Scholars Journal of Engineering and Technology

OPEN ACCESS

Abbreviated Key Title: Sch J Eng Tech
ISSN 2347-9523 (Print) | ISSN 2321-435X (Online)
Journal homepage: https://saspublishers.com

Construction of Basic Chemistry Courses for the Application Type Undergraduate Majors under the Background of New Engineering

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DOI: 10.36347/sjet.2022.v10i09.003 | **Received:** 18.08.2022 | **Accepted:** 24.09.2022 | **Published:** 27.09.2022

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Abstract | **Review Article**

This paper takes the training objective of applied talents under the background of new engineering as the guidance, the concept of OBE as the guidance, the knowledge system and practical ability as the training direction, and the focus of each course of basic chemistry. The investigation was carried out from the five aspects of teaching syllabus, course content, teaching model, application ability and assessment method. It is committed to cultivating a group of high quality composite new engineering talents with strong practical ability, innovation ability and international competitiveness.

Keywords: The new engineering; the application type undergraduate; basic chemistry; curriculum construction.

1. RESEARCH BACKGROUND

With the deepening of the new round of scientific and technological revolution and industrial transformation, only innovation can drive development. As a training base for future talents, it is very important for colleges and universities to take the initiative to deal with this change. Since February 2017, the Ministry of Education has cooperated with various universities on how to train engineering and technical talents in the new era, and deeply analyzed the connotation characteristics of new engineering and the construction and development of new engineering majors. It is agreed that under the new situation, a group of diversified, innovative and outstanding engineering and scientific talents should be cultivated under the guidance of virtue and talent cultivation, with inheritance and innovation, crossover and integration as the main approaches. Finally, the "Fudan Consensus" [1], "Tianjin University Action" [2] and "Beijing Guide" [3] have been formed.

Many foreign universities promote design-based learning, allowing students to participate in open projects, through the completion of projects, students can develop modeling and simulation skills, teamwork and communication skills [4-7]. In this way, students can play the role of promoting, all-round and multi-angle training and enhance the core ability of students. All kinds of domestic colleges and universities also carry out the construction of new engineering in different levels, different fields and different majors [8-11]. Guided by the industrial demand, they locate the corresponding cultivation goals of outstanding engineering talents, improve the quality of engineering education, boost the economic transformation and upgrading, and cope with the international competition and challenges of new technologies and new industries in the future. All kinds of colleges and universities in China also carry out the construction of new engineering in different levels, different fields and different majors. Guided by the industrial demand, the corresponding cultivation target of outstanding engineering talents is positioned, so as to improve the quality of engineering education, promote economic transformation and upgrading, and cope with the international competition and challenges of new technologies and new industries in the future [12, 13].

Application-oriented undergraduate colleges and universities take the type of applied technology as their orientation, and the cultivation of application-oriented talents is also a teaching mode based on the results-oriented OBE education concept. In the process of education and teaching, we should pay more attention to the training of students' practical ability and innovation ability. Although the new engineering policy guides the practice and research of new engineering, it still needs to deepen the construction field

longitudinally and broaden the construction field horizontally [14]. The realization of the construction of basic chemistry course is of great strategic significance to promote and innovate the development of applied talents training in the background of new engineering in China [15-17].

2. Present situation and problems of basic chemistry course at present

At present, there are many problems in basic chemistry course. Firstly, to solve the training objectives in the syllabus of basic chemistry only requires students to master the relevant knowledge, and there is little mention of the requirements of application practice, so the basic chemistry course cannot be flexibly used to solve the problems of professional engineering. Secondly, to solve the problems of independent knowledge explanation of basic chemistry courses, less integration of major and foundation, and weak training of application ability of new engineering. Thirdly, most of the basic chemistry course teaching models are relatively simple, and the combination of online and offline using the network teaching platform is less, which restricts students' autonomy, interactivity and openness. Finally, to solve the problems of the solidified assessment method of basic chemistry course, the student-oriented process assessment and the result assessment that can reflect the application and practice ability are weak, and the ability to use basic knowledge to guide the application and practice is weak.

