Cultivation of Innovation Ability of Students in the Discipline of Food Science and Engineering from the Perspective of Engineering Professional Certification

Weijie ZHANG, Haile MA, Xinquan SONG

School of Food and Biological Engineering, Jiangsu University, Zhenjiang 212013, China

Abstract Cultivating the top-notch innovative talents is an essential task for connotative construction of higher education. As an application-oriented discipline, the Discipline of Food Science and Engineering attaches great importance to the cultivation of innovation ability of college students. For a long time, however, the discipline education has problems of the inverted teaching subject position, weak coordination ability and single practice mode. The support for the cultivation of innovation ability is weak and ineffective. Therefore, in the context of professional certification of engineering education, it is necessary to make reform of traditional education mode and improve the carrier support and target acquisition taking the Outcomes-based Education (OBE) as guide, the innovation ability cultivation as objective, to provide effective guarantee for cultivation of the top-notch talents. These have become issues that should not be ignored in the development of the Discipline of Food Science and Engineering.

Key words Food Science and Engineering, Innovation ability, Outcomes-based Education (OBE), Learning mode, Teaching evaluation

1 Introduction
The Discipline of Food Science and Engineering, as an early discipline in domestic universities and colleges, is intended to cultivate senior engineers and technicians for food production technology management, quality control, product development, scientific research and engineering design. It is an engineering discipline and plays an important support role in the development of China’s food industry. The food industry is accelerating upgrade in both the technology and equipment and badly needs numerous innovative talents. The innovation ability of university students is an essential indicator for evaluating the quality of talent cultivation in colleges and universities. The Discipline of Food Science and Engineering is closely connected with social demands, is an engineering discipline with strong application, and needs high innovative ability of students. The 13th National Five-Year Education Planning Proposal put the innovation at the core place of the national strategic pattern, and specially stressed the function of innovation in improving the quality of education. Overall Plan for Cooperatively Advancing the Construction of World First-class Universities and First-class Disciplines specified that it is required to support various innovative, applied and inter-disciplinary talents with innovation spirit and practical ability[1]. Cultivating the innovation ability of students the Discipline of Food Science and Engineering is not only the internal driving force for promoting the development of the food industry, but also the requirement adapting to the national development situation.

The Discipline of Food Science and Engineering has passed the professional certification of engineering education. The professional certification of engineering education emphasizes innovation. In the engineering certification standard (2015 version), it specified that graduates should be able to build appropriate abstract model to solve the problem and reflect the creativity in the modeling process[2]. Its core objective is consistent with the demand of the Discipline of Food Science and Engineering for innovation. In the context of professional certification of engineering education, it is necessary to make reform of traditional education mode and improve the carrier support and target acquisition taking the Outcomes-based Education (OBE) as guide, the innovation ability cultivation as objective, to provide effective guarantee for cultivation of the top-notch talents.

2 Analysis on current situation of innovation ability of students
Colleges and universities should take the improvement of education quality as the core task of education reform and development, pay attention to the connotative development of education, and emphasize the improvement of education quality. As an essential indicator for evaluating the quality of higher education, the cultivation of innovation ability of college students has become a key point of teaching reform in colleges and universities. Innovation ability is the ability of transforming original things or ideas to creating new things and new ideas, and it is the fundamental goal for cultivating scientific thinking methods and ability[3]. Cultivation of the innovation ability has two levels of meaning. First, college students subjectively have the desire and enthusiasm for innovation. Second, society and colleges and universities can objectively provide a good environment for the development of innovation ability of...
college students. For many years, the Discipline of Food Science and Engineering focuses on infusion of theoretical knowledge in the cultivation mode, but neglects the cultivation of innovation ability of students. Although it has made a huge contribution to the development of a large number of professionals with food expertise, in the context of rapid development of science and technology, it is difficult to adapt to the current demands of food science industry for innovative talents.

