

# *The Status Quo and Countermeasures of the Cultivation of Innovative and Entrepreneurial Talents in Biotechnology Specialty*

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**Abstract:** As a rising and leading industry, the biotechnology industry has become the strategic focus of industrial restructuring and a new economic growth point. It will become the most promising and promising field for China to catch up with the productivity level of the developed countries in the world and realize the advantages of backward development and leapfrog development. In order to meet such requirements, the cultivation of biotechnology innovative talents should be moderately advanced to ensure the supply of talents. The article explores the talent training mechanism innovations such as talent training objectives, talent training programs, curriculum systems, teacher team building, teaching management and reform, talent evaluation system, and industry-university-research cooperation education. It's hoped that it will help the cultivation of applied talents in biotechnology in China. Experimental research shows that the innovative teaching mode of biotechnology specialty studied in this article is more excellent in many aspects, especially in the teaching method, which exceeds about 15%, which fully reflects the feasibility of the research content in this article.

## 1. Introduction

Biotechnology is an important scientific field in the 21st century. Biotechnology is the fastest-growing and most closely related subject of human existence, and is advancing at an unprecedented rate. Biotechnology is a technical science based on modern biological sciences, applying modern scientific experimental methods and advanced engineering techniques, in accordance with the pre-designed transformation of microbial cells, plant cells or animal cells, in order to transform or produce necessary products for humans. According to the characteristics of biotechnology, combined with the actual situation of Jiamusi University, on the basis of full investigation and demonstration, it is determined that the target of talent cultivation in the

application of biotechnology in schools is to master the basic skills, methods and related knowledge of the profession and adapt to the needs of modern biotechnology development. The people cultivated should be solid in foundation, wide in application, strong in practical ability, quick in adapting to post, innovative in consciousness, high in comprehensive quality, and able to engage in teaching, research and management in schools, scientific research institutions and production enterprises and other related work.

## **2. Analysis on the Current Situation of College Students' Innovation and Entrepreneurship**

In recent years, the State Council has successively issued a number of policies and measures to promote mass entrepreneurship and innovation. All colleges and universities attach great importance to college students' innovation and entrepreneurship education, set up college students' innovation and entrepreneurship principals fund projects, college students' innovation and entrepreneurship fund projects, college students' innovation and entrepreneurship competitions, etc. The school, science and technology department, and academic affairs department support and encourage the college students' innovation and entrepreneurship from many aspects. However, innovation and entrepreneurship are still unsatisfactory, and there are mainly the following reasons.

### **2.1. Reasons for the Level of Student**

College students lack awareness of entrepreneurship. Chinese college students have been receiving test-oriented education from primary school to middle school. From books, schools, families, lacking practice, innovation, employment education and training, to universities, they lack perception and understanding of entrepreneurship, and even some students have fear of entrepreneurship. In particular, college students in the first and second grades have just stepped into the university. They don't know much about the preferential policies that the state gives to college students to start a business. There is no training in this area before, and they are afraid, stunned and incapable of the university's innovative and entrepreneurial projects.

### **2.2. Reasons for the Level of Teacher**

Most college students' entrepreneurial innovation education stays in the theoretical education of books, ignoring the cultivation of college students' entrepreneurial innovation practice skills. In terms of teachers, college teachers are mostly academic experts, generally lacking entrepreneurial experience and ability, and can't carry out targeted and practical entrepreneurial education for students, which is difficult to meet the needs of college students' entrepreneurship education. Although many college students have the basic knowledge and skills to start a business, but because there is no teacher with practical experience or a professional who is employed in the company, it is often impossible to connect theory with practice.

### **2.3. Reasons for the Level of Social and Family**

Traditional beliefs generally believe that after graduation, they should go to government agencies, enterprises and institutions to work. Only those who can't find a job will start a business, the so-called "passive entrepreneurship." Most families do not support college students' entrepreneurship. Most of their parents hope that their children will find a stable job after graduation and have a stable salary. They are not willing to embark on a risky and unknown entrepreneurial path after graduation.

