

# Upgrading and Reconstruction Path of Applied Chemistry Major in New Engineering Construction: Take Yancheng Teachers University as an Example

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## Abstract

Based on the requirements of new engineering construction under the new economy, the traditional applied chemistry major must be faced the need for upgrading. In order to meet the needs of new engineering construction, a series of reforms have been carried out in the applied chemistry of Yancheng Teachers University. With engineering certification as the starting point, the reform of teaching content and curriculum system has been accelerated. Moreover, the construction of teaching research, curriculum and digital resources, experiments and teaching platforms, and the students' comprehensive capacity and innovative project construction to build a multi-level curriculum system have been strengthened to improve the students' entrepreneurial ability and meet the requirements of engineering quality in the new era.

**Keywords:** new engineering construction; upgrading and reconstruction; collaborative education mode; the applied chemistry major; Yancheng teacher university

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## 1. To meet the needs of new economic development, the upgrade of the traditional applied chemistry majors was accelerated through the engineering certification.

The relevant documents of the Ministry of Education pointed out that the China's Higher Engineering Education Reform stood at the new historical starting point and the pace of the construction of the "new engineering" of higher education must be accelerated [1-3]. Faced with the challenges of new engineering, there are obvious shortcomings in the traditional applied chemistry training mode. In order to cope with the industrial changes and a new round of scientific and technological revolution, it is urgent to accelerate the reform and innovation of higher engineering education and improve the quality of higher engineering education personnel training. The goal of cultivating chemical professionals has gradually shifted to the cultivation of high-level applied talents with high comprehensive quality and strong practical ability. In order to make the graduates recognized by the market, the applied chemistry major of Yancheng Teachers University was upgraded and rebuilt to develop the students' ability to solve practical problems in the application field.

The applied chemistry major of Yancheng Teachers University was established in 1999. In 2015, it was successfully awarded the first phase of the Jiangsu University Brand Professional Construction Project (with a grant of 9.6 million Yuan from the Provincial Department of Education). In 2013, it was successfully awarded the Provincial Experimental Platform Project of the Chemical Engineering and Technology Comprehensive Training Center of Jiangsu Province (with a grant of 2 million Yuan from the Provincial Department of Education). It was won the support of the "Finance Engineering and Technology Experimental Teaching Platform" project of the 2014 Central Financial Development Special Fund and the Jiangsu Provincial Local Education Attachment Project-Yancheng Teachers College Chemical Engineering Practice Education Platform. The accumulated investment is nearly 15 million Yuan, greatly improving the teaching foundation facility.

The goal of professional training points out that the cultivated talents must have the ability to engage in production, R&D and management in the fields of chemical, environmental, materials and related disciplines. Furthermore, the cultivated talents of the applied chemistry major must be the application-oriented compound talents with innovative spirit and practical ability. In the degree of achievement of professional training objectives, the main difference is that the cultivated talents are lack in engineering practice ability and innovation ability. The effective way to solve this problem is to strengthen the professional construction in accordance with the concept of engineering certification to achieve the upgrading of traditional engineering.

## 2. Professional construction was strengthened in accordance with the concept of engineering certification.

According to the concept of engineering certification, professional construction was carried out in three aspects: results orientation, student-centered and continuous improvement [4-5]. Firstly, based on the results-oriented educational philosophy, the reform of classroom teaching was carried out to realize the transformation from knowledge instillation to dialogue classroom, from closed classroom to open classroom, from knowledge classroom to ability classroom. The teaching effectiveness and innovative talents quality were greatly improved

through the above classroom teaching reform. Secondly, based on the student-centered educational philosophy, the teaching principles and teaching model were established to realize the transformation from teacher-centered teaching to student-centered teaching. The teaching effectiveness was improved to cultivate innovative application talent. Thirdly, based on the education concept of continuous improvement, the chemical safety teaching module was added and the new curriculum related to the registered safety appraisers was opened to cultivate innovative application talents that meet the needs of the Yancheng area's economic and social development.