2.1 Inversion of teaching subject Classroom mode takes teaching as the main part, while students remain in a passive understanding state, so it is difficult to stimulate the innovation interest of students. In the teaching-oriented teaching mode, teachers take up the leading position in the teaching process. All teaching links and processes are based on the completion of teaching tasks, and the course arrangement and teaching objectives are often based on class hours. There are advantages such as conforming to the teaching schedule of the state and convenient for accomplishing the fixed teaching tasks. However, there are also disadvantages, such as focusing on class hours in the teaching process, neglecting students’ grasp of professional knowledge, leading to poor absorption and digestion of knowledge in class and having to make up through additional time. As a result, those students with weak foundation lose interest in the discipline. Teaching arrangements of the Discipline of Food Science and Engineering should be set from basic to deep knowledge in accordance with the general education platform, the basic platform for professional disciplines, professional module courses and practice links. Nevertheless, according to psychology learning transfer theory, only well grasping the concept, content and basic classification of a discipline, may students get interested in learning the knowledge, and then master and apply the knowledge. Therefore, freshmen learn higher mathematics, chemistry, physics and other basic theoretical disciplines, while juniors and seniors mainly study professional courses. The division of time leads to the weak theoretical foundation of students, and it is difficult to achieve the effect of positive transfer of knowledge. Solid theoretical foundation is the basis of scientific research and innovation, fragmented grasp of basic theory will hinder the development of innovation ability of students. In the allocation of credit hours, graduates of the Discipline of Food Science and Engineering should have minimum credits of 200 credits. Most students during school activities need to be confined to the classroom, combined with the concept of classroom teaching, and students will reduce thinking and study time. As a result, students will have less time to cultivate the innovation ability.

2.2 Weak coordination in cultivation of the innovation ability Teaching evaluation mechanism breaks the system of students’ knowledge structure and focuses on the individual competition, but it is not favorable for the formation of knowledge framework system and good team working atmosphere. The Discipline of Food Science and Engineering is a discipline with high application. The evaluation of ability of students in this discipline mainly adopts summative evaluation method. In the form, it is comparative evaluation method. Sequencing method and rank division method are common methods. Ranking of students can be determined according to the credit points, student performance or scientific researches by semester. Comparative evaluation method is convenient for quickly ranking students in accordance with certain criteria to stimulate their sense of competition and crisis. By contrast, the summative evaluation method mainly concentrates on the middle and end of the semester and the evaluation is carried out mainly by the teachers. The evaluation of the ability of students mainly relies on the reliability and validity of the examination papers, so it fails to form a comprehensive judgment. The innovation ability, as an indirect ability, needs a long time of systematic monitoring. It is difficult to reach the evaluation effect only through regular examinations. The cultivation of innovation ability requires solid professional knowledge. However, in the current evaluation mode, students often focus simply on practicing examination knowledge and theories, but ignoring the overall grasp of other knowledge.

In the information era, the innovation is no longer an individual behavior, it relies more on the teamwork. Scientific research and innovation need teamwork, and startup innovation is also like this. The talent cultivation in the Discipline of Food Science and Engineering requires a good teamwork spirit and technical cooperation ability. However, in the process of practical operation, the comparative evaluation method easily leads to the competition among students, and it is easy to form the situation of individual behavior, which is contradictory to the requirement of collaborative innovation in the current information era.

2.3 Single practice mode This discipline is single in practice mode and it is difficult for students to experience the real situation. Innovation comes from practice but is higher than the practice. Innovation is based on the close combination of theory and practice and is the development of the original theory and practice. Excellent situation experience is an important approach for combination of the theory and practice. The practice is an essential way for students to gain professional experience. It is an important process to promote students’ independent thinking and creative teaching. It is an important channel for the students to cultivate their innovation ability.