## **2.4. Reasons for the Level of University Education Curriculum System**

At present, the curriculum of innovation and entrepreneurship education in the training program for college students has not yet been reflected. After entering the university, college students have not received professional training in innovation and entrepreneurship. When applying for innovation and entrepreneurship projects in the second and third grades of the university, students' knowledge in this area is seriously lacking. Students don't know how to choose a topic and don't know how to write a project. It becomes a common phenomenon. Some college students who have been approved for the project have a lot of theoretical courses, too many courses, lack of entrepreneurial practice classes, and can't squeeze out the time of practice (experiment). They can't complete the expected research content systematically and in-depth, and haven't concluded.

## **3. Biotechnology Professional Requirements for the Quality of Innovative Talents**

### **3.1. A deep Theoretical Foundation and a Broad Knowledge**

The discipline of biotechnology is a multidisciplinary and comprehensive discipline. The biotechnology of the 21st century depends more on the support and application of the basic theory discipline. Every major advancement in biotechnology is not the result of the application of modern science and technology. To this end, future-oriented biotechnology talents must have a profound theoretical foundation to adapt to the needs of continuous innovation and continuous industrialization of biotechnology. In addition to a deeper basic theory, 21st century biotech talents must have a broader knowledge. On the one hand, there must be a broad range of professional knowledge, because biotechnology involves a wide range of fields, involving all fields of biology, as well as a large number of production applications such as agronomy, medicine, environmental protection, etc., which requires a broader macro background. On the other hand, there must be a wide range of knowledge in the social sciences, management sciences, etc. Biotechnology is not only an upstream research work, but also the task of downstream promotion, development, and industrialization is very heavy. Therefore, biotechnology talents can only actively adapt to the needs of the development of science and technology and creatively carry out their work if they have a broad knowledge base.

### **3.2. Strong Experimental and Practical Ability**

Because biotechnology is an experimental and practical discipline, students are required to have strong experimental skills related to biotechnology, and to master the use of conventional and large-scale precision instruments, the knowledge of construction, management, etc.

### **3.3. Strong Creative Ability**

Biotechnology is a discipline that is constantly innovating. Its vitality, potential and vitality lie in constant innovation. This requires students to have strong practical ability, information gathering and processing ability, especially to have innovative spirit, innovative consciousness, innovative thinking and innovative personality, with a sense of competition and a strong sense of responsibility and mission.

## **4. Biotechnology Talent Training Objectives and Training Specifications**

### **4.1. Training Objectives**

According to the requirements of biotechnology for talent quality and the Party's education policy, the goal of training biotechnology professionals is to face the 21st century, and develop moral, intellectual, physical and aesthetic. Ideological and political ethical quality, knowledge and ability structure adapt to the requirements of reform, opening up, socialist modernization, and socialist market economy, with thick foundation, high quality, innovative spirit and practical ability, to develop applied and compound senior professionals who can engage in biotechnology teaching, research, production, development, management and so on after graduation.

### **4.2. Training Specifications**

Biotechnology professional personnel training specifications: (1) Have a scientific world outlook, outlook on life, values, law-abiding concepts, good moral quality; (2) Have pioneering spirit, unity and cooperation, hard work spirit and strong sense of social responsibility And historical mission; (3) Have solid basic knowledge of mathematics, science, chemistry, biology, systematically master the basic theories and techniques of genetics, biochemistry, cell engineering, genetic engineering, microbiology engineering required for biotechnology (4) Have certain knowledge of humanities, social sciences, law, etc.; (5) Have good computer application ability and good foreign language ability; (6) Have certain scientific research, production management knowledge and ability; (7) ) Have a healthy body and good psychological quality.

For the talent training specifications, based on the emphasis on basic specifications, commonality and unity, depending on each person's interests, hobbies, and specialties, there may be different types of training and professional direction. It is necessary to pay attention to the diversity, individuality and characteristics of the training specifications. The specific types of personnel training can be divided into: teaching and research; technology promotion, industry development, and management.

The specific professional direction can be focused on, depending on the individual's interests, focus on: genetic engineering; cell engineering; enzyme engineering; protein engineering; microbiology engineering and other professional directions.

