

Practice and Exploration of Integrating Industrial Innovation and Entrepreneurship with "Application-Oriented" Talent Cultivation -- A Case Study of Bioengineering Major

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Abstract

Review Article

Industrial innovation and entrepreneurship talent training (IETC) mode is increasingly important in line with the integration of industrial innovation, and has become an important development trend in the future. Methods Taking the cultivation process of biology major students as the research object, the talent cultivation mode merging industrial innovation and entrepreneurial ability was constructed and the practical effect was evaluated. From the perspective of undergraduate training impact, centering on the ability training of industrial innovation talents, students' ability to produce, discover and utilize opportunities has been considerably improved. Students under the IETC model have more positive thinking, more initiative in innovation and stronger employability.

Keywords: Teaching reform; College students; Higher education; Industrial innovation and entrepreneurship; Bioengineering.

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INTRODUCTION

Industrial innovation and entrepreneurship training is a characteristic training requirement of universities under the background of new engineering, and has become the consensus and characteristics of applied university education in the world today [1, 2]. Industrial innovation and entrepreneurship have become the necessary skills and knowledge for students to engage in scientific research and production of their major, and also an important part of colleges and universities to cultivate applied talents. Industry training mode of innovative undertaking and innovation through the campus culture, synergy between colleges, "double tutorial system for undergraduates" and research integrated measures such as to cover all aspects, students develop process will be "application oriented" concept into the training objective and curriculum system, cultivate high-quality talents to adapt to the new industry of innovative biological field.

The Ministry of Education clearly requires that colleges in transition and development "restructure the

structure and process of talent training as needed, adjust the specialty setting around the industrial chain and innovation chain, and form characteristic specialty clusters" [3]. Industrial innovation and entrepreneurship talent training (IETC) mode is oriented by industrial demand. Universities embed the school-enterprise cooperation mode into the whole process of innovation and entrepreneurship talent training mode by using innovation and entrepreneurship platform [4]. In recent years, the author has actively explored the cultivation of bioengineering talents, integrated the industrial capacity needs into the whole process of talent cultivation, implemented the "dual tutorial system for undergraduates", constructed the cultivation system of students' innovation and entrepreneurship ability, and constantly improved the quality of talent cultivation.

1. Practical teaching reform of industrial innovation and entrepreneurship talent training

Due to factors such as management mechanism among universities, enterprises and scientific research institutions, the demand for industrial

innovation and entrepreneurship talents is disconnected from the talent cultivation of universities [5]. In order to change this phenomenon, in recent years, we keep on biological engineering professional training objectives and curriculum system optimization, will clean the greening, such as biology applied biological engineering professional knowledge organically integrated into the existing curriculum system, and to the student to carry on the guidance and teaching, improve the effect of the training mode innovation.

1.1 Construction of curriculum system for bioengineering major

In terms of teaching objectives, guided by the concept of green development, we will gradually realize the integration of innovation and entrepreneurship with biological engineering enterprises. Develop biological engineering professional basic knowledge, grasps the biological technology, engineering and industrialization of the basic theory and skills, has the good team cooperation spirit, eye shot is open, self-study ability is strong, can be engaged in the production management in the field of biological engineering, engineering design, product research and development work, has innovation consciousness and consciousness of sustainable development, High quality applied talents with the ability to solve complex bioengineering problems.

In terms of teaching content, the module of cultivating industrial innovation and entrepreneurship ability is set up to clarify the teaching content of docking with enterprises [6]. The teaching of biological engineering major includes eight courses modules, which are: general compulsory courses, general compulsory courses, basic courses, specialized basic courses, specialized compulsory courses, specialized elective courses, specialized elective courses, and specialized practice courses. In the 28 weeks of professional practice course, the teaching of professional practice course mainly includes military skill training; Production practice; Innovation practice; Chemical principle, pharmaceutical Engineering, chemical equipment and mechanical basis and biological separation engineering, etc. Graduation practice and graduation defense. The total practical hours should reach 31.36% of the total hours.

