following accumulation in the later application practice or work position.

4. Implementation Opinion and Suggestion

During the specific implementation process of training talents, at the first glance, talent training plan is just the basis of teaching schedules in four years of university. For talent training mode of implementation, specific teaching section, department and individual teacher is the key to carry it out and achieve it. From students' cultivation of practice ability points of view, the implementation of specific training includes both hardware and software aspects: hardware situation refers to the lab environment, equipment performance, amount of equipment, and so on, which should be enough for training even one class. And the equipment should also be sustainable renovating and close following with the business practical development; while software aspect includes the content of practical teaching, teaching methods, and course teaching goals, these should be set very clear, which is a controllable process and keeping pace with times. Otherwise, there should be a sound scientific evaluation system of teaching quality and a better teaching organizational form.

However, talent training is a long-term project, the authorities of university education should pay high attention to support the software and hardware needs of the front-line teachers. And the teachers also should be guided by the talent training target, combining with the specific student's features and divided course type, having the teaching characters of the edutainment goal, the application goal, and practical goal. All of these are servicing students' healthy growth and a full development.

Only aiming at international engineering education development on time, strengthening "New Engineering Science" connotation, enriching our teaching contents, and improving our teaching methods, can we inspire students learning interest, and inject lasting power for the growth of talent.

5. Conclusion

On the basis of the investigation, electronic science and technology professional talents training mode, talent training scheme and curriculum system of Tianjin University of Technology and Education are mentioned and improved here. At the same time, a curriculum system for training direction is shown as an example. All of measures above are just following the goal to service student's healthy growth and their full development in the future, which would provide some references for cultivating application-oriented professional construction.

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