### **3. The reform of teaching content and curriculum system was accelerated to revise and improve the teaching plan.**

Based on the transformation of educational thoughts and concepts, the goal of talent training was realized through targeting the cultivation of high-quality innovative talents, optimizing the curriculum system and updating the teaching content as a means to strengthen the construction of the teaching staff, and reforming teaching methods and teaching methods [6]. In the process of revising and optimizing the teaching plan, the cultivation of basic theories and basic skills of students and the forging of innovative ability were emphasized. The curriculum system consisting of general education courses, professional platform courses, professional courses and practical teaching links were constructed to achieve the combination of quality education and professional education, classroom teaching and experimental teaching, personality development and commonality. In addition, in the process of revising the teaching plan, the relationship between strengthening the foundation and broadening the profession should be better deal with. For some professional courses with strong pertinence in the industry, the experts from enterprises and industry were invited to participate in the revision of the teaching plan and form a programmatic document for the course teaching.

### **4. Teaching research, curriculum and digital resource construction were strengthened.**

The use of modern teaching methods based on the multimedia and digital resources was vigorously promoted to provide the teaching platform for teachers and students to meet the teaching needs. The support of teaching research projects such as the professional argumentation and internationalization research, the engineering ability training and the construction of the collaborative education mechanism of the government, industry, education and research, the innovation of the teaching content and the modern teaching method reform research, the local industry demand, the economic "new normal" and the talent training program under the new technology continuous improvement were further strengthened in the applied chemistry major. Regular inspections were carried out to ensure the successful accomplishment of each teaching project and strive to make significant breakthrough at the award level. The "course construction project" was implemented to intensify the construction of quality courses and vigorously promote the adjustment, merger and reorganization of the curriculum. Through the reform of teaching content and curriculum system, the micro-curriculum resources of the four courses of Instrument Analysis, Basic Chemistry Experiment II, Chemical Technology, Process Automation and Instrumentation were built. The three courses of "Organic Chemistry", "Analytical Chemistry" and "Chemical Technology" are bilingual teaching. The "Inorganic Chemistry" course are English-only teaching. The "Organic Chemistry", "Basic Chemistry Experiment II", "Chemical English" and "Information Retrieval" Internet Teaching Platforms were built based on Internet + teaching ideas. Furthermore, the Internet + Applied Chemistry Course Self-learning Platform, Internet + Practice Training Platform were also built. The reform of innovative talent training mode, examinations and assessment methods were promoted in the applied chemistry to improve the talent cultivating quality.

### **5. The construction of experiments and teaching platforms was strengthened.**

The construction of a comprehensive training and education platform for chemical simulation were strengthened to cultivate the students' comprehensive design and innovation capabilities through giving full play to the advantages of the disciplines of the school, actively utilizing the development strength and support capabilities of the enterprise, and fully integrating the experimental teaching resources of the school.

### **6. The students' comprehensive ability and innovation project construction was strengthened.**

The students' innovative ability training plans were developed to actively explore the mode of integrating classroom teaching, experimental teaching and scientific research training, promote and strengthen the second classroom activities such as the university students' innovative project research, open experiment, and the students' participation in teacher vertical and horizontal research projects. Furthermore, the implementation of the tutor system for outstanding students and special students was carried out to strengthen the cultivation of students' innovative ability. Through a variety of academic lectures, academic salons and other academic exchange activities, the strong academic atmosphere was created to broaden the students' academic horizons and stimulate the students' creative thinking ability.

Closely integrated with the characteristics of regional industrial development, the policy background counseling, related technical consultation, innovation and entrepreneurship education ability were carried out to provide comprehensive education services for innovative application talents in the coastal chemical, new energy vehicles and environmental protection industries.

The students' innovative and practical ability were promoted through the science and technology competition as the carrier. The students participating in the science and technology innovation competition is an effective carrier to cultivate the students' innovative practice spirit and enhance their comprehensive practical ability. The students to participate in various domestic competitions were actively supported and the students who won high-level awards were reward to feedback the results of the competition to improve students' innovative ability.

#### **7. The multi-level curriculum system that highlights entrepreneurship education was built to enhance students' entrepreneurial ability**

The content of entrepreneurship education was infiltrated into the daily teaching of professional courses through revising the professional talent training program and adhering to the "four-year continuous line", so that the entrepreneurship education could be carried out simultaneously with the professional education throughout the whole process of talent cultivation. In the first semester, the major was enrolled in the new school entrance education, and the content of entrepreneurship education was added to the "Situation and Policy" class to initially arouse the students' entrepreneurial awareness. In the 2th to 6th semester, the entrepreneurial knowledge was opened and combined with the professional courses to enable students to acquire the necessary entrepreneurial knowledge. In the 4th-6th semester, the entrepreneurship practice training was organized through the organization of the University Student Entrepreneurship Forum and the Business Plan Competition. In the 5th to 8th semester, students are encouraged to apply for the National University Student Entrepreneurship Training Program to strengthen their entrepreneurial practice.