The practice of the Discipline of Food Science and Engineering includes specialized practice, comprehensive experiment, course design, and graduation design. Specialized practice mainly includes specialized understanding practice and specialized production practice. Although the practice occupies a certain proportion in the teaching design, in order to ensure the overall progress of the professional courses, practice is mainly arranged in the idle period of the course. As a result, the professional practice schedule is in disorder and lacks systemic characteristic. To save time, the practice place is often arranged in areas surrounding the university, but the practice factories are not highly professional. To complete the practice credit points in the teaching plan, the professional practice is generally arranged in the fourth year, but
mainly in the form of visiting factories. This type of visit is short, and the practice is in a hurry, it is difficult to attract attention of students, and it is difficult for students in the practice to understand the industry trend, and more difficult to test their academic level in the school and the practical work in the future.

The Discipline of Food Science and Engineering is a discipline closely connecting with the actual situation. Therefore, it is difficult to reach the excellent situation experience effect through short visit. Such single practice mode easily leads to disconnection of students’ professional theoretical knowledge with the rapidly developing food industry.

3 Logical analysis of OBE mode and students’ innovation ability

The professional certification of engineering education is based on outcomes-based education (OBE) mode and has important guidance function for the engineering disciplines. This teaching mode sticks to the continuity, system, innovation, and entirety principles[4]. It is goal-oriented, it formulates teaching objectives, course programs, course implementation and course evaluation, which is characterized by the fact that measures have carrier and evaluation has support. Under the guidance of this model, the cultivation of innovation ability is integrated in the overall teaching. The internal logic is to cultivate the innovation ability of talents, refine the factors that affect the creativity of students in the process of teaching, specify inoperable factors, and continuously improve teaching measures and teaching conditions.

3.1 Attaching importance to the innovation ability

This mode takes the graduation outcomes of students as objective and negates the traditional education mode focusing on course arrangement. Innovation is the key characteristic of this mode. The engineering certification education is a type of innovation of traditional education mode. It takes the innovation ability as an essential graduation requirement. In other words, the cultivation of innovation ability is measurable, predictable and definable. The cultivation of students’ innovation ability needs enough time to ensure the system and entirety of their knowledge learning. Students also need to have more time to think and explore. In the OBE mode, the teaching design requires compressing the time of compulsory courses and increasing the time and space for students’ self-exploration. It redefines the teaching practice and study time, emphasizes the flexibility of the learning method and persistence and high efficiency of the learning effect. Students are asked to master the most important outcomes in the limited time. Engineering certification education compresses part of the course hours, and leaves more time for students to explore, thus provides time guarantee for the cultivation of innovation ability.

3.2 Stimulating vitality of both teachers and students

The OBE mode increase the flexibility of teaching methods and content, takes the graduation ability of students as objective, to give students high-level theoretical guidance. Teachers, as mentors and guides, have the greatest degree of freedom to achieve the graduation goals of students. In the OBE mode, teaching design concentrates on the ultimate goal, but does not specify the specific details of the teaching and means to enhance the autonomy of teachers. In fact, teachers play a subjective initiative to facilitate students to develop individualized programs to keep the innovative teaching of teachers in the teaching process. This mode is based on the principles of continuous improvement, goal-oriented. Teachers work out teaching strategies and select teaching methods through the teaching goals and review the implementation of engineering discipline taking three years as the period, to promote continuous exploration of the implementation personnel in the teaching process. In teaching goals, this mode requires learning frontier theory and advanced technology of the Discipline of Food Science and Engineering, and making improvement of the existing goals. Changes in the teaching goals will bring about changes in teaching strategies and methods.

The important principle of high expectation outcome-based mode is an essential means for stimulating learning motive of students and guiding students to succeed[4]. The fundamental approach for knowledge accumulation and intelligence development is to fully stimulate curiosity, initiative and explorative spirit of students. This mode focuses on high expectation and the purpose is to stimulate learning motive of students. Only through arousing the interest of students, may it be able to arouse their enthusiasm for learning and promote them in a positive state of mind. High expectations have three key dimensions: improving acceptable standards of outcomes, abolishing the quota successes, and increasing high-level courses[4]. By increasing the evaluation indicators and evaluation methods, it can change the traditional problem of focusing on credit points; by increasing high level course, it is able to give students more academic stimuli and challenges to stimulate their professional motivation to cultivate soil for innovation and development.