3. The advantages of combining new engineering with basic chemistry courses for applied talents

The basic chemistry course is a basic required course for many majors, and it is also a course group that pays equal attention to both theory and experiment. It can effectively deepen students' understanding of the basic theory of chemistry and improve their ability to solve practical problems with professional knowledge. In order to adapt to the reform and development of engineering education in China, according to the characteristics of local colleges and universities and the characteristics of professional structure, the research group of basic chemistry courses meet the construction content and objectives of applied talents training in local colleges and universities, which can meet the needs of the development of the new engineering industry. The construction of basic chemistry course can effectively train students' scientific thinking mode of combining theory with practice, which is an important link to train students' innovation and entrepreneurship ability, and also the basic guarantee to train applied talents under the background of new engineering.

Compared with the traditional applied basic chemistry course, the teaching model of "new engineering" oriented basic chemistry course cultivates a group of high-quality composite application talents with strong practical ability, strong innovation ability and international competitiveness for the emerging industries and new economy. This teaching mode should not only be profound in a certain discipline, but also have the characteristics of "interdisciplinary integration". It can not only use its knowledge to solve existing problems, but also learn new knowledge and new technologies to solve problems in future development, and play a leading role in future technologies and industries. Under the guidance of new engineering, basic chemistry courses emphasize the practicability, intersections and comprehensiveness of disciplines, especially the close combination of new technologies such as information communication, electronic control and software design with traditional industrial technologies.

4. The construction of the content

(1) Teaching syllabus construction

According to the training objective of new engineering applied talents, the basic chemistry teaching syllabus was revised to meet the requirements of production enterprises and institutions for the knowledge and skills of applied chemistry students.

(2) Course content Construction

To optimize and integrate the contents of basic chemistry courses: ① Cross-integration of theoretical content: introduce the latest development of industry and technology and the latest requirements of the industry for talent training into the teaching process, promote teachers to timely transform research results into teaching content, and build curriculum resources to meet the needs of the development of the industry. Theory and practice are connected, foundation and major are crossed, and all courses of basic chemistry are integrated. ② Experimental project reform: The experimental teaching project will be reorganized, and the experimental project close to life and production will be selected according to the characteristics of each discipline in our school.

(3) Construction of teaching model

Reform the teaching model of basic chemistry course. To implement the student-centered teaching concept, increase students' choice of time and space for learning, enhance teacher-student interaction, and form a learner-centered engineering education model.

(4) Application capacity building

Participate in the scientific research team of teachers to enhance students' ability of practical application. To train students' thinking mode of scientific research, improve their ability to use knowledge, and exercise their ability to combine theory with practice.

(5) Construction of assessment methods

The reform of the assessment method of basic chemistry course will pay equal attention to process assessment and result assessment, strengthen the

assessment of students' participation in the process, and strengthen the assessment of practical ability in the results.

5. Outlook

Through the optimization and integration of teaching content and the reorganization of experimental projects, high quality composite new engineering talents with strong practical ability, strong innovation ability and international competitiveness can be cultivated to improve the achievement degree of basic chemistry courses for students. Through flexible adjustment of teaching mode and the inspection way, strengthen the "student-centered" teaching and a variety of means of intervention, outstanding learning autonomy, interactivity, sharing and openness of the process, to stimulate interest, solid foundation, expand skills, improve students' ability in the combination of theory with practice, for the society transport more new engineering construction and application of high quality talents.

Fund Project

1. Research Project on Teaching Reform of Higher Education in Heilongjiang Province (Construction and practice of basic chemistry courses for applied undergraduate majors under the background of new engineering; Serial number: SJGY20210625)
2. Project of Education Department of Heilongjiang Province (Research and practice of organic chemistry "Gold Course" construction based on the combination of online and offline mixed teaching mode; Serial number: SJGY20190472)
3. Education and Teaching Reform Research Project of Heilongjiang Bayi Agricultural University (Exploration and practice of organic analysis teaching reform in applied chemistry under the background of new engineering)
4. "Curriculum Ideological and Political" teaching reform project of Heilongjiang Bayi Agricultural University, Course name: Organic Analysis

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