In terms of teaching mode and method, a variety of teaching modes are adopted to realize the effective combination of professional theoretical study and entrepreneurial practice. Formulate the principles and standards of achievement assessment scientifically and reasonably, encourage students to study, evaluate the effectiveness of students' innovation and entrepreneurship ability training scientifically. Taking "Biological separation Engineering" as an example, the examination of the course focuses on the application of practical ability examination, the examination content focuses on the actual case as the main question type;

My usual grades are mainly group defense and group case analysis and discussion; The experimental results accounted for 40%, the experimental class group test, examination mainly to group test results analysis. Thus, IETC mode cultivates students' comprehensive analytical ability.

In terms of the cultivation of innovation and entrepreneurship ability, it pays attention to the organic combination of entrepreneurship basic courses, student competitions, science and technology parks and entrepreneurship parks with teaching. Corporate project-based teamwork, research and design practices enhance the teamwork and communication skills needed by innovative and entrepreneurial talents in the industry. In the past five years, the school has published 9 papers related to employment and ideological and political education. Since 2006, 35 employment practice bases have been established. In the past five years, 11 enterprises have implemented "3+1". Implement the "3+1" talent cultivation mode, study in school in the first three years, and work as an intern in off-campus enterprises in the fourth year [7]. From June to July every year, the school invites a series of biological companies such as Shanghai Junshi Biology and Novizan to the school for "3+1" internship publicity and recruitment. Carry out "3+1" quality development activities closely related to the improvement of students' practical ability, enhance students' sense of teamwork, improve their interpersonal communication, organization and coordination, practical operation and application ability. The teacher made a telephone follow-up visit to 20 graduates who participated in "3+1" and worked in "3+1" enterprises, and learned that the graduates were directly favored by employers after the training, which strengthened the mutual understanding between the school and enterprises.

1.2 Professional standards of practical teaching for training industrial innovation and entrepreneurship talents

Biological engineering industry innovation personnel training practice teaching professional standards should have good political and professional quality, scientific experiment skills literacy and social sense of responsibility, to understand the professional ethics and norms of biological engineering, honesty and fairness, consciously abide by the rule of good faith, in the biological engineering practice has strong social sense of responsibility, To effectively understand and fulfill bioengineers' obligations and responsibilities with respect to public safety, health, well-being, environmental protection and sustainable social development.

2. Adopt the "dual tutorial system for undergraduate students" to upgrade the collaborative cultivation of innovative and entrepreneurial talents by universities and enterprises.

The "Dual tutorial system for undergraduate students" has been successfully applied in graduate education and vocational education in our country. University teachers have a strong theoretical level, and a relatively wide range of theoretical knowledge, suitable for teaching, suitable for laying a foundation for university students, which is the advantage of university teachers. However, young college teachers lack front-line production practice experience and practical operation ability, so it is difficult to be competent for practical course teaching work, and it is difficult to understand and explain practical cases thoroughly. Unlike college teachers, enterprise mentors have strong practical ability and can accurately make products needed by the market and the company. In short, the characteristics of university teachers are strong theoretical knowledge, but weak practical operation ability, suitable for teaching, but also suitable for some scientific research projects, but it is difficult to make practical projects; the characteristics of corporate mentors are strong practical operation ability, suitable for the market, suitable for the company's needs of specific product projects.

In order to cultivate talents for industrial innovation and entrepreneurship, we have strengthened practical courses in talent training programs to cultivate students' practical operation skills and social adaptability. The "double tutorial system for undergraduate students" has been established, and technical backbones of enterprises have been employed as corporate mentors for students. The enterprise tutor and the university teacher jointly train the practical ability of the students, so that the students can get the dual guidance of the theory tutor and the enterprise tutor outside the school at the same time, and overcome the problem of the disconnection between theory teaching and production practice. More than ten "enterprise mentors" (entrepreneurs, team leaders or senior researchers) were organized to conduct field visits to the existing practice sites, experimental equipment, training programs, curriculum and teaching contents of the school. They love their work, are diligent in observation, thinking, insightful and good at sharing. The introduction of enterprise mentors, training high quality, high ability students, realizing the close connection with production practice, for the cultivation and development of students' entrepreneurial ability has laid a solid foundation. In addition, as the supervisor of the production line, I timely feedback the actual situation of the production of the enterprise to the professional teachers in relevant universities. Teachers update and expand the curriculum content in time, promote the close connection between curriculum and teaching content and the job needs of enterprises, and

ensure the practicality and foresight of talent training. The enterprise tutor guides the university student to operate the instrument hand in hand, and gives full play to the function of "pass, help and lead" of the skill expert. Corporate mentors help students make the transition from student to professional using their time at school.