3.3 Attaching importance to the teamwork

This mode emphasizes teamwork and creates excellent environment for cultivating the innovation ability of students. The OBE evaluation model is a clear understanding of the ability of students and summarizes the formative evaluation, summative evaluation and diagnostic evaluation. The core of the comparative evaluation method is still the division of interpersonal comparison and the grading of scores, which is easy to lead to competition between individual students and is not favorable for the cultivation of cooperation awareness. With the advent of the information era, the importance of interpersonal cooperation is unquestionable. Innovation is not building cars behind closed doors. It needs cooperation of multi-field and different levels of staff. The outcomes-based education model emphasizes teamwork and interpersonal communication skills of students, to achieve innovation through multi-disciplinary cooperation.

"More opportunities" is another important principle of the OBE model, that is, to create more opportunities for students to maximize the ability to innovate. In teaching design, it attaches importance to the practice links, sets forth higher requirements for
the quality of practice, and sets up a sound system of practical teaching. This model maximally meets the needs of students for graduation, to achieve the practice training, cultivate practical ability and innovation ability of students through engineering practice\(^1\). In addition, this model also attaches importance to exploring frontier theory and sets forth higher requirements for quality of individual teachers. Only high quality teachers may better cultivate high quality talents. It protects students’ innovation ability from teachers, teaching plan, course setting and discipline setting.

In short, the engineering professional demonstration model is a teaching model emphasizing the overall, systematic and operational teaching. It focuses on the cultivation of innovation ability of students. Based on the goal of cultivating the students’ innovation ability, it can formulate feasible, measurable and predictable teaching strategies, integrate the teaching conditions, teaching equipments, teaching methods and teaching objectives into a unified whole, provide available time and high level of academic goals, to promote the development of innovation ability of students. The goal of cultivating innovation ability is based on social development and frontier academy, so as to form a sustainable, improveable and enforceable dynamic innovation ability cultivation mechanism.

4 Recommendations for cultivation of innovation ability of students

4.1 Making clear teaching subject It is recommended to enhance the leading position of teachers in teaching, and strengthen the subject awareness of students. In the OBE model, teachers play a leading role in teaching and they need to find teaching methods that can achieve the teaching effectiveness in accordance with teaching objectives and teaching strategies. On the one hand, teachers have more dominance and flexibility in the teaching process, and they can choose teaching methods suitable for students’ ability. On the other hand, teachers need to constantly explore innovative classroom teaching modes and keep stimulating interests of students in the professional learning, and they constantly stimulate motivation for learning and innovation ability. Teachers’ teaching mode has changed the traditional cramming education mode. Combined with the heuristic and discovering teaching mode, they adopts the new and effective teaching methods such as MOOCS and flipped class, they makes full use of new teaching tools and Internet resources, and changes the teaching methods to stimulate the curiosity and enthusiasm of students for scientific research. In addition, the innovation in the form of classroom teaching of teachers is more favorable for touching the interests of students and expanding the knowledge of students. On the condition of compressing compulsory courses, students will have more spare time, teachers need to provide more scientific research guidance and make full use of time to improve scientific research and innovation. Students should strengthen the teaching subject awareness. For a long time, students have been passive receivers in the teaching process. This education mode makes it difficult for students to change from traditional knowledge accepters to knowledge innovators. The core of all-round development is to make people-oriented, fully mobilize people’s self-selectivity, and conscious formation and spontaneous creativity\(^3\). Strengthening the awareness of teaching subject is to enable students to master a solid theoretical foundation and take the initiative to produce a strong passion for innovation. Consciousness plays an important role in bringing into play subject function of students and enhancing the subjectivity of the students. The most important thing is to enable students to play a dynamic role and independently study the professional knowledge and independently explore and solve scientific research problems. Science and technology competitions and social activities offered at the national, school and college levels provide students with opportunities to learn solid foundation of knowledge and effectively raise awareness of science and technology innovation and solve problems through solidarity and collaboration. From the theoretical basis to engineering practice and then to innovation and team awareness, the one-stop cultivation system for students lays a solid foundation for maintaining good enthusiasm for innovation. The cultivation of innovation ability needs long-term continuous input and needs clear and targeted course design. In the teaching design, colleges and universities compress the credits, reduce part of compulsory courses, increase the elective courses, increases the self-learning time of students, and guarantee the realization of teacher guidance and students subject status.

