Construction and Practice of Penetrating Training Mode of Biotechnology Innovation and Entrepreneurial Talents

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Abstract—Biotechnology is an emerging discipline with a cross-cutting and comprehensive nature in the 21st century. If China wants to achieve a true lead in biotechnology, there is still a long way to go, and the cultivation of a large number of relevant innovative talents in the field of biotechnology will become a decisive factor. The need for the society to propose innovative capabilities to biotechnology professionals, and how we should cultivate these innovative talents to meet the needs of society, this is an issue that our educators engaged in the training of biotechnology professionals need to explore. In this context, based on the characteristics of modern biotechnology disciplines and the needs of society for biotechnology innovation talents, this paper explores the cultivation mode of high-quality innovative talents infiltrating into biotechnology through innovation and entrepreneurship.

Keywords—biotechnology, innovative talents, training model

I. INTRODUCTION

As a high-tech discipline, biotechnology must be cultivated in a long-term manner to be able to use its creativity in practical applications to create value for biotechnology companies and society. At present, the professional orientation of biotechnology professionals in colleges and universities is vague, the training objectives are not clear, the talent training is not in line with market demand, the curriculum planning system is not perfect and the professional teachers are insufficient, and the lack of talent training mechanisms in higher education institutions, enterprises and social governments. With the introduction of innovation and entrepreneurship, it is helpful to infiltrate innovation and entrepreneurship into biotechnology for biotechnology innovative talents. This paper starts from the innovation and entrepreneurship, clarifies the training objectives of biotechnology professional innovation talents, expands the diversified skill training platform, strengthens the construction of the teaching staff and builds a multi-party innovative talent training environment, in order to build a composite innovation professional talent training base for the biological field, and establish a training model for biotechnology professionals that closely links with the needs of the talent market, and provide feasible ideas and lessons.

II. CHARACTERISTICS OF MODERN BIOTECHNOLOGY DISCIPLINES

Modern biotechnology has been regarded as a high-tech by countries all over the world. In the "High-tech Research and Development Program Outline" formulated by China in early 1986, biotechnology was ranked first in high-tech such as aerospace technology, information technology, laser technology, automation technology, new energy technology and new material technology. In the "China Biotechnology Policy Outline" formulated by the State Science and Technology Commission in the same year, "biotechnology" was defined as: "Based on modern life sciences, combined with advanced engineering techniques and scientific principles of other basic disciplines, according to advance Designing or transforming organisms or processing biological materials to produce the desired products for humans or to achieve such a purpose." According to this definition, combined with a series of achievements in the rapid development of life sciences in the past 20 years, it can be summarized that the modern biotechnology discipline has the following characteristics.

A. Cross and Comprehensive

Biotechnology has a long history. China has a winemaking technology more than 4,000 years ago, but this is purely an ancient biotechnology based on experience. Since the success of the first human genetic recombination experiment in 1973, biotechnology has had a tremendous impact on human society and economic growth with its rapid development. It is the creation and development of modern biotechnology centered on advanced technologies such as recombinant DNA, which has injected new vitality into the life sciences. The experimental methods and means provided by it have greatly promoted the in-depth study of the traditional biology department. Modern biotechnology is supported by disciplines such as molecular biology, cell biology, microbiology, immunology, genetics, and physiology, combining chemistry, chemical, computer, and
B. Experimental and Practical

As a new discipline, biotechnology is based on traditional biology, and it is also experimental in traditional biology. Practice is the foundation of theory, and any authoritative data in the biology department must be obtained through numerous experiments by relevant experts. The advancement of science is to develop productive forces, and the development of biotechnology will also drive the emergence of a number of high-tech, high-input, high-return related new industries, and the talents capable of these industries are not limited to their laboratory capabilities, it needs talents with the concept of science-technology-production integration. Biotechnology is very experimental and practical, but biotechnology is also cross-cutting and comprehensive. Therefore, biotechnology is transformed and integrated by a group of excellent teaching and research personnel, using cutting-edge experimental methods and high-tech. It is a discipline that is promoted and closely linked to human production and life and has strong social practice.

C. Application and Intuitive

As a high-tech, high-tech discipline, biotechnology needs to be applied to social practice to reflect its unique value. Since the emergence of documented biotechnology, the development of biotechnology has been reflected in the way of products. For example, the first-generation biotechnology of winemaking technology, the production of lactic acid, baker's yeast, amylase, etc., the antibiotic industry such as penicillin in modern biotechnology, the amino acid fermentation industry, the enzyme preparation industry, etc., the use of DNA recombination in modern biotechnology, the results of technologies such as cell fusion, interferon, insulin growth hormone and its related factors, transgenic plants and animals, and so on.

III. THE MAIN PROBLEMS IN THE CULTIVATION OF BIOTECHNOLOGY PROFESSIONALS

A. Biotechnology professional positioning and training objectives are not clear

In the stage of popularization of higher education, according to the orientation of higher education personnel training, the talents cultivated by higher education institutions include the following three types. Key institutions train research-based innovative talents based on academic research; general undergraduate colleges train applied talents based on scientific and technological development; higher vocational colleges use practical talents based on skill application. The society has different requirements for knowledge, ability and quality of these three types of talents. In accordance with the requirements of the Ministry of Education, the biotechnology major is mainly to cultivate applied talents. Its professional orientation, talent training mode and talent training program should focus on the theme of applied talents. After the enrollment expansion of the college entrance examination, many colleges and universities did not fully understand the characteristics of biotechnology, and the results were blind. The professional orientation was vague, the talent training objectives were not clear, and the talent training model was the same, regardless of the actual needs of the society and the characteristics of the discipline. The application of technology professional orientation, blindly cultivating research-oriented talents to comprehensive universities, has made it difficult for senior talents to adapt to the needs of applied biotechnology talents for economic and social development.

