

# *On the Reform and Innovation of Curriculum System and Teaching Content for the Cultivation of Marine Medicine Talents*

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**Abstract**—The reform and innovation of curriculum system and teaching content in institutions of high learning is the key and difficult point of teaching reform, and also the foothold of the reform on talent training mode. It should adapt to the current trend of social science and technology, economy and social development. This research takes the laboratory construction as the breakthrough point. It should encourage students to participate in teachers' scientific research and cultivate their innovative spirit by setting up innovative science and technology projects for college students. Through comprehensive practice, field practice and graduation design, the characteristics of applied discipline of pharmacy are highlighted. With adjusting the professional structure and broadening the professional scope as the core, a new curriculum system is established based on interdisciplinary and integration and a new system for cultivating application-oriented marine medicine talents is established to meet the needs of the society.

**Keywords**—marine medicine talents, curriculum system, reform and innovation

## I. INTRODUCTION

The 21st century is the century of the ocean, and the ocean is the future of mankind. Exploitation and utilization of marine living resources is the most important content for marine exploitation. With the rapid development of life science, marine medicine industry will develop rapidly. Marine medicine, as an interdisciplinary and comprehensive high-tech, will be widely and effectively applied in the field of medicine. It should be one of the major directions for Zhejiang Ocean University to develop marine medicine and blue medicine.

Oceans cover 71 percent of the earth's surface. So far, only 10 percent of the 200,000 animals and 20,000 plants in the sea have been listed, and only 1 percent have been studied. So, in a sense, the ancient and vast ocean is still a largely unexplored "virgin land", a treasury of many unknown species.

Zhejiang Ocean University, located in Zhoushan city of Zhejiang province, along the East China Sea, is the third ocean university in China. Therefore, it is its duty to cultivate scientific and technological talents for the development and utilization of marine and marine medicinal resources. Zhoushan has diversified sea medicine resources which are widely distributed. Some of them have considerable reserves.

Thus, it is of realistic and potential significance to develop the ocean. Among them, there are 55 species of algae, such as kelp, laver, sargassum fusiforme, rat tail algae, copper algae, gulfweed, crony algal and ectocarpales, accounting for 85% in the province and 50% in the country. There are 36 species of mollusc, including oyster, sea clam, mussel, conch, placuna, cuttlefish, octopus and abalone, accounting for 44% of the whole province and 26% of the whole country. There are 16 kinds of arthropods, such as shrimp, crab and bergamot, accounting for 62% of the province. There are 213 species of medicinal fish in Zhejiang, almost all of which are found in Zhoushan. Therefore, Zhejiang Ocean University, located in Zhoushan, enjoys unique advantages in building marine medicine talents based on marine medicine.

In recent years, marine medicine has developed into a new interdisciplinary subject, which has an increasing impact on the national economy and has been widely valued by many countries. Ocean University of China takes the lead in the development of a new marine medicine for the treatment of cardiovascular diseases-- polysaccharide sulfate, which is quickly put into production and achieves good results. Hailisheng Pharmaceutical Co., Ltd. in Zhoushan enjoys rapid development in marine medicine, from fish liver oil preparation for children to Vitamin A and D drop, from fish liver lipid-lowering pill to Polyene-kang capsule. Although fish oil is used as raw material, it develops by leaps and bounds in quantity and quality.

## II. THE CURRENT SITUATION OF THE DEMAND FOR TALENTS IN THE MARINE DRUG FIELD

The talents of marine medicine in our province and even our country are scarce. At present, few universities in China offer marine medicine majors except Ocean University of China. So far, there is no university in our province having marine medicine majors. With the advent of the era of marine development, the demand for talents in this field is increasing, and the contradiction in demand is increasingly prominent.

According to the actual situation in Zhoushan, the original seven pharmaceutical enterprises in Zhoushan have 1,736 employees in total, including 88 professional and technical personnel, accounting for only 5% of the total. Among them, there are even fewer with middle or senior professional titles,

and there are none of marine medicine majors, most of which are graduates with "pharmacy" major. The development of blue medicine requires professionals to have basic theories and knowledge of pharmacy as well as marine biology. Therefore, it is urgent to cultivate marine pharmaceutical talents.

