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Research Article

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Curricular system constituting of new specialty on bio-pharmaceutical in ordinary engineering institutes

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ABSTRACT

The curricular system constitution of new specialty on bio-pharmaceutical in ordinary engineering institutes was introduced, the further tentative plan for new specialty with combination of the development trend of bio-pharmaceutical home and abroad and the characteristics of discipline were also discussed.

Key words: bio-pharmaceutical；specialty；course system

INTRODUCTION

Relevant departments estimated that an average annual growth rate of biotech drugs would not be less than 25% in the future. With the government offering the preferential policy and increasing investment, the bio-pharmaceutical industry is facing an unprecedented development opportunity. A large number of highly skilled biotechnology pharmaceutical talents are much in demand due to the rapid development of the biomedical industry. Colleges and universities are the cradles to cultivate bio-pharmaceutical talents for employing units, and about 90 percent of companies choose to recruit talents from colleges and universities, followed by 70% companies which focus on in house training, 40% companies importing talents from other companies; while 20% companies prefer to introducing talent from overseas and foreign experts respectively [1]. Taking this background as an opportunity, in 2011, our institute set up a major in bio-pharmaceutical education on the basis of the biological, pharmaceutical, chemical, chemical engineering and technology with the approval of the Ministry of Education, granting the Bachelor degree of Engineering a four-year curriculum. So building course system of new specialty on bio-pharmaceutical in ordinary engineering colleges lays the foundation to train high-quality, applied bio-pharmaceutical talents and provides a reference for the talents.

CONSTRUCTION IDEA ABOUT NEW SPECIALTY ON BIO-PHARMACEUTICAL

Our institute is a provincial university with the chemical distinctive characteristics and engineering quality education has been carried out through all terms. It is the purpose and characteristics of talents training developing “a skilled engineer”. The “triple” training mode of the “emphasizing downstream, engineering, and practice” is proposed.

How to combine the training objective, model and actual situation, how to make the curriculum in line with market demand, and how to train bio-pharmaceutical talent with our own characteristics and other professional construction issue.With reference to relevant professional teaching mode from the domestic and international famous university, and investigating related research on the colleges and universities inside and outside the province; New training program and curriculum system were discussed by experts on campus and off-campus; With reference to the overall strength of departments and school, and combining with talent strategy plan of training “outstanding engineers”, we put forward our own characteristics of bio-pharmaceutical specialty[2] : with the biological separation engineering as the foundation, the biological pharmaceutical engineering for method, the engineering technology of biological

agents as the goal, we will combine the base theory with engineering practice, be familiar with pharmaceutical biological technology, combine production with study to train more modern and applicative engineers with a certain development capabilities.

COURSE SYSTEM CONSTRUCTION OF NEW SPECIALTY ON BIO-PHARMACEUTICAL

According to the specialty construction ideas and the characteristics, studying carefully about knowledge constitution of students, the establishment to the course system and optimization of the course structure overall, are the key problems to be solved in this new professional.

2.1 Discipline characteristics

Since the development of biological pharmacy in the 1990s, it is a new development direction at home and abroad, and the course setup also is still in a groping, improved and gradually perfecting stages. The specialty construction has just set up soon, and a standard construction mode has not been set up. At present, the specialty directions of different colleges are different because of different basic condition emphases and the different corresponding course system and curriculum. But the professional curriculum should emphasize a macroscopic, novelty and whole optimization [3-5].

According to the actual situation, and relying on different majors of biological technology and engineering, chemical, pharmaceutical preparations and pharmaceutical engineering, chemical engineering and technology, which is a national special majors, provincial key laboratory on chemical separation technology and so on as professional platform, and the discipline construction plan with the characteristic of practice are proposed:

1: Relying on pharmaceutical preparations specialty, preparation production process as the main line, combined the "biological agents project" engineering characteristics with "GMP" contents to form engineering characteristic of biological engineering.
2: Relying on pharmaceutical engineering specialty, dry, making water and sterilization, biological reactor, broken and mixing, Solid-liquid leaching are used as the main contents to train the talents major in biological pharmaceutical technology, biochemical pharmaceutical technology, food biological technology, biological chemical technology, and so on. Engineering characteristic of biological pharmaceutical engineering is formed.
3: Relying on major of chemical engineering and technology to train the talents who can effectively apply all kinds of separation technology to design the reasonable purification process route or improve existing technology, and theoretically solve various engineering problem, according to the characteristics of the different product, and engineering characteristic of "biological separation engineering" is formed.

2.2 The course system settings

According to the ideas of professional construction and needs of course system construction, seven curriculum group are set up.