## **5. Research on the Countermeasures for the Cultivation of Innovative Talents in Biotechnology**

### **5.1. Clarify Talent Development Goals and Basic Professional Skills**

The clarification of the innovative talent training objectives and basic professional ability is the key content that must be grasped in the training of innovative talents in biotechnology. In this process, it is necessary to start from the actual situation of enterprise development, and to be able to clarify the demand for talents of enterprises. From this aspect, the basic professional ability of students is clarified, so as to build a talent training goal. The training of biotechnology professionals must focus on the analysis of the relevant job occupations involved, and clarify the requirements of professional competence and basic professional competence. From the development of the bio-pharmaceutical industry, pharmaceutical production mainly involves pharmaceutical preparations, fermentation, biochemical pharmaceuticals, chemical synthesis and pharmaceuticals. Drug testing mainly involves quality inspection, and pharmaceutical purchasers and sales personnel are involved in drug marketing. In this way, in the process of clarifying the target of talent training

and cultivating basic professional ability, it is possible to strengthen the training of modern biotechnology, pharmaceutical production and operation technology, medicinal chemistry, drug fermentation technology, drug identification technology, pre-job training, and post-training, to enable students to have strong professional quality and ability, in the actual work process, can meet the needs of the company's posts.

### **5.2. Increase Practice Venues and Cultivate Innovative and Entrepreneurial Capabilities**

Biotechnology is a practical science. Practice places and venues are necessary conditions for cultivating students' practical ability and innovation and entrepreneurship. On the one hand, colleges and universities should make full use of social resources, strengthen cooperation with relevant government departments and enterprises, actively carry out off-campus practice teaching activities, encourage college students to use winter and summer vacations to practice enterprises, broaden their horizons, enhance market sensitivity, and cultivate students' practical skills and improve their comprehensive quality and entrepreneurial combat capability, providing a solid foundation for students' employment and entrepreneurship after graduation. On the other hand, colleges and universities should establish an innovation and entrepreneurship practice center and an internship training base (that is, one heart, one garden and one base) on the campus to build a platform for students to innovate and start a business.

### **5.3. Strengthen the Construction of the Teaching Staff**

The construction of the teaching staff directly affects the teaching effect of biotechnology. By building a strong faculty, we can improve the teaching methods and ensure that in the teaching process, we can better integrate the actual situation of students and adopt appropriate teaching methods to effectively improve teaching results. In the process of building the faculty, we must focus on improving the innovative ability of teachers, and can view the cultivation of biotechnology professionals from a development perspective. We can improve the traditional teaching methods in light of the characteristics of the development of the times, and better enhance the subjective learning of students. Motivation enables students to actively participate in the study of professional knowledge.

### **5.4. Improve the Teaching Evaluation System**

The improvement of the teaching evaluation system should focus on the evaluation of students' learning from a comprehensive perspective, change the previous single evaluation method, and use the teaching evaluation to better motivate students. In the process of perfecting the teaching evaluation system, it is necessary to pay attention to the effective evaluation of "process evaluation" and "summative evaluation". The so-called procedural evaluation, that is, in the process of teaching evaluation, we can grasp the learning process of students, so as to effectively solve the problems existing in the learning process, so that students can better find problems and promote teaching and the effect is improved. In the process of summative evaluation, we should pay attention to the objective angle, highlight the "encouraging" development principle of evaluation, and effectively ensure that teaching evaluation can better promote the development and progress of teaching work

## **6. Sampling Method**

In the questionnaire survey, we use  $P(s)$  to represent the probability of the sample  $s$  drawn. At this time, we use the random variable  $I_k$  to indicate whether the sample contains the  $k$ -th overall

unit, and the value of  $I_k$  is as follows:

$$I_k = \begin{cases} 1, k \in s \\ 0, k \notin s \end{cases} \quad (1)$$

Where  $S$  represents the sample set of the  $k$ -th overall unit, and  $s$  represents a specific sample that has been drawn. We call  $I_k$  the sample indicative variable of the  $k$ -th population unit. The probability that the  $k$ -th unit is included in the sample is called the inclusion probability of the  $k$ -th unit, which is denoted as  $\pi_k$ . Under a given sampling design  $p(\cdot)$ , it can be expressed as follows:

$$\pi_k = \Pr(k \in s) \Pr(I_k = 1) = \sum_{s \in k} p(s) \quad (2)$$

In the same way, the probability of including the units  $k$  and  $l$  is recorded as  $\pi_{kl}$ , and the given sampling design  $P(\cdot)$  is expressed as follows:

$$\pi_{kl} = \Pr(k \& l \in S) = \Pr(I_k I_l = 1) = \sum_{s \in k \& l} p(s) \quad (3)$$

It can be seen from the above discussion that the inclusion probability and sampling design are similar, that is to say, different sampling designs determine that the  $k$ -th unit has a different inclusion probability  $\pi_k$ .