4.2 Caring about learning process Innovation ability is a long-term, systematic and non-dominant ability. It needs to combine direct evaluation and indirect evaluation methods, to make the evaluation model more flexible, systematic and comprehensive, and it attaches importance to the proportion of innovation ability in the overall assessment. Under the guidance of engineering professional demonstration, the mode of student evaluation becomes more diversified. It is not based on the arrangement of class hours, but based on the final graduation requirement of students. It focuses on the cultivation of innovative thinking and requires graduates to design solutions to complex engineering problems, design systems, units (components) or processes that meet specific needs, and it embodies innovation awareness in the design process\(^2\). The cultivation of innovative thinking needs persistent emotional input of the students and also needs constant innovation and enthusiasm. Teaching evaluation, as an important means of teaching guidance, attaches importance to the final examination results and takes into account the teaching process, to maximize and stimulate enthusiasm of students for innovation.

From the horizontal perspective, it focuses on the evaluation of ability of students, focusing on the evaluation of the teaching process, and the development of innovation ability is a long-term systematic monitoring. Colleges and universities carry out strict examination through academic report card, practice report, and graduation design thesis, to evaluate the grasp of professional theoretical knowledge; they use comprehensive evaluation to assess
4.3 Ensuring the innovation quality    Solid and effective teaching security measures are helpful for ensuring that cultivation of innovation ability will be put into practice. Teaching security mechanism with strong operation and high standard is an effective carrier for cultivation of innovation ability. The teaching link of Discipline of Food Science and Engineering is complex and needs scientific and reasonable teaching security mode. In the system, it attaches importance to the academic tutor system, and the teachers provide targeted and systematic guidance for students. The academic tutor system is an effective teaching security mechanism for realizing interaction between students and teachers. Academic tutor refers to the full-time and part-time teachers who are responsible for providing instructions in academic planning, professional learning and innovation ability cultivation of undergraduates, and each student corresponds to one academic tutor. Academic tutors provide follow-up counseling in the academic, scientific research and ideological education of the students in four years of the university. The implementation of the academic tutor system is a guarantee for teachers and students to achieve good interaction and individualized guidance of the teaching system. Professional course setting needs to meet the diverse needs of students. It attaches importance to the career planning ability of college students and sets up compulsory courses (academic planning courses), so that students have the ability of self-planning. On this basis, every student needs to fill in their Student Academic Planning, for the establishment of academic planning file. An essential part of this file is the follow-up cultivation of the innovation ability, to make a record of the cultivation of innovation ability in school. In the allocation of credits, it is recommended to set up innovation credits, and students must get full credits. Students may obtain credits only through scientific research, entrepreneurship projects, patents and other forms, so that it is possible to urge students to attach importance to the innovation ability from the perspective of credits. The cultivation of innovative talents needs multi-level and targeted professional guidance. The innovation ability of college students is mainly reflected in scientific research innovation, entrepreneurial ability, and organizational innovation. The Discipline of Food Science and Engineering can build "135 Tower-style Talent Cultivation Model", to achieve full coverage of innovation ability education knowledge and courses. In this cultivation model, it is recommended to cultivate 30% students with strong innovation and entrepreneurial intention, and provide pertinent guidance for 5% of students with highly innovative potential.

