

Study on the Curriculum System of Petroleum Engineering under the Background of New Engineering

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Abstract. In view of the current transformation of old majors such as petroleum engineering, under the background of new engineering proposed by the Ministry of education, it is very important to build a curriculum system suitable for the recognition of enterprises and industries. At present, there are some problems in the petroleum engineering specialty, such as the disconnection from the enterprise industry, the unreasonable course setting and the unfitness to the new requirements of the information industry for petroleum engineering talents in the era of big data. The reform of the course system setting by levels and modules has been put forward. It is necessary to increase the cutting-edge courses related to the industry and embed the OBE concept, which has achieved good teaching results.

Keywords: New engineering; petroleum engineering; curriculum system.

1. Introduction

The wave of new technology revolution led by intelligent manufacturing has come, and the traditional training of engineering professionals is facing multiple challenges brought by the new technology revolution and industrial transformation. In recent years, with the active promotion of the Ministry of education and universities, a new engineering education model trilogy of "Fudan consensus", "Tianda action" and "Beijing Guide" construction and reform has been formed, teaching The Ministry of Education issued guidance documents on the development and promotion of research and practice in new engineering, and actively promoted the reform and innovation of engineering education.[1]

Higher education shoulders the responsibility of training innovative talents for the country to meet the needs of society. With the rapid development of science and technology and the integration of global economy, international competition is increasingly fierce. In the final analysis, all kinds of competition is the competition of high-level talents with innovative spirit and practical ability.[2]

As an important part of engineering education, local colleges and universities play an important role in regional economic development and industrial transformation and upgrading. They are active participants and main forces in the construction of new engineering, and shoulder the responsibility of serving the local economic and social development and training high-level innovative application technology talents.[3] At present, there are many problems in the teaching of professional courses, such as the rigid practical teaching system, the poor learning autonomy of students, and the disconnection between the practical content and the development of the industry.[4]

2. Problems in Engineering Education under the Background of New Engineering

2.1 There is a Conflict between the Increase of Professional Class Hours and the Curriculum Setting under the Concept of OBE (Outcomes based Education)

In the course system design of traditional old majors, some courses are old-fashioned and can not adapt to the development of the new era. For example, unconventional courses have become the focus of current research, while foreign universities have already set up relevant courses. According

to the requirements of professional certification, there are strict regulations on credits and class hours of required professional courses and engineering courses. If the increase of courses will lead to the unreasonable proportion of credits, the petroleum engineering major is a combination of drilling, oil production and development, and the credits required for students' graduation are already very high. From the perspective of learning, students are embarrassed and burdened.

2.2 The Proportion of Innovative Education Credits is not Enough

The new engineering requires the students to have innovative spirit, and the current innovative education curriculum is not reasonable. Some scholars think that innovation education should be reflected in every professional course, while others call for independent innovation courses, especially innovation practice credit must be the basic requirement for students to graduate.

In practice teaching, the cognition from the real professional situation can not be separated from the structural basis of biology and nerve. The lifelong development of individual practical ability also has a strong relevance to the authenticity of practical teaching situation. The ability and habit of continuous learning in work depend on the knowledge and ability constructed in the real professional situation.

2.3 The Curriculum has not Realized the Transformation from "Teaching Centered" to "Learning Centered"

In 2001, a revised version of Bloom's educational goal taxonomy was published. Based on the original classification, it adds knowledge dimension, and classifies teaching objectives from two dimensions of knowledge and cognitive level. The dimensions of knowledge include factual knowledge, conceptual knowledge, procedural knowledge and metacognitive knowledge with increasing difficulty in turn; the new classification of cognitive process is still six levels with increasing difficulty in order: memory, understanding, application, analysis, evaluation and creation.

The traditional teaching process in China is basically pyramid shaped. A large amount of classroom time is spent on the low-level cognitive activities of memory and understanding, and the teaching of application, analysis, evaluation and creation is very limited. This is the main difference between the undergraduate teaching activities in China and the United States. The focus of American four-year university classroom is the application, analysis, evaluation and creation of high-level activities, and each course almost consistently practices such a model. The Chinese university classroom often stays in the low-level learning activities of "memory and understanding", the high-level cognitive training is scarce, and the cultivation of innovative talents is also difficult to talk about.

3. Improvement Strategy

As an old specialty, China's undergraduate education of petroleum engineering is facing the integration with the world. The original curriculum system needs to be improved. China's Ministry of education calls on Engineering Majors in Colleges and universities to carry out new engineering construction. The main reason is the current problems in engineering education.

3.1 Integration of Course Content with OBE Concept

The original professional courses pay more attention to the basic concepts, understanding methods, and mastering the application. Foreign colleges and universities are accustomed to taking project as the basic course content, and students must learn and consult the relevant knowledge by themselves when completing the task.

Petroleum engineering is a combination of drilling, oil production and development. There are a lot of professional courses and professional basic courses for students. Therefore, it is considered to combine some necessary knowledge and few class hours into professional courses. Make full use of the high-quality online courses of brother colleges and other majors, so that students can learn the

basic knowledge on-line and use discussion form in class. The existing seminar courses have explored enough experience and are relatively easy to implement. For example, there are 32 class hours of technical economics, and the most significant method for petroleum engineering students is net present value. Students can learn economic evaluation in the reservoir development program of Petroleum Engineering I by self-learning two class hours on the Internet. This requires teachers to determine the course content in the form of course group discussion.

For content that cannot be integrated, such as unconventional oilfield development, courses need to be reset. After the course integration, the overall credits will be reduced, which can be arranged in without increasing the burden of students. This is in line with the law of professional and industrial development.