## 7. Experimental Research on Innovation and Entrepreneurship of Biotechnology Major

### 7.1. Experimental Program

In order to make this experiment more scientific and effective, this experiment conducted a questionnaire survey of biotechnology majors in colleges and universities in a certain place. This questionnaire survey uses a sampling survey method to survey teachers and students of biotechnology majors to ensure the validity of the experimental data. Sex, the sex ratio of the subjects surveyed this time is equal. Based on the investigation of the status quo of the biotechnology specialty, the traditional biotechnology specialty teaching mode is compared and analyzed with the innovation and entrepreneurship studied in this article, so as to judge the feasibility of the innovation and entrepreneurship biotechnology specialty strategy studied in this article.

### 7.2. Research Method

#### (1) Sampling survey method

This research conducted the research by using sampling survey method for the students majoring in biotechnology, and used the analytic hierarchy process for the statistics and analysis of the survey data. These data not only provide a theoretical reference for the topic selection of this article, but also provide data support for the research results of this article.

#### (2) Field research method

This paper conducts on-the-spot investigation and records data on the teaching status of biotechnology major in a university in a certain place. These data provide a reliable reference for the final research results of this paper.

#### (3) Mathematical Statistics

Use related software to make statistics and analysis on the research results of this article.



## 8. Experimental Analysis on Innovation and Entrepreneurship of Biotechnology Major

### 8.1. Analysis of the Teaching Status of Biotechnology Specialty

In order to make the results of this experiment more scientific and effective, this experiment conducted a survey of teachers and students of biotechnology majors through the sampling survey method. The data obtained are shown in Table 1.

Table 1. Analysis of the teaching status of biotechnology specialty

	Genetics	Cytology	Genetic biology	Others
Teachers	4.23	5.08	5.55	4.87
Students	4.78	4.92	5.03	5.66

