

Research on Teaching Reform of Biopharmaceutical Specialty in Higher Engineering Institute

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Abstract—Since the 21st century, biopharmaceutical specialty has already become one of the most promising industries. Based on the requirements of the society, some suggestions for the teaching reform were, proposed including strengthening practical education, engineering quality education and the application skills. By doing so, the foundation-oriented education into technology-applied education will be achieved.

Keywords—*Engineering Colleges, Biopharmaceutical Specialty, Teaching Reform*

I. INTRODUCTION

Owing to the wide prospect, a high priority on funding biopharmaceutical industry in China has been established. Undergraduate education plays a key role in biopharmaceutical specialty in our institute, delivering high-level applied biopharmaceutical professionals to design institutes, research institutes, management organization in biotechnology and pharmaceutical engineering. However, the recent survey shows that lack of professionals is the problem, especially new drug R&D researchers and production management engineers. The reason induced by the biopharmaceutical teaching, such as the lack of sessions of biological experiments and experimental instruments, and the unsolved narrow discipline, which cause the students have a surface understanding of the majors and take their professional courses lightly. Therefore, how to deal with the situation and cultivate more applied technical talents fitting the needs of the society become a key problem to be solved urgently.

II. METHODOLOGY

A. *Modification of Training Program*

The objective of professional training is to establish the system for applied talents on mastering interdisciplinarity subjects including chemistry, medicine, biology, pharmaceutical engineering and technical aspects of the basic theory, basic methods and basic skills. And technological designs in the field, such as biotechnology and pharmaceutical engineering and related production enterprises, research institutes, design institute and the management department and other units, production management, new technology research and new product development, are on the basis of biology, methods for pharmaceutical engineering, to master fermentation, separation engineering of the biological medicine products.[1]

Considering the actual situation of our institute and the characteristics of students majoring in biopharmaceuticals, the

"Outcome-based Education (OBE)" model has gradually been explored and carried out. Integrating teaching and learning organically is useful for improving students' thinking and logical ability, and will promote and motivate to learn with the results.[2]

An efficient teaching system of theoretical curriculum characterized by the mutual selection of teaching can be built through the combination of compulsory courses and elective courses. The compulsory courses obey the basic quality requirements of the relevant regulations and professional requirements of the Ministry of Education or the Education Committee. The frontier contents of biomedicine in elective courses are offered to enrich their knowledge, encourage their innovation and broaden the horizon.

B. *Reform of Teaching Methods*

At present, all biopharmaceutical professional teachers have Ph.D, practicing OBE in their teaching course. The goal of teaching design and practice is the final improvement obtained by students through education process and emphasizing "knowledge, ability and quality" three-dimensional, and so it is necessary to construct a model of highlighting ability standard education.[3]

1) *Establishing the college student practical courses:* In the process of the cultivation of technology-applied talents, the main role of students and the leading role of teachers in the teaching process should be highlighted by means of reducing lecture-style classes, increasing the proportion of seminars and practical courses, and setting up a comprehensive category of biopharmaceutical practice projects. Due to the long duration of biology experiments, students conduct experiments in groups producing periodic reports, and collective evaluation by teachers and students, which demonstrate good team spirit. Students' understanding and practical application of theoretical knowledge is greatly enhanced. The use of interactive teaching methods such as flipped classroom and case type is beneficial to develop students' ability of solving problems.

In recent years, the undergraduate tutorial system, an effective way to strengthen the education of college students at the present stage, has been implemented in more and more colleges and universities across China. The core of management functions is consulting and guidance.

Since the founding of the biopharmaceutical specialty, the tutorial system has been introduced based on willingness of sophomores, which can prevent students confusion on their own

professional development timely and effectively. Through the communication with the tutor and senior student from interest group, the tutorial system can actively guide the students to gain the higher, better learning results, gradually eliminate mystery feeling of research, consequently professional interest can be cultivated, their study motivation and independent thinking can be stimulated.

Through active participation and cooperation within three years, the students have broadened their horizon and improved their practical skills, deepened their professional knowledge, improved their comprehensive quality and expanded their employment channels.