B. Biotechnology professionals training does not meet market demand

Under the current limited educational resources, the enrollment scale is too large, which will inevitably lead to low quality and cannot meet the needs of the biotechnology talent market. In this way, the following contradictions occur in the talent market. On the one hand, students have difficulty in employment. On the other hand, enterprises face the huge graduate employment army but cannot find the talents they need and the biotechnology undergraduate training mode of higher education institutions cannot meet the needs of the market. The talents required by biotechnology companies are multi-level. They need high-level R&D talents responsible for product development and project management. They also need general technical personnel who have certain professional knowledge and skills to cooperate with R&D personnel to complete project development or technological innovation. The traditional biotechnology professional education is characterized by subject type and research type, emphasizing the basic theoretical level, scientific research ability and ability of further study, and neglects the cultivation of experimental techniques and practical skills of college students.

C. Inadequate planning of the biotechnology professional curriculum system

Most of the undergraduate education in biotechnology majors in colleges and universities still stay in the traditional professional talent training stage. The training mode is also generally influenced by the test-oriented education. The cultivated college students are still in the initial stage of “appreciating knowledge and ignoring knowledge, attaching importance to technology contempt, and emphasizing imitating and ignoring creativity”. Most of them lack the ability to use the professional knowledge to discover, analyze and solve problems, not only lack of innovation consciousness, but also lack of innovation ability. It cannot meet the realistic requirements of biotechnology-related enterprises for high-quality innovative professionals. Due to the obvious irrationality of the curriculum of biotechnology in the higher education institutions at this stage, it is difficult for college students to understand the professional knowledge, and the theory and practice cannot be well combined. Relevant statistics show that there is a serious theory of light practice in the relevant curriculum of biotechnology majors in colleges and universities in China. College students can only talk on paper, but they can't connect theory with reality. The theoretical consequence of not being able to relate to reality is that many college students' understanding of knowledge only floats on the surface, and cannot apply what they have learned to practical practice.
A. Clarify the talent training objectives of biotechnology majors

The goal of talent development is multi-level and diverse. Although some colleges and universities clearly stated that the undergraduate training goal is “thick foundation, wide caliber”, then the basic “thickness” to what extent, the extent to which the basic course is opened, and how the practical goal is achieved is not specific. This is mainly due to the diversity of higher education training objectives. Educators must have a broader vision, dynamically look at the goal of biotechnology talent training, and establish a sustainable development concept of talent cultivation. From the perspective of personal development, we should regard undergraduate education as a link or a stage of lifelong education, and correctly handle the relationship between general higher education, vocational education and continuing education. With the concept of lifelong education, the problem of cohesiveness between the training objectives of each stage is solved, so that the training target system not only reflects the internal relevance of the level training objectives of different academic levels, but also reflects the progressiveness of its level. Therefore, the educational goal of the undergraduate stage should be to train general-purpose biotechnology talents. Through a wide-ranging curriculum, it not only strengthens the cross-disciplinary penetration of the disciplines, but also pays attention to the overall and systemic nature, highlights the practical hands-on ability, and enables students to have a good overall quality.

B. Expand the diversified skills development platform

To build a diversified professional skills development platform, the standardization of off-campus internship construction and the professional quality of the school to expand the project training as the carrier, to standardize the construction as the goal, to ensure the extension of professional social skills training. The standardized operation mode of project management and credit system certification ensures that the plan can be effectively implemented. The quality development training is included in the graduation qualification requirements; the university students apply for professional quality development content in the form of projects, and when the training requirements are met according to the design, the corresponding credits can be obtained. Through the project conception, design and implementation, college students improve their independent work ability and knowledge application ability. Firstly, with the research direction of crop genetic engineering and functional research, molecular marker-assisted breeding, tissue culture and cell engineering, biotechnology pharmaceuticals and gene therapy, it is proposed to set up research and innovation training courses for college students. A group of instructors is composed of professors, and college students are free to form a research group to select, declare and compete for scientific research topics. Encourage and prioritize research and innovation projects with certain creativity, independent design and practical feasibility. Secondly, encourage and support college students to use new ideas, new technologies and new methods for technological innovation. While paying attention to the research results, we always put the innovative talent cultivation process and all-round education in the first place.

C. Strengthen the cultivation of students’ self-reliance and entrepreneurship

As the three largest developing countries in the world, why is China's current level of science and technology higher than that of India and Brazil? This is because the past policies of the three countries are different, and the difference mainly comes from an important one. The long-term impact of factors is the spirit of self-reliance in New China. At this stage, China needs to change the overall level of biotechnology majors to be lagging behind in developed countries. While vigorously strengthening the cultivation of biotechnology talents' innovative ability, it is also necessary to cultivate students' self-reliance spirit. Let students establish self-reliance and entrepreneurship, enhance the self-reliance of the Chinese nation and the country, and show the spirit of self-reliance of the country and the nation. Only in this way can biotechnology overcome various difficulties, accelerate development, truly adapt to the international environment of economic globalization and accelerated scientific and technological progress. To adapt to the new situation of building a moderately prosperous society in all respects, improve the socialist market economy system and the strategic deployment of a more dynamic and open economic system. Accelerate reform, further liberate and develop productive forces, and inject strong momentum into economic development and overall social progress.

V. SUMMARY

The basic framework of biotechnology major has been defined. All colleges and universities should continually revise the guiding ideology of running schools and strengthen professional construction, and constantly think about and reform practice. Through careful summarization, we will find a way to cultivate biotechnology talents in line with China's reality, exploring a model suitable for the cultivation of innovative talents in biotechnology in the 21st century.

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