Study on Educational Reform of Exploration Engineering - based on the OBE pattern

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Abstract. It is suggested that the teaching reform in the OBE model can be carried out on the course of Exploration Engineering in accordance with the current market demand for drilling rig construction, involving the following aspects: 1) the courses are limited to some certain ones, and 48 class hours are determined. 2) the practical experience of teachers and teaching methods should be improved. 3) independent practice should be set up to strengthen the training of actual operation and simulation construction. 4) the assessment method should be changed to the combination between problem analysis and simulation operation.

Keywords: OBE; talent cultivation; teaching reform; construction drilling rig.

1. Introduction

With a close relationship with geological disciplines, Exploration Engineering is widely used in engineering geology, mining geology, and the development of oil, gas, groundwater and geothermal. A slew of experts (Tao, 2015; Jiang, 2018, Wang , 2018; Huo et al., 2018; Feng et el.,2018; Hou et. el 2018, Zhai, 2018) have researches on the various problem of construction drilling rig for the reason that different projects may have diverse requirements and problems for drilling rig construction in areas. These research results see significance to Exploration Engineering teaching. Urbanization and socio-economic developing, China still needs more in engineering construction so that there is a big market in drill jobs. Therefore, it is essential that teachers provide students for a more practical Exploration Engineering class so that they can have a better understanding of this course, which is good for them getting jobs. It is common that companies prefer to hire skilled persons or the persons who can be in practical operation after simple training according to the social division of labor and the increasing number of undergraduates. So the teaching reform is a must. The paper aims to give a reference to cultivate applicable talents with high quality in line with the research on teaching reform of Exploration Engineering based on OBE model and the teaching model under the current situation.

2. Basic Content of Exploration Engineering

Exploration Engineering is a specialized elective course for students in resource exploration engineering. Students in the class can be familiar with the basic process principle, techniques in the drilling process so that they can have the practical abilities to design drilling process and manage drilling construction in mine lots according to the geological and stratum conditions and requirements.

3. Traditional Teaching Methods

The traditional teaching method mainly goes to teachers' direct teaching, normally lasting 36 hours. They provide students for the related knowledge of Exploration Engineering, involving geological conditions of Exploration Engineering, drill bit, drill string, drilling fluid, borehole orbit, drilling parameters, fixed drilling, some complex situation processing etc. there are some problems for this kind of teaching method, such as too much content with less class time, less prominent focus and less application of specific projects. It is difficult for students to pay full attention to the course using direct teaching with PPT or blackboard writing.

4. Features of OBE Model Courses

4.1 Strengthening the Course Positioning

Exploration Engineering, an elective course, has owned less attention for a long time as there has been greatly reduced in the jobs of exploration and the remaining work needs to face some complex situations with the developed engineering construction and the state's emphasis on environmental protection. As an applicable course, Exploration Engineering should be reposition as a required course increasing the class hours from 16 (national standard 1 credit) to 48 (3 credits). Therefore, the course can not just combine with mining geology and engineering geology, and also can become an independent orientation. Namely, students need to learn how to implement the drilling work independently as well as how to solve the actual problems relating to engineering construction when combining with the engineering geology, mining geology and environmental geology.

4.2 Highlighting Engineering Characteristics

In the traditional teaching model, the knowledge points and regions involved in the curriculum are wide while the regional targets are weak. For the local ordinary universities, this model is too broad to meet the level of students. The teaching reform of OBE model should be conducted in Exploration Engineering to change the traditional method with the characteristics of wide, deep and large knowledge. The priority should be given to students' applicable ability. The course should emphasize on the application of diversified projects combining with the specific engineering construction besides the routine operation in the specific teaching.

5. Reform of Teaching Methods in OBE Model

5.1 Cultivating the Teachers with Theories and Practice Knowledge

At present, some universities require that the first degree of teachers hired should be from the double top universities (Project 985 or Project 211) and they also need to provide the certain number of Sci academic papers. So there are numerous "academic" teachers who spends a lot of time to finish their papers and lack of practical experience. With its strong practicability, Exploration Engineering needs teachers to improve their practical training by some projects or directly involving the construction and management of drilling project in vacation to learn some related knowledge and the methods to solve the specific problems . Especially in some local ordinary universities, teachers should be given more chance to learn fully combining the theories and practice to become teachers with theory and practice knowledge.