2) *Establishing the college student competition system:* Students are encouraged to participate in various life sciences innovation competitions as a supplement to classroom teaching, from simple operation to designing experiments by themselves, so as to enhance their ability to apply what they learn.

For the better result of the discipline competition, a diversity complementary-typed team with the members is established. The students enthusiasm is fully activated and the teamwork awareness is cultivated in the process of participating in the competition. More importantly, students are gradually able to declare, design and carry out a research independently.

Participating students have the chance to conduct academic discussion and knowledge exchange with elite students from colleges and universities all over the country. The judge's comments on the contest performance on-the-spot have greatly broadened students' professional vision and provided students with a rare opportunity to take in the latest developments outside the classroom. At present, the results of students discipline competition performance are shown in Table I.

TABLE I. STUDENT COMPETITION AWARDS, PAPERS AND PATENTS

Category	Project's name	Grate	Year
Competition	National College Students' life science innovation experiment contest	Third Award	2016
	Life science contest of university student in Jilin province	Second award	2017
Paper	Toxicological evaluation of the flavonoid-rich extract from <i>Maydis stigma</i> : Subchronic toxicity and genotoxicity studies in mice	Journal of ethnopharmacology	2017
Patent	Corn silk anti fatigue oral liquid and its preparation method	Authorized patent	2017
	Semi bionic extraction of active components from corn silk and its antioxidant effect	Authorized patent	2017
	Preparation method of corn stigma flavone , its products and application	Authorized patent	2018

3) *Establishing an open laboratory system:* Due to strict biological experiment conditions, the relatively long duration

of experiment, and insufficient school laboratory resources, subjects open to students are limited. Therefore students are encouraged to participate in the teacher's scientific research subjects. Both the responsibility system of tutor and the hierarchical classification experiment contribute to perfectly implementing professional applied talents training mode.[4]

4) *School-enterprise cooperation helps cultivate technical talents:* Since the integration of production and education has become a booster for the development of higher education institutions, the introduction of biopharmaceutical enterprises into the cultivation of applied technology talents can greatly improve students' practice and innovation ability, and help them adapt to the working environment quickly in the future.

5) *Professional academic salons helps cultivate technical talents:* Regular professional academic salons to enhance students' academic standards enables the students to acquire leading-edge development of the subject, broaden the students' vision, stimulate students' interest, activate students' thinking, improve students' ability to analyze and solve problems, and therefore the teaching effect of "teaching how to fish" is achieved. Famous scholars and experts are invited to deliver science and technology lectures, in which they discuss and communicate with students, imparting their scientific research experience, scientific practical skills and innovative thinking mode to students, letting students walk with wise people, and motivating students to pursue truth and realizing the value of life.

III. RESULTS AND DISCUSSION

The professional teaching system of "curriculum theory focusing on knowledge points, course experimentation as a line, and graduation thesis as an interdisciplinary course" is formed combined with the characteristic disciplines in our institute. In the future, the students will take part in the competitions of various levels and types , such as the Challenge Cup Competition, Yaoyuan Forum, Pharmaceutical Engineering Design Competition, and Life Science Innovation and Entrepreneurship Competition. The number of student's passing CET-4 has increased in successive years. The cooperation with the open laboratory benefits both sides in some aspects, eg reducing the cost of R & D of the enterprises, better utilizing scientific research resources, and enhancing teachers and students' scientific research capabilities. Above all, students have got themselves prepared for the employment by knowing the needs of enterprises ahead of time, and the employment rate has been increased in successive years.

IV. CONCLUSIONS

The paper discusses the reflection on teaching reform of the higher undergraduate majors in biopharmaceutical and proposes the reform of the training program aimed at training more professional applied talents with basic theoretical knowledge in pharmacy and biology and biomedical analysis. Thus, from the results inference, they can undertake the related work in biopharmaceutical research, development, production, medical testing, health and epidemic prevention, which is the goal of cultivating and providing excellent talents for the biomedical field.

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