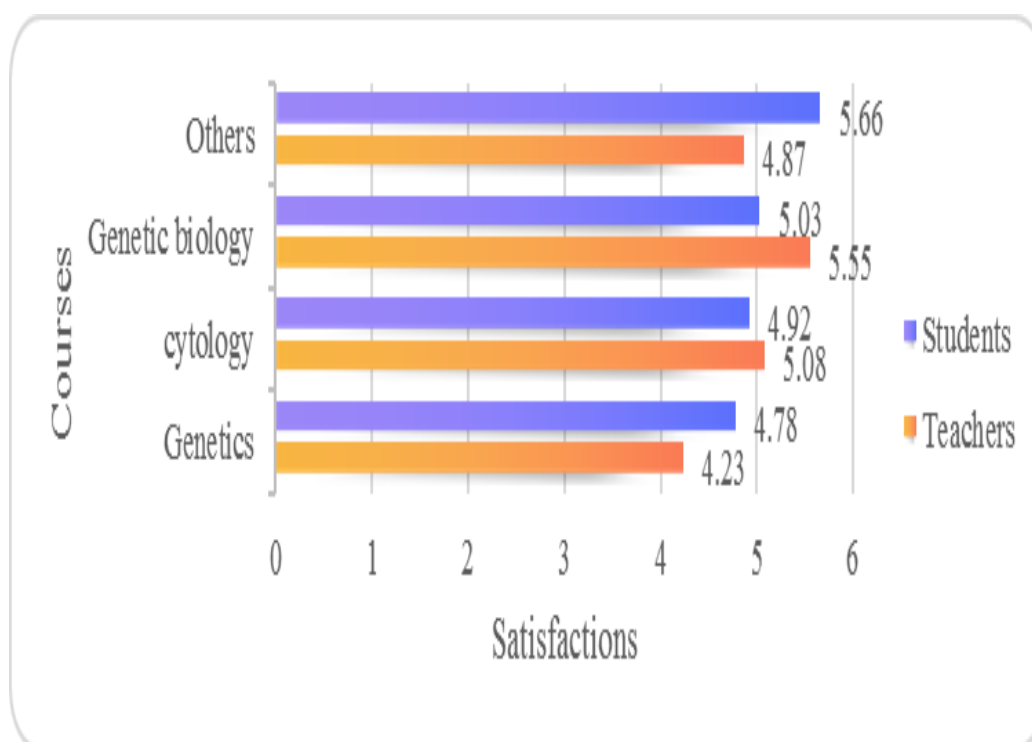


Figure 1. Analysis of the teaching status of biotechnology specialty

It can be seen from Figure 1 that the teaching scores of teachers and students for genetics courses are 4.23 and 4.78 respectively. It did not reach the standard of 5. The scores of other subjects are also fluctuating up and down 5. This shows that there are many problems in the current teaching of biotechnology, which need to be solved urgently.

### 8.2. Comparative Analysis of Biotechnology Teaching Models

In order to further analyze this research, this paper compares and analyzes the traditional biotechnology teaching methods with the innovative and entrepreneurial teaching methods studied in this paper. The data obtained are shown in Table 2.

Table 2. Comparative analysis of biotechnology teaching models

	teaching methods	Course Resources	Learning efficiency	Others
Innovation and entrepreneurship	71.2%	68.5%	66.7%	59.4%
Traditional	55.9%	58.1%	56.7%	55.0%

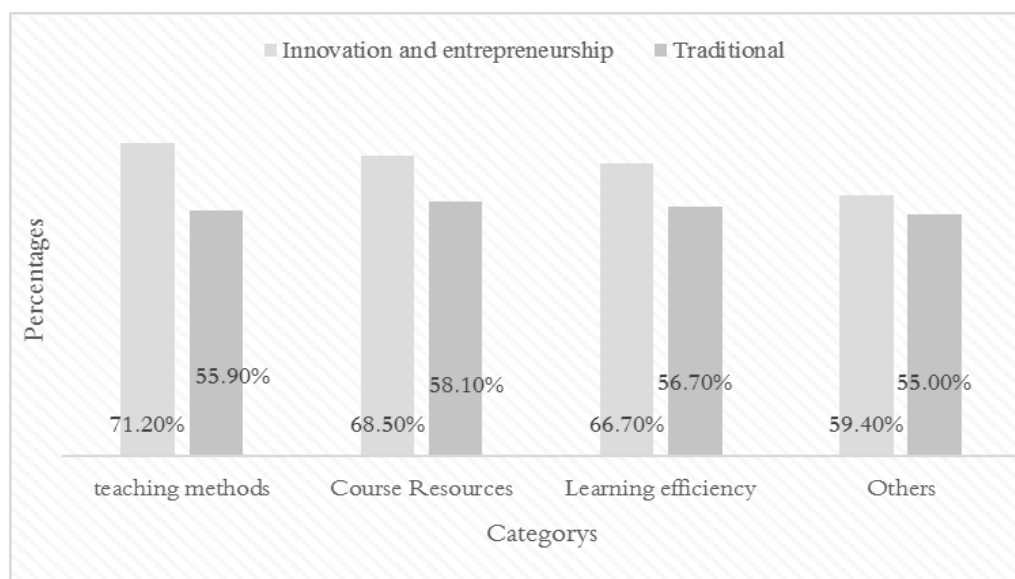


Figure 2. Comparative analysis of biotechnology teaching models

It can be seen from Figure 2 that compared with the traditional teaching status of biotechnology, the innovative teaching mode of biotechnology studied in this article is more excellent in many aspects, especially in the part of the teaching method that exceeds about 15%, which fully reflects the research in this article. The feasibility of the content.

## 9. Summary

China has put innovation and entrepreneurship education at the height of national strategy. As an important base for talent training, colleges and universities should cultivate innovative talents in biotechnology that are in line with the times. We must base ourselves on the current social and economic development situation, and be able to grasp the characteristics of the development of the times and the original teaching. The model is improved, and it can be combined with the needs of enterprises to cultivate innovative talents. In this way, we can better promote the cultivation and development of professional talents, continuously improve the practical ability of innovative talents, and meet the needs of bioengineering enterprises for professional talents.

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## Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this



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### Conflict of Interest

The author states that this article has no conflict of interest.

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