

The Primary Exploration of the Teaching Model for the Course 'Special Oilfield Development'

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Abstract: In recent years, the newest achievement of the international engineering educational reform called CDIO engineering educational model has been gradually applied in Chinese higher education reform and practice. In the course educational model for 'special oilfield development', its model has been applied in teaching content, method, project based on learning and the positive exploration for the evaluation model, which has developed the ability of solving problems, teamwork and communication skills, and professional quality of the engineering for students. The result of this model essentially achieve the development goal for the outstanding engineers.

Keywords: educational reform; educational model; CDIO; *Special Oilfield Development*

1. Introduction

In virtue of the increase for the higher educational scale, the increase of knowledge, and the change for social need. A massive educational reform is going on in Chinese universities. At present, undergraduate educational reform for many research universities of China is very similar to American circumstance before 1990s, which simply focused on copying regular universities and colleges and going for superficial projects. As a result, on one hand, undergraduate educational reform were not effective, on the other hand, it might be affecting research universities that should played a role in participating in the innovative nation[1].

The famous American educator think that study is the discovery based on the direction of teachers, rather than the transmission of the information. Stanford University vice-president who is responsible for education think that: "Undergraduate education generate quiet revolution: the key did not relevantly divert to teaching form research, but teaching is redefined as students take part in research [2].

Special Oilfield Development is the most important course for petroleum engineering course. We need explore a new teaching model to enhance students' research level for current education system. The educational model called CDIO which is applied by Northeast Petroleum University begin to reform its course. CDIO stands for conceiving, designing, implementing and operating, which is the whole life of the modern industrial product from design and development to operation and even retire [3]. The educational model of CDIO is to develop students' engineering abilities with the whole process of it as a carrier, including individual engineering science and the need of engineering talents [4]. In the process of the educational reformation practice for the course of *Special Oilfield Development*, this paper introduce the idea of CDIO to explore the educational reform model from the angle of the educational strategy and student's quality, work to implement 'The Educational Development Program for The Outstanding Engineers' and achieve development goal of excellent petroleum engineering engineers with innovative ability and the need adapted to the development of social economy [5, 6].

2. The teaching strategy at the theory of the CDIO

The teaching strategy of the *Special Oilfield Development* is mainly reflected in the following aspects: First of all, according to preparedness of students' learning, we should choose the critical areas of the teaching and increase the areas of case teaching; Secondly, we should adopt the method of elicitation teaching in personal instruction, which can mobilize initiative and positive of the learners and provide guarantee to enhance capabilities; Thirdly, we should remain flexible in many kinds of teaching methods and teaching means and adopt diverse teaching mode centered students for different tasks and learning environment to achieve ideal teaching effects; Finally, we should introduce the point of the company for the assessment of students' achievements, besides assessing students' learning ability, but the performance included the abilities of teamwork, engineering system and so on.

2.1 The choice of the critical areas of the teaching

(1) The choice of the teaching material and references

According to the development plan for the applied undergraduate talents of the *Petroleum Engineering*, the course of the *Special Oilfield Development* has closed relationship with numerous professional courses such as *Reservoir Physics*, *Fluid Mechanics in Porous Medium*, *Engineering Fluid Mechanics*, *Petroleum Engineering*, *Enhanced Oil Recovery* and so on, which simply lead to less outstanding key point for the lectures because of existing certain crossover and joints with it. We used the newest written *Special Oilfield Development* as major teaching material, which had been appropriate deletes and supplement for teaching contents based on the characteristics of the undergraduates of the *Petroleum Engineering Profession* and actual learning level, remain most of contents and compress and drop parts for teaching material, such as coal bed methane and so on. At the same time, we recommend some important assistant books as the references, including *Enhanced Oil Recovery Applied Heat*, *The Theories And Methods of Seepage of The Effective Development in Extra—Low Permeability Reservoirs*, *The Theories And Practices of The Effective Development in Condensate Gas Reservoir* and so on.

(2) The supplementary for lots of engineering cases

Aiming at the stronger reality of the course theory, lots of cases were added to the teaching content. For example, according to actual production data of parts of native heavy oil fields and basing on the thermodynamics principle, we summarized the contradiction between using the way of heating to reduce viscosity and using the way of decreasing the pressure to expand the volume, the routes for solving the contradictions, et. The analysis of typical examples was a way applied widely in this course, which can play better noted role in explaining complicated concepts and theories.

