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Discussion on the Team Construction and Teaching Method for the Undergraduate Teaching of Medical Equipment

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***Abstract*—In order to protect human health and solve the relevant medical problems, biomedical engineering is emerging as a new discipline, and the medical equipment direction thereof is the product of medicine and various disciplines, and the development level represents the level of comprehensive strength and scientific technology development of a country. As the medical equipment industry requires professionalism and particularity, and China still lacks of the professional talents in medical equipment, so it is urgent to cultivate comprehensive talents that have integrated medicine and engineering knowledge. This article focuses on the undergraduate teaching of medical equipment, combines with years of teaching practice, starts from the construction of teaching team and methods for talent cultivation, and puts forward the construction method for the teaching team that can combine external introduction with internal cultivation, and takes into consideration the development of the industry and the training of talented people to realize the integration of production, learning and research, and cultivate talents needed by the industry**

Keywords—Health; Medical equipment; Team construction; Talent cultivation

I. INTRODUCTION

Health problems have always been the problems concerned by people over the years, and along with the improvement of economic development and the growth in the living standard of people, while people are enjoying modernized civilization achievements, food safety and environment sanitation problems also emerge one after another, and people's awareness of health also reaches to a new level. Health is not only the most valuable future of individuals but also the social asset, and health maintenance is more like a social responsibility. Currently, Chinese economic society is developing at a high speed; meanwhile, health problems have also brought a huge challenge to the society. Sub-healthy groups are increased, and the incidence rate of diabetes, cardiac-cerebral vascular disease and other chronic diseases is increased. According to Chinese Cardiovascular Disease Report 2015 [1], the fatality rate of cardiovascular disease has exceeded cancer and became the primary pathopoiesis and fatal course of human. The generation and development of these diseases will cause a huge burden and injury to individuals and families and also consume lots of social medical resources. As per the era development, and social demand, the new concept of "massive health" is generated.

In order to ensure human health, and solve the relevant medical problems, as one emerging discipline, biomedical engineering gradually rises. In combination with physics, chemistry, mathematics, computer and engineering principle, biomedical engineers conduct the research of biology, medicine, ethology or hygiene. It utilizes the knowledge from molecular level to organ level, develops and creates new biology materials, implantation materials, device and information methods, and uses them in disease prevention, diagnosis and treatment, and this has largely improved people's health. Except for good social benefits, biomedical engineering also has good economic benefits, and is quite meaningful for social and economic development; besides, it is also one of the high technologies striving to develop in various countries during the new era. The contents of biomedical engineering include biomechanics, biological materials, medical image, medical electronic equipment and other precision medical equipment. Medical equipment industry is an interdisciplinary, knowledge-intensive, and fund-intensive high-tech industry related to people's life health, and many medicinal equipment are the product of medicine and many disciplines, and its development level represents the comprehensive strength and scientific technology development level of a country. The products manufacturing technology for medical equipment industry involves medicine, machinery, electronics, plastics and other several cross-technology fields, and its core technologies cover biomedical polymer material, laboratory medicine, hematology, life science and other several disciplines. Just because of the expertise and particularity of medical equipment, its R&D and production also require comprehensive talents of medicine and engineering combination, and the talent cultivation is the foundation for medical equipment, biomedical engineering and even the entire health industry development[2-3]. This article is aimed to start from medical equipment teaching, to discuss the teaching team construction and talent cultivation method.