### III. PRACTICE AND REFORM

The applied marine medicine talents, or the social service marine medicine talents, can be divided into those with original innovation, industrial research and development entrepreneurial talents who can engage in the technical work of medicine research, development and production in the field of biomedicine, those who can solve the engineering and technical problems in drug development and production, those pharmacist who can solve the problems of drug quality control and safe and rational drug use and those medical-management talents who can make scientific decisions, organize, coordinate and manage. Therefore, this paper systematically studies the measures to develop "knowledge and ability structure and training" of these three types of talents. According to this requirement, it should strengthen the training of ability in practice, design, innovation, industrial research and development and management of application-oriented talents. Its cultivation mode has the following characteristics:

#### A. *It takes the laboratory construction as the breakthrough point to cultivate the entrepreneurial talents of marine biological medicine.*

With the rapid development of life science, especially the rise of molecular biology and genome science, modern pharmaceutical research has ushered into a new stage of development. In 2005, the college was approved as "pharmacy (marine pharmaceutical laboratory)", with a construction area of 1,112 square meters and a total construction fund of 2.56 million Yuan, and it was officially put into use in 2007.

In addition to the professional training program, we also have a series of practical teaching, such as pharmaceutical social practice, hospital pharmacy social practice, teaching and research practice, preparation production practice. In terms of practical teaching content, we focus on the following aspects: we will further "fill up vacancies" in basic laboratory, make an overall arrangement among verification experiment, demonstration experiment, comprehensive experiment and self-designed large experiment and strengthen the comprehensive experiment and design experiment on the basis of emphasizing the verification experiment in order to achieve organic unification with both connection and difference. We emphasize the comprehensive application of knowledge in terms of professional laboratory emphasizes, focus on the cultivation of development and innovation and strives to realize the open management of professional laboratory (open to students and the society).

Through the efforts of teachers and students of the department of pharmacy for more than two years, the highlight of pharmacy has been initially formed. We encourage students to participate in teachers' scientific research and cultivate students' innovative spirit by setting up innovative science and technology projects for college students. Through

comprehensive practice (including interclass practice), field practice and graduation design practice, the characteristics of applied discipline of pharmacy are highlighted to cultivate students' comprehensive practical ability. It has formed a training model for interdisciplinary and applied pharmaceutical talents which combines pharmacy, medicine and chemistry, as well as pharmacy, food and biological sciences.

Tutorial system. It provides tutors for students. They directly participate in the guidance of relevant courses, and develop personalized early research training plan for students.

Research platform for college students. It makes full use of the existing resources, explores students' potential of scientific research, and builds a good platform to cultivate students' consciousness of scientific and technological innovation. In addition, we take the science and technology innovation ability as a bridge in order to closely integrate innovation and entrepreneurship education. We have been using this platform to expand the educated for entrepreneurship from teams to junior and senior students so as to create a good atmosphere, increase the practice opportunity and exercise their own entrepreneurial character and quality in independent scientific research work.

#### B. *It strengthens teaching reform and cultivates applied marine medicine talents to meet social needs.*

On the basis of repeated discussion and demonstration, this study proposes an adjustment plan for the original biological science (marine medicine direction) and pharmacy major of Zhejiang Ocean University. The major is adjusted into two that is, marine medicine and pharmaceutical marketing. The adjusted major adheres to the principle of "broadening professional scope and enhancing adaptability" and highlights the school policy of "fishing, shipment and fish", which reflects the advantages and characteristics of our school in marine education.

Focusing on the cultivation of research-oriented pharmaceutical talents in the 21st century, it is necessary to strengthen the teaching of life science. Therefore, we should update and deepen the theoretical basis of pharmaceutical science from the following aspects:

① Changing the pharmacy basis from a single chemical model to such a model as combines chemistry and life science.

In the basic disciplines of pharmacy, on the one hand, the related content of life science is strengthened; on the other hand, the integration of chemistry and life science is emphasized as the basis of pharmacy. Therefore, a series of life science-related courses are offered, such as medicine molecular biology, biochemical pharmacy, marine biology, etc. It is an innovation for higher pharmaceutical education of China to offer biochemical pharmacy course for students.

② Building a new curriculum system based on interdisciplinary and integration.

We have established the "pharmaceutical medicine foundation" course system, broken the traditional curriculum system which is based on physiology, human anatomy, pathology and so on, set up cross-secondary discipline system

of comprehensive medical foundation course which is characterized by mutual penetration among multidisciplinary and mutual combination, integrated related subject contents through the normal physiological of cell, tissue and organ system, pathological changes, drug therapy and new drug design to build a comprehensive pharmaceutical medicine foundation course mode.

③ Innovating teaching methods and focus on cultivating students' abilities.

First, we allocate a certain amount of teaching time for many courses, adopt a variety of teaching methods and guide students to self-study. For example, Teachers assign a certain amount of topics and divide students into several groups. Each group has a topic. And students need to go to the library and Internet to refer to literature review and then discuss in the classroom, which can not only make them be familiar with the forefront of subject knowledge as soon as possible and stimulate their innovative awareness by making the students study theory and the process of technology innovation, but also improve the students' ability in foreign language, literature review, communication. Second, we implement open teaching, strengthen the training of ability in scientific research and organize students to take turns to train their ability in scientific research in medicine chemistry, pharmacology, natural medicine chemistry, pharmacy and other disciplines. The teaching form is mainly open teaching. 1-2 students, as a group, are sent to the laboratory of their teachers to participate in the research projects of teachers and graduate students. The "supervisor responsibility system" is adopted, which means that the supervisor puts forward specific plans and gives specific guidance before the experiment, and the students write the experimental summary after the experiment. Third, the teaching plans of each major are comprehensively revised and adjusted.