Major Disciplines: chemistry, biology, pharmacy, engineering.

Main course: inorganic and analytical chemistry, organic chemistry, physical chemistry, chemical principle, biological chemistry, pharmacology, microbiology and immunology, biological pharmaceutical technology, biological pharmaceutical engineering, Pharmacy.

Public education course group: humanities social sciences, natural sciences, foreign language, computer, etc. The main courses have the moral character, legal basis, college Chinese, college English, higher mathematics, linear algebra, University physics, computer culture basis, engineering philosophy, etc.

Chemical foundation course group: inorganic and analytical chemistry, organic chemistry, physical chemistry, instrumental analysis, etc.

Biology course group: biochemistry, molecular biology, cell biology, microbiology and immunology, etc

Engineering course group: biological separation engineering, chemical principle, and biological pharmaceutical technology, preparation, engineering, engineering drawing, etc.

Pharmacy course group: pharmacology, pharmacy, Pharmaceutical analysis, pharmaceutical chemistry, biological pharmaceutical technology, pharmacy management, etc.

Practice teaching curriculum group: basic chemistry experiment, organic chemistry experiment, instrumental

analysis experiment, physical chemistry experiment, chemical principle experiment, biochemistry experiment, biological pharmaceutical technology experiment, production practice, chemical principle course design, professional course design, graduation practice and graduation design (paper), etc.

Elective course group: cell engineering, biotech pharmaceutics, pharmaceutical and biological products, biological pharmaceutical analysis, natural medicine chemistry, Chinese medicine biotechnology, Analysis of Chinese Preparation, new drug research and development, China pharmacopoeia lectures, science thesis writing, etc.

2.3 Characteristics of curriculum system

In recent years, according to our school foundation, school environment, the school quality and school scale，we propose the "triple" training mode of emphasizing downstream, emphasizing engineering, emphasizing practice and combined with discipline characteristic to form his own the characteristics of school.

This specialty is based on biology, chemistry, medicine and engineering discipline, it is complicated discipline with different disciplines penetrated each other rather than simple summation by several disciplines, new knowledge structure and course are formed.

In 2011, the chemistry discipline of our school was evaluated as key discipline in Jilin province, it is one of main subjects in bio-pharmaceutical specialty, including basic chemistry (inorganic and analytical chemistry, organic chemistry and physical chemistry) and professional chemical (biochemistry). It requests the students to master the foundation chemical knowledge, basic theory and basic skills. The teaching process must pay special attention to the abilities of basic skill in laboratory and innovation consciousness.

Life and pharmaceutical sciences are the major disciplines, main courses include microbiological and immunology, physiology, molecular biology, pharmacology, pharmacy, pharmaceutical analysis. Through these courses, lay the foundation for the application of modern biotechnology research and development. The courses in the colleges with high score in "questionnaire analysis and proposals for reform on curriculum in bio-pharmaceutical specialty" have been set up in our college, this accord with the requirements of the enterprise to the specialty [6].

Due to the limitation of study period, teachers are required to concentrate the focus on key chapter and content, in order to lectures fewer but better, for some chapters to guide the student to study independently, guide and inspire "students thinking, train students" self-study ability.

"Emphasizing engineering" is one of talents training modes in our school, therefore, compulsory parts of the project courses including engineering drawing, chemical engineering principles and bio-pharmaceutical engineering and so on are set up.

The students should be required to understand engineering drawings, also have the ability of equipment selection, put forward the design requirements. Engineering philosophy in public education course group is a required course of training modern engineers in the sixth term. The courses of environmental protection and sustainable development and the modern enterprise management are restricted to choose, these engineering disciplines can strengthen the importance of engineering, highlight characteristics of our college.

Foreign language and computer level in public education course are relatively important. According to the requirements of the training goal, the students must master a foreign language, can skill operate a computer. With the development of modern bio-pharmaceutical, the application of computer in pharmaceutical professional become more and more widely. To master a certain computer skills for each staff is indispensable. So it is necessary to increase students' ability of computer application. Biological technology in scientific front position, if it accords with international standards, students have to learn and pass college English test four, in order to adapt to the needs of the future of work.

THE EXISTING PROBLEMS AND SOLUTIONS

This course system can basically satisfy the needs of modern engineer talent training，also there are some problems to be solved in the following three aspects.

3.1 The simulation training

"Emphasizing practice" require students to master the principle of bio-pharmaceutical, operation process and technology. Deep Inside the Pharmaceutical companies is the best opportunity to practice. But the pharmaceutical enterprises according to the GMP, the external persons are limited into enterprise.