3.2 Integrate Innovative Education Hours into the Curriculum

First of all, the professional course module must constantly update and learn the new progress, new knowledge and new trends in the professional field, strive to let students understand the latest professional development status, shortcomings and future development prospects at home and abroad, and always keep the professional core courses connected with the industry development front.

Secondly, we should innovate the teaching methods, through modern new teaching modes such as micro class, flipped class and online teaching, combined with teaching methods such as case type, question type and heuristic method, to stimulate students' active learning enthusiasm and desire for knowledge, and strive to change the traditional teaching mode centered on "classroom, course book and teacher" in the past, so as to enhance students' initiative in the teaching process, Train them to learn how to study, learn how to cooperate, learn how to think and learn how to innovate in the process of knowledge acquisition, give full play to the leading role of teachers in the teaching process and the main role of students in the learning process; thirdly, promote the integration of disciplines and break the barriers of disciplines. In the new engineering talent training program, some elective courses that can produce cross application with the discipline, or some innovative knowledge points of professional frontier cross application are added in the teaching process of professional courses, so as to train students to use multi-disciplinary multi-dimensional to solve analysis problems and train students' innovative thinking; finally, the platform of off campus practical training base is established Set up, according to the characteristics and development direction of the major, sign a long-term and stable school enterprise cooperation training platform with enterprises in related industries, encourage students to enter the enterprise without affecting their study for the enterprise's on-the-job training, and guide students to understand the society and connect with the society by visiting entrepreneurs, visiting enterprises and social talent demand survey, etc., so as not to let students go out of the school, It is too far away from the reality of the industry, resulting in all kinds of discomfort. Through in-depth cooperation between schools and enterprises, students can learn, practice and start their own businesses at the internship base or innovation and entrepreneurship education practice base inside and outside the school.

3.3 Take the Golden Course Construction as an Opportunity to Make the Necessary Flipped Classroom Really Turn

The fundamental problem of classroom teaching is the concept problem. To realize the concept transformation of "student-centered" is the main purpose of undergraduate teaching reform, and also the core of building and constructing various types of "golden course" teaching at present. Not all courses are suitable for flipping, because some basic courses pay more attention to basic concepts and basic theories. The construction of gold course proposed by the Ministry of education is just the important condition to distinguish whether it is suitable for flipped course teaching.

It is not only urgent but also significant for higher education to change from "teaching centered" to "learning centered". At present, hybrid teaching is emerging and will become the mainstream teaching mode for a long time in the future. Its core is to realize the effective connection and integration of online and offline teaching, achieve the transformation and improvement of

traditional teaching, and ultimately greatly improve the quality of teaching. It is an effective education mode to create and build "golden course".

Online and offline hybrid teaching can change the traditional single teaching as soon as possible, and realize diversified and personalized education. Brain science research results show that the central control area of the brain is just like a general commanding thousands of troops. One of its important functions is to focus on the core tasks. Studies have shown that British college students only have an average of 10 minutes to concentrate in class. However, every class in our country is 50 to 100 minutes, and it is very common for teachers to teach 2 to 4 classes in a row. Therefore, the key to improve students' attention is to divide classroom science into several segments and increase the variability and rhythm of teaching between each segment. This is also a solid basis for diversified teaching such as micro class teaching, video viewing, group discussion, hands-on operation and personal display in the construction of hybrid "gold class".

Team learning and discussion is another effective way of innovative teaching, which has a deep cognitive neuroscience foundation. From infancy, we learn and grow by imitating others, from simple imitation to more complex imitation, all because the mirror neuron system in the human brain works. Mirror neurons enable us to quickly understand others' intentions and experience others' emotions. Group learning increases the opportunities of students' active participation and more instant feedback information, and also improves the frequency and depth of communication between partners. Students are inspired by the diversity and richness of their peers' ideas and constantly revise themselves, which is a high-quality teaching effect that is difficult to be achieved by simple interaction between teachers and students. Group learning also creates conditions for the establishment of partnership relationship between teachers and students. A really good teacher should be a true partner of group learning, providing help and guidance for students at any time. It has been proved that group partnership can not only improve the learning effect, but also provide the necessary experience foundation for socialized learning, and thus the "team spirit" required by modern society can be exercised.

4. Summary

Under the background of the construction of new engineering, it is imperative for the curriculum system reform of petroleum engineering professionals to focus on curriculum setting, integrate online and offline courses, and increase the frontier of disciplines. Taking the golden course construction as an opportunity, the implementation of golden course is the basic carrier to realize the curriculum reform, integrating innovation education into professional courses. The realization of project-based discussion class can stimulate students' interest in learning and improve learning effect. It is the key of teaching reform to strengthen the cultivation of teachers through the establishment of relevant systems.

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References

- [1]. Yang Weiming, Wang Shihui, Yu Dunhui. Research on the construction of big data course system and teaching mode of it major under the background of new engineering. *Computer Education*. (2019) No. 11, p. 64-68.
- [2]. Fu Lin, Jiang Shiming. Exploration of the practical teaching reform of embedded system course in Local Universities under the background of new engineering. *Gaoxiao Shiyanshi Kexuejishu*. Vol. 37(2019) No. 7, p. 36-38.

- [3]. Wu Cuilian, Gao Yuan. Research on the reform of Diversified Practical Teaching System of computer specialty under the background of new engineering. *Experimental Technology and Management*. Vol. 36(2019) No.11, p. 222-224.
- [4]. Chen Caiyan. Research of Innovative Entrepreneurship Education for College Students under the Background of New Engineering. *Microcomputer Applications*. Vol. 35(2019) No. 10, p. 41-43.
- [5]. Qi Ning, Chen Dechun, Ba Haijun. Exploration and Practice of the Upgrading of New Engineering Disciplines for Petroleum Engineering Majors. *Higher Education of Science*. Vol. 25(2019) No. 4, p. 64-67.