#### **8. The internationalization of undergraduate talent training was promoted through "Four-wheel drive".**

The "four-wheel drive" international talent training model was built in the applied chemistry, consisting of international concepts, subjects (student and teacher), content and environment. Based on the international talent training concept, the students' global vision was expanded to cultivate their cross-cultural understanding and international communication skills [7]. The 3%~4% of outstanding students were sponsored each year to study and exchange with the well-known foreign universities through the full subsidy, half-finance and air ticket financing. The training and content construction of international teachers and students were promoted through the international engineering certification as the starting point. For the professional core courses, the internationally-used materials were actively used to promote the internationalization of content. The international environment was built through the bilingual teaching and the whole English teaching. Teachers were encouraged to go to foreign universities to study and the opportunities for teachers to exchange and study abroad were expanded to enhance the research ability of teachers, encourage teachers to provide full English teaching, expand the breadth and depth of international courses, and provide a good environment for cultivating international talents.

#### **9. Based on the improved management system, the new quality control system was established to strengthen teaching management.**

The sound teaching quality management supervision system and a standardized teaching management model and mechanism were built in the applied chemistry major. Based on the idea of "not only attaching importance to target management but also to process management", the teaching management documents were revised, the quality monitoring system was improved, and the teaching routine management was strengthened. The teaching inspection and evaluation were listed as the daily work of teaching management, and the system of teaching quality monitoring, student evaluation, and teacher evaluation was established. The quality of teaching was strictly controlled according to the quality standards of all aspects of teaching.

The quality standards of the main links such as classroom teaching, textbook selection, practical teaching, examination and performance management, graduation thesis, curriculum construction, and professional construction were perfected. The university teaching quality assurance and monitoring system were established. The teaching supervisor inspects and supervises the teaching work in the form of listening to the class, participating in professional evaluation, and examining the quality of the thesis, and submits opinions and suggestions on the management of the teaching process. The definition and treatment of teaching accidents were revised. The teaching accidents was divided into three aspects: teaching, teaching management and teaching guarantee. The teaching and research section must take responsibility for ensuring that teachers prepare for classes and listen to classes.

## 10. Conclusion

Yancheng Teachers University combined with the requirements of the Ministry of Education for the construction of new engineering disciplines and engineering professional certification to cultivate a number of outstanding engineering talents for the new economic construction and meet the Yancheng Regional economic development needs through focusing on the upgrading of traditional engineering and strengthening professional construction.

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## References

- [1] Xiu-Hong Li, Wen-Hui Li. (2019). Research on Basic Course Reform of Mechanical Majors in the Background of New Engineering Subjects. *Theory and Practice of Education*, 39: 36-38.
- [2] Liping Tang. (2019). Innovative Study on the Model of College and Enterprise Cooperative Education in Local Practicality-oriented Universities from the Perspective of Emerging Engineering. *Journal of Zhongzhou Unviersity*, 36: 100-104.
- [3] Rong-Tao Zhu, Bing-Tao Hu, Yan-Fei Wang, Yan-Feng Li. (2019). The Reform and Exploration of Experiment and Practice Teaching System in Colleges and Universities under the New Engineering Course. *Education Teaching Forum*, 16: 72-75.
- [4] Yang-Yang Li, Dan Zhong, Jie Feng, Li-Cheng Jiao, Shui-Ping Gou, Rong-Hua Shang. (2019). Talent Training Practice of Leading New Engineering-Taking the Major of Intelligent Science and Technology as an Example. *Education Teaching Forum*, 17: 29-30.
- [5] Yuanzhang Lu, Zhenbang Xu, Tiantian Dong. (2019). Research on the Innovation Mode of Electronic Information Specialty of UAV Platform under the Concept of New Engineering. *Vocational Technology*, 18: 22-25.
- [6] Yan-Li Bai, Jian Lu, Heng Li, Jin Xu. (2019). Design and Implementation of Professional Training Project of Cooperative Industrial Robot under Background of "Dual Creative " and "New Engineering". *Education Teaching Forum*, 15: 40-41.
- [7] Xiang-Bin Meng, Qian Zhang, Wei-Hua Tian, Jian-Ying Hu. (2019). Research on the Training Mode of Innovative and Entrepreneurial Talents in Applied Engineering Colleges under the Background of New Engineering. *Journal of Shenyang Institute of Engineering*, 15: 116-119.