With the actual circumstance, through purchasing training platform software system of simulation GMP production line, students without entering the workshop can really simulate online design, verification, production, quality and file management on the aspect of the operation in computer room . The training do not only operate feasibly but cost saving with high cost performance.The students can have quickly a perceptual knowledge of all sorts of preparation technology of pharmaceutical enterprise, use of pharmaceutical equipment , so as to lay the foundation of the real productive practice.

3.2 Teachers

Bio-pharmaceutical specialty involving multiple disciplines, therefore, high requirements are proposed for teachers. Teachers' knowledge structure, the knowledge innovation ability, its own production practice ability and virtue style directly determine the quality of teaching level. To adapt to the bio-pharmaceutical specialty needs and improve teachers' professional quality, the excellent young teachers should be selected out to learn, and regularly teaching research organize and external experts lectures should be organized, and will recruit two high-level talents.

3.3 Convergence adjustment basic courses and major courses

Students in lower grades have very weak understanding of the major, do not understand the connection between the courses and the major. Teachers who teach basic courses should communicate with professional teachers, when teaching basic course and appropriately contact the professional knowledge, make the students master the basic courses, and have a strong interest in specialized courses, improve the students' thirst for knowledge [7].

Inorganic chemistry and analytical chemistry are integrated with inorganic and analytical chemistry, theory 80 hours, experiment 24 hours. For example, molality in the inorganic chemistry is the basis of the injection preparation in the pharmacy, chemical equilibrium is the foundation of chemical pharmaceutical process, redox reactions is an important reaction types in *vivo*, is closely related to drug metabolism, drug action mechanism , the metal element is the basis of analysis of harmful elements in the pharmacopoeia.

Organic Chemistry is the most important basic course in the bio-pharmaceutical specialty. Teaching classes for 88 hours, set up in the third and fourth semester. By learning to make the students master the basic concept and basic theory of organic chemistry, molecular structure of organic compounds, the relationship between structure and the compounds nature, the synthesis of organic compounds and mutual conversion.

COURSE CONSTRUCTION FURTHER ASSUMPTION ON BIO-PHARMACEUTICAL SPECIALTY

Bio-pharmaceutical specialty had been to achieve enrollment in 2011, and training program and teaching programs were formulated initially. But curriculum system building is a systematic and dynamic process, need to keep up with the pulse of the times, adjust, improve the curriculum system, so the following four points are put forward for reference only:

4.1 reasonable arrangements for the required courses and elective courses

Students select courses according to individual learning basis, interest and hobbies, elective courses are opened with the lectures, limited course and public course.Courses are based primarily on the development of the bio-pharmaceutical industry and the trend of demand for talents. The courses should adapt to the needs of students' personality development, combined with frontier science and technology, expand knowledge.

4.2 Exploration of practical courses

The teaching research should combine with science research and production practices in universities. The practice teaching as a breakthrough in teaching and research will promote the entire teaching process.

According to the needs of the professional curriculum and personnel training, experimental teaching is to be designed into three levels: Firstly, verify experiments are opened in the basic course to ensure that students grasp the basic laboratory skills of the professional experience-based; secondly, comprehensive experiments are the integration of professional experimental courses of teaching content, and focuses on training students completely system of knowledge structure and can master a variety of experimental skills; thirdly, openness and innovative experiment require students to complete independent research project design, mainly in the elective and after school hours, and emphasize the development of students' independent research capacity and innovation consciousness [8-9].

4.3 Strengthening the management and learning of laws and regulations

In the modern pharmaceutical enterprises, we need unassailably follow the instructions of the GMP management, strictly comply with the national drug production management laws and regulations. So pharmacy management and regulations is classified as required course.

4.4 Combination with the licensed pharmacists system

Licensed pharmacists system is the strategic measures for medicine business to adapt to market economy, strengthen macro management, promote the reform of medical system, it is also the important guarantee to be in line with international standards, implement the international recognition. For students, it is both an opportunity and a challenge. It is very favorable for the students' future employment and working to teach in line with the market and international standards in the undergraduate courses [10].

CONCLUSION

Due to the course system of bio-pharmaceutical specialty has just been started, its rationality needs time to verify, we plan to make a system of course evaluation every school year, and ask for advice from students, more scientifically and reasonably advices need to remain to be further research.Through the solid work and forge ahead, the new professional will develop distinctive, and maintain a new level. It can play a positive role to develop, production and management in biological pharmaceutical talents training, medicine and health care, food, biological technology and products, etc in our province [11-12].

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