II. TEACHING TEAM CONSTRUCTION

Education development, teacher-oriented; undergraduate colleges are generally the combination of teaching and scientific research, and teachers are acting as the bridge for the school and students, and they are not only the knowledge transmitter, but also the knowledge founder. The qualification and professional qualities of teachers will not only directly influence the overall teaching quality of universities, but also exert a key function in the formation of good view of life, world view and value of college students. Medical equipment covers medical treatment, electronics, computer, communication, machinery, new materials and other disciplines, and can exert an indispensable function in each link, including the disease prevention, diagnosis and treatment. At present, each country strives to develop medical treatment industry, the medical equipment industry is now developing at a high speed, and each medical equipment enterprise is working hard to improve its own competitiveness, and occupy commanding height of technology. Correspondingly, the teaching team of medical equipment shall also be a comprehensive team combining several disciplines, a forward-looking team with international view, and an innovative team with strong competitiveness. How to make the teaching team become the undergraduate teaching team of "precision medical equipment" with international view, high theoretical level, strong practical capacity, rich teaching experience and certain popularity and influence in medical equipment field, and we have made the following reflections and explorations.

A. The introduction of domestic and overseas high-end talents

The medical equipment education is carried out relatively late but develops relatively fast; many universities still have certain problems in teacher level regarding this [4]. For instance, the quantity of teachers is scarce, and the increase speed of teachers is far behind the increase speed of students. In some universities, one teacher is generally responsible for teaching several courses, and this has caused the heavy burden of teachers, low teaching efficiency and other problems. The reasonable introduction of high-end talents as per the existing teacher conditions can effectively improve the academic level of teaching group, alleviate the tense quantity of teachers, and optimize the teacher team structure. The introduction of talents who possess international view, and can comprehensively seize the domestic and overseas development conditions about their own research field and also have strong theoretical foundation and problem solving capacity for their own research field can play a good leading role in the construction of medical equipment teaching group in colleges. This can exactly meet the strong expertise characteristics of the medical equipment industry. Abstract the participation of clinical teachers and senior experts, and develop medical equipment education in combination with clinical demand.

B. The establishment of sound training system;

invite domestic and overseas famous education theoretical experts as well as the experts and scholars of teaching method and skills to periodically give lessons and lectures in schools, set teaching method demonstration courses, organize teachers to attend a lecture, observe and emulate; organize excellent teachers to make theme report and share experience, organize teachers to conduct teaching communication as per the form of "seminar"; invite the experts and scholar of medical equipment specialty to give a lecture in schools, and the contents include education and scientific research, the selection of research task, the compilation of course project approval, the compilation of research report; encourage teachers to periodically participate in domestic and overseas research and studies as well as training, and participate in teaching reform and scientific research project; with respect to young teachers, implement young teacher tutoring system, and teachers with high-grade professional titles shall act as the young teacher tutor, who will be responsible for the cultivation work of young teachers, and the young teachers can grow up fast through acting as teaching assistant, class tutor and other approaches [5]. Besides, comprehensively improve the comprehensive quality of the team in professional quality, education theoretic level, teaching method skills, scientific research capacity, course development capacity and the theoretical knowledge of teachers considering the specialty and other aspects, and help teachers alleviate pressure, and motivate working enthusiasm.

C. Encourage teachers to go deep into the industry, and carry out industry-study-research cooperation;

Currently, most teachers of medical equipment specialty in colleges are in lack of engineering practical experience, and the courses taught thereby are disjointed with the social development and cannot meet the current demand; meanwhile, it can also make students hard to deeply understand the current status about actual engineering, and this is extremely unfavorable to the education of students, especially the students of engineering. Thus, the engineering practical experience of teachers is the basic requirement considering whether they can be competent for the engineering talent cultivation. The cooperation with enterprises can provide a broad approach for the study and practice of teachers, and can also promote the improvement of teachers' knowledge structure and capacity structure. Thus, colleges shall fully utilize the school-enterprise cooperation platform, to encourage teachers to practice at enterprises, promote teachers to understand the development of medical equipment industry and the actual demand of the enterprise, and meanwhile, utilize their own knowledge to help enterprises to solve problems, and combine their own theoretical knowledge with practice. Meanwhile, timely understand enterprise demand, and further adjust the cultivation objective, the modification of teaching contents, and the reform of teaching means, and further guide teaching reform.