5.2 Diversification of Classroom Teaching Methods

With the information surging, these two traditional methods of blackboard writing and PPT teaching make students feel boring. So it is time for us to enrich classroom teaching methods by using more practical engineering teaching videos, reverse courses to deepen the impression and Rain classroom software to finish process of learning (pre-class preview, on-class learning and review after class) breaking the line between class and after class, combining the learning and life.

5.3 Practical Operation and Construction Simulation

Many courses have their physical objects or model demonstration, such as specimens in petrology, deposit models in deposit science. So does Exploration Engineering. There should be some basic teaching rigs to achieve the similar effect. Universities can demonstrate by some old or scrapped drills, which can not just have a objective impression on the drill, but also can cultivate students' practical operation ability.

Computer technology developing, some simulation software can be used in the course besides the teaching drill. Universities can cooperate with some companies to develop a set of software for

Exploration Engineering class. Thus, students will have a deep impression on the whole process of drilling machine construction.

6. OBE Model Capability Enhancement

6.1 Improving Professional Internship

The market demand for Exploration Engineering is huge though, the professional internship is still short. Students have less understanding of this course as it does not have the professional internship in traditional geological majors and also does not have or have less experimental classes. The only way for them to learn the drill is graduation practice. However, there is a must that the internship should be set up with the course in accordance with the concept of OBE cultivating applicable talents, which can make students learn the operation of drilling rig construction. The internship is set in the projects, such as engineering survey, the construction of mining, hot spring, geothermal. Students should learn in the specific operation combining the project.

6.2 Typical Case Analysis of Construction Operation

The "engineering inversion" is a significant method for cultivation of applicable talents. Qualified applicable talents require a lot of practice to be able to carry out specific work on the production line in a very short time. The typical construction operation is a very effective training mode for specific problems, which can be either theoretical, practical or a combination of the two aspects. Teachers can help students involve in the practical operations and improve their understanding of the specific work from the initial preparation to the final solution according to the concrete problem in specific cases. It is very practical that typical construction operation analyzes the representative problems in engineering drilling and mining drilling in different areas, types and existing state. For example, typical construction operation can analyze the specific problem according to different engineering, the differences of drilling in coal, copper, lead and zinc, hot spring etc. and the requirements of engineering drilling under various construction conditions. Students then can have demonstration in line with the similar examples. Thus, this analysis can highly improve their ability to analyze and solve relevant problems in drill construction.

6.3 Cultivating the Integrated Talents

Exploration Engineering aims to cultivate the personnel relating to drilling techniques. The course emphasizes on the theoretical problems in traditional teaching. however, the integrated talents with some certain management and ability to solve specific construction problems are needed nowadays. So it is a must for us to train students into an applicable talents with higher level. There should be a systematic management of drilling operation both in mining construction and engineering survey. The management of drilling construction can be increased in Exploration Engineering, including the cost and time in drills' dismantling, assembling, transportation and operation. The different organization models should be adopted for mining exploration, engineering exploration and other types of construction.

6.4 OBE Model Assessment-Stimulation

The final goal for OBE model is ability in application. Therefore, Exploration Engineering can adopt case or problem analysis and simulation operation to show students' ability instead of answering questions or writing reports on papers. It is much better to exam their learning both from theory and practice which case/problem analysis and simulation operation account for a certain proportion.

7. Conclusion

There is a huge demand for drilling rig construction after systematic analysis. So it is essential for us to reposition Exploration Engineering as a required course in optional courses. The reform should

be conducted as follows in order to cultivate the applicable talents under OBE model: 1) increasing class hours to 48; 2) enriching the teaching methods and setting up teaching drills; 3) independent internship is a must; 4) cultivating students' management ability; 5) the combination between problem analysis and simulation operation should be adopted in the final assessment.

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