(3) The embodiment of the leading theories and the advanced technologies

There are some of the new requirements to update teaching with the continuous development for the relevant theories and technologies of the *Special Oilfield Development*. Hence, the recent studies and advances of the relevant theories, technologies and methods replenished and updated timely in the teaching content for the focus of the chapters, allow students understand the forefront of the industry timely.

2.2 The choice for classroom teaching methods

(1) Full information to impart

The enthusiasm of the students' active learning is fully aroused by the direction for the knowledge of the key. We should encourage students to make the most of Internet resources, refer to relevant documents and files and deepen the understanding of the course. The measures of all mentioned above can effectively develop students' abilities of acquiring, mastering, operating and dealing with

the information and promote students' self—exploration and intellectual constructs in learning.

(2)The heuristic teaching

We adopt the heuristic teaching method based on the heuristics of the elaborative designing teaching goal and teacher—student interaction to introduce students' thinking from different perspectives, angles and levels for the problems in the design of the special oilfield development. We allow students to have always learnt in active and positive situation to provide prerequisite and guarantee for applications.

(3)Participating in classroom teaching fully

Combining with the teaching content such as reviewing, analyzing cases and so on. We arrange some students to summarize and analyze on class. While teacher timely assesses what was said and directs or supplements the knowledge and the key point in which appeared. This way contributes to deepening students' memory and understanding for the course, training their abilities in summarizing, analyzing what their learned and communicating.

2.3The introduction teaching of PLB

Project Based Learning(referred to as PLB) is a new teaching model based on the learning theories of the constructivism, which has been widely applied in Europe, America, et [7]. Specifically, that is a new kind of innovative learning model based on the concepts and principles of subjects as the center, works made as the purpose and the interrelated problems solved for a considerable time. We introduce discuss and design based on the actual production problem for oil to allow students to master the content outside books.

2.4Assessment model

We introduce the concept of enterprise' s evaluation at the teaching evaluation system for *Special Oilfield Development*. We fully assess the abilities of their teamwork and engineering system besides the learning for students. So we consider making decisions by combining consequence with process in the academic achievement of this course. The aspects of the evaluation includes attendance status, operation, activities on class, collaboration and so on. As to the evaluation of the process, on one hand, it reflects in the teacher' s usual record, on the other hand, it bases on the comprehensive evaluation for the division of labor for team member in the process of discussing operation, the content of collaboration and the results, as well as the mutual evaluation among members and so on. According to some contents discussed on class, teacher assure that students play roles in the team, are able to understand and apply the textbook knowledge, and more effectively reflects the real extent they should mastered to some extent. This way achieve better effects.

3. Students' quality training at the theory of CDIO

(1)We develop students' abilities for solving engineering problems. We focus on the training for engineering ability from the reforms and practices of this course, to reflect the principle of ' *Study For Practice*' at talents development.

(2)We develop students' the abilities for teamwork and communication. We underline the concept of team in the course, whether students explain the knowledge or discuss the issues on class, they work as team to train their abilities of cooperation. The division of labor and responsibility for every member of each team need transform the roles on turn, which can allow students to understand different roles in team and develop their abilities of cooperation and communication from different perspective. The evaluation of the course also bases on team, which can increase students' group consciousness.

(3) Modern engineers developed by utilizing engineering professional quality and higher engineering education do not have certain breadth and depth scientific basis, professional knowledge and the ability for solving practical problems, but also ability of reference and adaptation for the necessary economies, social environments, human relations, moral norms and ecological regulations. [8] We also focus on the development for their values, choice and practice of the engineering. We hope we can help students establish that engineering is the process of continuous commitment, which must allow us to look back over multiple time, amend repeatedly, keep creating and explore deeply.

4. Summary

Modern engineering is becoming more pronounced for its sociality and complexity, which need to solve by using natural science, social science and human science. The talents' development goal for the course of special oilfield development is to develop outstanding engineers that have a lofty professional morals and dedication, understand industry's good concept and technical changing tendency, have various skills, innovative thinking and be good at dealing with complex problems. I deeply appreciate in many years' teaching that only using the newest teaching ideas, the positive teaching methods for exploring science and teaching means can we promote the teaching quality and develop real outstanding engineering professional talents adapted to industrial development and enterprise's need.

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