In addition, in order to upgrade students' ability of practice and innovation, the "Novizan Biological School-enterprise Cooperation Internship and Employment Base" was created outside the school. Through the recruitment interview, students are designated to various positions (r&d, testing, etc.), so that students can comprehensively and swiftly strengthen their competitiveness in the talent market. The enterprise provides convenience and support for the college in students' social practice. Business tutors assist students to get familiar with the production process, understand the production equipment and clarify the practical direction in advance. The enterprise tutor provides multi-position training for the students. At the same time, the tutor of the enterprise evaluated the students' post skills, working ability, internship log and other aspects, and all received great evaluation. Accordingly, it lays a good foundation for curriculum practice teaching and training of innovative and entrepreneurial talents.

Consequently, the establishment of the "dual tutorial system for undergraduate students" recognizes the realization of two educators in one course, complementing each other's advantages, which not only cultivates students' practical ability, but also provides backup talent resources [8]. In order to better promote their own professional development, college educators introduce practical problems in the production line and the needs of enterprises into theoretical teaching and research, update teaching contents and methods in time.

3. Under IETC model, a multi-dimensional practice training system of "competition and research" is built

"Competition and research integration" is a process in which students combine theory and practice by participating in science and technology competitions and teachers' scientific research projects. Since 2017, the educational achievements of college Students' Innovation and Entrepreneurship Competition have been significantly improved, more than 30 national awards have been won in The National College Students' Life Science Competition. More than 200 students have participated in the first (2021) Heilongjiang College Students' Live E-commerce Innovation and Entrepreneurship Competition. One of them said to his growing experience, science and seriousness, said he felt the test of experience to the vocational skills contest singing. Under the teacher's encouragement and guidance, seeking better testing

schemes, he learned a lot of new skills, made tests orderly, improved the ability of his practice exploration.

Flexibly utilize a variety of teaching methods and give play to the advantages of multimedia and network in teaching [9, 10]. During the COVID-19 pandemic, the author conducted online experimental teaching through the "National Virtual Simulation Experimental Teaching Platform" (experimental space <http://www.ilab-x.com/>) to enable the course to be carried out as scheduled. The combination of virtual simulation and actual operation can comprehensively enhance students' practical ability, comprehensive practice and innovation ability [11, 12].

4. Conclusions and Prospects

In this paper, a new educational reform model with better training effect is put forward, which enables college students to acquire bioengineering knowledge and problem analysis ability, and improves the mental health level of students majoring in biology. IETC graduates can construct knowledge structure, train logical thinking and cultivate modeling ability through theoretical and experimental teaching of chemistry and chemical drawing, and can evaluate and solve biological engineering problems through biological information research. Master professional language tools for expressing bioengineering problems; in view of the biological engineering problems, the mathematical model is established to demonstrate and analyze; understanding, judging and analyzing the key links of biological metabolism and regulation; be able to professionally describe complex engineering problems such as microbial growth and metabolism pathway and speed; ability to design basic biotechnological processes and develop corresponding solutions. To jointly train talents in short supply for innovation and entrepreneurship in emerging industries, schools and enterprises can give full play to their respective advantages and improve the quality of talent training. Through the continuous adjustment and optimization of training programs, innovative and high-quality talents needed by society can be cultivated. In the process of cooperation between schools and enterprises, we should combine industrial innovation and entrepreneurship elements to enhance students' technological innovation ability and speed up the growth of mass entrepreneurship education. Through the support of off-campus practice base, the teaching resources of the school are effectively replenishment, the innovation and entrepreneurship consciousness of the whole society is stimulated, the innovation and entrepreneurship practical ability of college students is cultivated, and the employment ability of students is improved. These effects are very encouraging and deserve further exploration and extension in order to determine the sustainability of the methods proposed in this study.

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