III. TALENT CULTIVATION METHOD

Students majoring in medical equipment will be engaged in the work of the medical equipment industry, the health care system, the government medical equipment supervision management department, etc., and shall possess the compound characteristics of engineering-medicine combination and mechanical and electrical combination as well as the comprehensive capacity of precision medical equipment design, preparation, development and application; possess the basic theory of mechanical and electrical integration as well as the basic knowledge of precision medical equipment manufacturing, maintenance and repair; master the operation, use and maintenance skills of medical equipment, and medical instruments, and can be engaged in the manufacturing, operation, maintenance and management work of medicinal preparation machinery and medical equipment; master the national standard and quality inspection technology of precision medical equipment, be familiar with the relevant supervision regulations, and can be engaged in the quality supervision, inspection, production and sales work of medical equipment, etc.

A. Definite teaching objective

Cultivate comprehensive talents who can adapt to the social development and the development demand of medical equipment industry, master good theoretical knowledge and practical method, possess international view and employment competitiveness, and can adapt to the work of medical equipment industry, health care system and the government medical equipment supervision management department, etc.

B. Teaching reform and construction

Gradually establish the cultivation mode that implements theory-practice integration: compile and publish theory-practice integrated undergraduate professional textbooks with professional characteristics, and can meet the talent cultivation requirements; jointly establish professional laboratories with enterprises, promote the laboratory equipment level, and provide hardware support for theory-practice integration cultivation. Carry out diversified teaching reform: further perfect the construction of network teaching platform for the core courses of the specialty; gradually expand the bilingual teaching of professional courses; through setting innovative practice courses and guiding students to participate in the relevant innovative practice competition, promote the students' innovation awareness and practical skills [6]. Further highlight the international characteristics of the specialty: carry out multi-dimensional professional cooperation communication with overseas cooperated colleges, jointly develop professional cooperation courses, and jointly build practical training platform; gradually introduce the European professional skill standards to professional teaching, and lay a solid foundation for docking with international courses, and cultivating international professional talents.

C. Reasonable course setup

As per the demand of medical equipment industry, set the relevant courses. The production and sales of medical equipment products can be approximately divided into several types as follows: medical electronic equipment type, domestic medical equipment type, medical image diagnosis type, radiotherapy type, interventional therapy type, sanitation consumables type, etc.[7]. Specific to the aforementioned demands, it is applicable to set medical equipment outline, physiology, medical image principle, biomedical optics, biomechanics, and biomedicine inspection technology, the fluidic technology in medical equipment, the computer simulation technology, clinic in-vitro diagnostic devices, typical medical equipment experiment, the advances in biomedical engineering and other compulsory foundation courses. Besides, as per the interests of students, it is also applicable to select one or two products therein as the main research direction, and specific to different research directions, it is applicable to set deeper professional courses. Moreover, the relevant professional courses can be opened for students who have the intention of further study. Comprehensively consider the social and industrial development demands and the personal intention of students, cultivate talents of application type, technical type, research type and other different layers.

D. Cooperation with enterprise, and promote industry-study combination

Since the medical equipment industry develops relatively fast [8], and the technologies are also updated fast, in order to ensure that the students can master the most advanced and practical skills, it is requested to pay attention to industry-study combination. The cooperation with medical equipment enterprises can provide an internship opportunity for students in enterprises, and through industry-study combination, improve the learning enthusiasm, definite the learning objective, reasonably conduct self-positioning, expand the newest skills and knowledge on the basis of mastering the basic skills and knowledge, and increase the employment opportunities and employment competitiveness.

IV. CONCLUSION

Our country's medical equipment industry is developing fast, with big demand for high-quality talents. This article starts from the teaching team construction and talent cultivation method, to carry out a relatively in-depth discussion on the undergraduate teaching of medical equipment, and puts forward the teaching team construction method that combines external introduction and internal cultivation and closely connects with the industry as well as the talent cultivation method that implements industry-study integration and fits industrial demand; the objective is to better cultivate qualified talents that can adapt to industrial demand and possess higher professional technical level oriented to medical equipment industry.

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