On the basis of the adjustment of professional direction, research groups revise and perfect the teaching plan of pharmacy major including biological science (marine medicine orientation) twice in accordance with the idea of reform on talents training mode of applied marine medicine by combining with the findings of the educational reform project while adhering to the requirements of education "gearing to the modernization, the world and the future" and of "cultivating senior specialized talents with innovative spirit and practical ability", which has the following new features compared with the original teaching plan:

Clear training objectives. It fully reflects the requirements of talent training in the new era. For example, the current pharmaceutical major has a wide range of professional services in terms of training objectives, covering the main training objectives of the original three majors of pharmacy, biopharmaceuticals and pharmaceutical marketing and appropriately extending to marine pharmaceuticals so as to cultivate a wide range of students.

The curriculum system is more reasonable. In the revised professional teaching plan, the curriculum system is mainly composed of public basic courses, professional basic courses, professional courses and professional courses. In the teaching content of professional courses, the knowledge points and

information amount are increased in main professional courses while keeping the class hours basically unchanged. The purpose of setting up the course group of majors is to make students better adapt to the needs of the post after graduation, and at the same time to provide students with the opportunity to choose the professional direction according to their interests.

Practical teaching. Through the combination of production, learning and research, we have closely cooperated with pharmaceutical industrial enterprises and pharmaceutical commercial enterprises to establish a long-term production practice and education and practice base and closely combine theory and practice, so that students can enrich knowledge, improve ability and enhance quality in practice. At present, 10 off-campus education practice bases have been established, including Zhejiang Xinchang Pharmaceutical Co., Ltd., Zhejiang Minsheng Pharmaceutical Co., Ltd., Zhejiang Hailisheng Pharmaceutical Co., Ltd., Jiangsu Shenglang Pharmaceutical Co., Ltd., and Zhejiang Hengrui Pharmaceutical Group.

Open up the second classroom. Under the joint effort with the scientific research office, student affairs office and the youth league committee, the college continues to open up the second classroom while paying special attention to the first classroom, and carries out a series of academic lectures and cultural, scientific and technological activities that integrate the ideological, academic, intellectual, practical into one. We actively encourage and support students to participate in scientific and cultural activities of provincial new seedling plan, organize related teachers to open up a series of professional scientific research lectures, such as "marine medicine development trend", "health food development", "environment and health", "human body art anatomy", etc., to broaden students' knowledge.

#### IV. THE ACHIEVEMENTS OF THE REFORM

Through the above reform and innovation, we have made some initial achievements as shown below:

1. High employment rate of graduates. With their good dedication, wide range of knowledge, strong ability and high quality, graduates won the wide praise from the society. Among them, 12.5% of graduate students are admitted to continue to study for master degree, 16.4% of them work in institutions of higher pharmaceutical inspection and pharmaceutical research institutions, 57.3% in state-owned large and medium-sized pharmaceutical industrial and commercial enterprises and Chinese-foreign joint ventures, 2.7% in state organs and government departments and 11.1% in other working units.

2. Sound student pool and high comprehensive quality. In recent years, the number of outstanding students applying for the pharmacy major has increased significantly, and the quality of freshmen has been continuously improved. In 2016 and 2017, all the students who applied for the pharmacy major were their first choice. Students of our school have strong practical ability in combining theory with practice and experiment. They are highly appraised by some domestic research institutions where they practice. For example, the evaluation of Zhejiang Academy of Traditional Chinese

Medicine on our students is "extensive knowledge, solid basic skills and strong practical ability", the evaluation of Zhejiang Minsheng Pharmaceutical Co., Ltd. on our students is "solid professional foundation, active scientific research thinking, broad scope of knowledge, strong dedication, and good English foundation".

3. The achievements of educational reform. Through research, a number of research achievements and practical experience with great reform and distinctive features have been obtained in the cultivation objectives, quality and specification requirements of pharmaceutical (marine medicine) professionals, the construction of various curriculum structures and curriculum systems and the application them into textbooks. We has published 4 papers on educational reform, participated in the compilation of 1 textbook, edited 8 experimental guides and 1 teaching material, built 1 provincial excellent course and 1 college-level excellent course, edited 3

college-level key textbooks and set up 1 college-level key subject, 1 general subject and 6 related college-level and school-level educational reform projects.

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