It is recommended to establish the teaching process quality monitoring mechanism. The cultivation of innovation ability is a long-term systematic process, and it requires teachers and students to invest much energy. The establishment of teaching process quality monitoring mechanism is to ensure the smooth implementation of academic guidance system, so as to ensure "record of guidance and feedback of effect". It is recommended to set up college student incubation base and provide students with a strong entrepreneurial platform. It is recommended to actively combine related theories of the Discipline of Food Science and Engineering and social demands, to create entrepreneurial projects, so as to improve the entrepreneurial ability of students.

4.4 Focusing on the cultivation of soft strength    It is required to attach great importance to the cultivation of interpersonal communication skills, and create a suitable educational environment for the development of innovation ability of the Discipline of Food Science and Engineering. The Outline for Medium and Long Term Educational Reform and Development Plan of the State (2010 – 2020) set forth stimulating curiosity of students, cultivating interests of students, and creating favorable environment for independent thinking, free exploration and bold to innovate\(^5\). Under the engineering professional demonstration, the ability cultivation of students of the Discipline of Food Science and Engineering should pay attention to the study of professional theory, and attach importance to other theories, especially humanities and social science knowledge. Interpersonal relationship and communication ability play an important role in ensuring the development of innovation ability of college students. Nowadays, the work of science and technology takes on the characteristics of collectivity, which is the inevitable trend of social development. Only the equality and freedom and sincere cooperation may generate the spark of wisdom and stimulate creativity. However, traditional assessment method leads to high competition of students and hinders academic freedom and development.

The engineering professional demonstration stresses the cultivation of individual ability and team awareness. The engineering professional demonstration mode requires students to undertake the role of individual, team member and person-in-charge after graduation. High schools can cultivate the role recognition of students through discipline contest and student project competition, to provide excellent environment for cultivation of the innovation ability and awareness. For the Discipline of Food Science
branches and clans worship different animals. These beliefs and customs are helpful for maintaining the ecological balance and biological diversity [3]. Such tradition of nature worship and protection of the Miao People has once provided excellent ecological environment for their hunting life. At present day of increasingly deteriorating ecology in both China and the world, such thought and action are particularly precious.

5 Conclusions
The agricultural economic situation in the Miao region is an essential factor for determining the generation and development of its religious belief. Religious belief also has a tremendous impact on the agricultural production of the Miao People. The religious belief of the Miao People contains the understanding and exploration of their ancestors about the universe and life, and embodies the observation and reflection of the Miao People on nature and society. The primitive religious belief of the Miao People is generated and developed in the long historical process. It is inherited and delivered by the generation and generation of the Miao People, and it is an important part of the Miao culture. Without a comprehensive understanding of the primitive religious belief of the Miao People, it can not fully understand the history and culture of the Miao People. Only through making comprehensive analysis, studying the reasons for its existence and revealing its connection with other social culture, criticizing the superstitious part and absorbing the reasonable part, and providing proper guidance, may it be able to bring into play its positive effects in a better manner.

References

4 Conclusions
Innovation is the primary force leading development. In the context of mass entrepreneurship and innovation, the Discipline of Food Science and Engineering is facing new challenges. Based on the OBE theory, it is of great practical significance to make clear the cultivation objectives of innovation ability and awareness, to find out effective carrier support and to realize the transformation of traditional education mode of the discipline. The cultivation of innovation ability can not be reached at a single leap. It needs long-term systematic education investment and accumulation, its connotation will change with the social development, thus it is necessary to constantly adjusting the investment in education. Therefore, it has become an important issue to explore the new rules for the development of the Discipline of Food Science and Engineering, to recognize new changes in social development, and find out a suitable path with characteristics of the discipline.

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and Engineering, it is recommended to encourage students to participate in extracurricular sci-tech innovation activities, such as Starlight Cup, Dongfanghong Cup, National University Student Innovation Program, Student Almond Innovation Competition, and DuPont Danisco Student Innovation Competition. These activities urge students to invest in entrepreneurship or scientific research, maintain good innovation interest, and also provide students with more opportunities to communicate and cooperate in innovation [6–9].