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On the Cultivation Mode of Petroleum Engineering Professionals in Higher Vocational Education

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Abstract
In this essay, the author points out several problems during the cultivation of petroleum engineering professionals in higher vocational education, and brings up an innovative training model which involves "platform + module" in theoretical teaching and "basis + innovation" in practical teaching. Analysis are made on the reform of curriculum system, improvement in students' professional accomplishment, strengthening of teaching staff construction featured as "double-Identity instructor with double capabilities", acceleration in practice bases construction, improvement of teaching method of skills training , enhancement in professional skills training, etc..

Key words: Higher vocational education; Petroleum technology; Cultivation mode

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INTRODUCTION
In recent years, following the three largest oil companies in China, many others have been reducing staff while the number of petroleum engineering graduates increasing; the job market is tough for the oil enterprises have been raising their employment standards, which leads to a wider gap between a college graduate and a qualified employee. There are current and upcoming issues to be solved, including economic construction in oilfield areas where colleges provide services, cultivation of highly skilled talents, training quality improvement and employ ability enhancement. Besides, the higher vocational education in China has developed from the stage of quantity expansion to that of quality improvement. It is a general trend of higher vocational education to promote reform and innovation to lead scientific development of vocational education and to further highlight the distinctive characteristics of education in higher vocational schools to strengthen their capabilities in the service of economic and social development (Fan, 2013).

1. EXISTING PROBLEMS IN CULTIVATION OF PETROLEUM ENGINEERING TALENTS IN HIGHER VOCATIONAL EDUCATION
Currently, the training modes and goals, teaching methods, contents and faculty composition in most vocational colleges are isolated from the needs of oil companies for the following reasons.

1.1 Unclear Localization of Talents Cultivation
Vocational colleges are supposed to train highly skilled and innovative professionals who are creative enough to discover and solve problems, explore new fields and make innovative contribution to the construction of material and spiritual civilization. The oil industry is booming and the development of new devices and technology is more rapid than ever. Thus, enterprises have to improve their standards and employees are required to be adequate and familiar with their jobs and device in a short time. A number of colleges fail to run basing on their localization and to reform catering for the features of each major. In addition, major construction and development are determined by school policy while the development of the college is influenced by multiple factors, such as policy of the education department, public opinion, evaluation system of functions, etc.. (Gao, 2011)

1.2 Isolation Between Cultivation Goal and Social Needs

According to a research conducted by Professor Zeng Xiangquan and others from Renmin University of China: The five most important qualities are responsibility, professional dedication, verbal ability, learning ability and problem-solving ability, and the five least important skills are foreign language competence, computer skill, leadership, supervising ability and capacity for innovation. However, students tend to consider problem-solving ability, foreign language competence, planning and coordinating ability, learning ability and computer skill the most essential capacities while writing ability, achievement motivation, response capacity on crisis, leadership and supervising ability the least significant. The result shows great cognitive difference between college students and employers. In a college, the curriculum, teaching content and teaching mode are mainly determined by the faculty. In applying universities from economically advanced regions, faculty with strong diversity is required to have more practical experience. In China, the majority of teachers come directly from colleges with limited working experience and thus, their teaching methods and contents can hardly meet the demands in the actual work.

1.3 Lack of Training on Non-Cognitive Factors

Soft skills are divided into application level, cultivation level and talent level. Application level includes communication skill, interpersonal skill, analytical ability, organizing ability, cooperative ability, innovative ability, etc.; cultivation level includes responsibility, achievement motivation, service consciousness, self-confidence, stress tolerance, global consciousness, morality, etc.; talent level includes intuition, aesthetic perception, characteristic, personality, etc.. According to the research, among all employability skills, soft skills turn out to be the weakness of college students, which suggests the lack of training and that of effective approach (Liao, 2014).

1.4 Unsound Construction of Student Teaching Bases in Higher Vocational Schools

At present, students majored in petroleum engineering usually have their production practice collectively at the teaching base outside the school, and students will be led by instructors in their practice which will mainly include visiting and professional lectures. As to production practice, however, it is a significant link of practical teaching for students majored in petroleum engineering and it also serves as an effective way of cultivating students' capabilities in real operations as well as problems analysis and solutions. By production practice, students will be stimulated to develop interest in studies of such follow-up professional courses as drilling engineering and oil production engineering and also to apply the theoretical knowledge they've acquired to real operation of oilfield production. There are several main reasons for the problems between training objectives and methods.

Through over 30 years of reform and opening up, the petroleum enterprises have transformed from government's subsidiary to legal and market competition entity; thus, the pursuit for benefits has become a significant concept during operations of those petroleum enterprises which are not obliged to accept students for production practice. Second, as China now depends heavily on foreign trade to obtain petroleum, domestic petroleum enterprises are confronted with arduous production tasks to ensure petroleum supply; thus, it is difficult for those enterprises to ensure necessary staff and materials required for production practice. Last, the production practice of students majored in petroleum engineering is usually characterized by fixed time period and large number of participants; besides, the practice is usually arranged during the summer vacation from July to August when the petroleum enterprises are too busy with their production and operation to arrange and admit a large number of student interns in a short period.

There will be insufficient hands-on experience and training during the production practice as to students majored in petroleum engineering. Moreover, it is riskier for students with little professional skills to have field practice since there will be carriage, sling as well as loading and unloading of large equipment under the environment filled with high-temperature and high-pressure fluids, large-current and high-voltage system as well as drilling rig and petroleum production systems. If production practice mainly includes visiting without real operation, students will be less positive and active in follow-up learning since they have no chance to acquire professional skill training to gain understanding of internal structure and working principle of the equipment. Second, the schedule of students' production practice will be affected by oilfield production and operation in a significant way; thus, the original practice program will sometimes be adjusted as required, making it difficult to ensure reasonable and complete production practice. Besides, it is impossible for students to acquire a comprehensive understanding of main manufacturing techniques and technology in the entire field of petroleum engineering within limited time period of production practice due to detailed division of professional functions in the production field (Wang, 2010).

2. CULTIVATION MODE OF PETROLEUM ENGINEERING PROFESSIONALS IN HIGHER EDUCATION

Universities in China have been mainly using the "three-floor" reverse structure, "elementary course → elementary technical course → specialized course", which intends to train "specialist" while oil companies are looking for employees with broad knowledge and a certain understanding of specialized skills and career. Therefore,

the new cultivation mode, aiming at nurturing innovative talents, involves "platform + module" in theoretical teaching and "basis + innovation" in practical teaching.

In theoretical teaching, "platform + module" provides platforms for elementary course, elementary specialized course, specialized course and elective course and broad knowledge of the field; basing on the platforms, elective specialized modules are available for each major to provide a theoretical foundation for innovative talents. In practical teaching, "basis + innovation" refers to cognitive practice, geological practice, productive fieldwork, engineering training, course design, etc., which are intended to improve hands-on ability while innovative experiment and graduation design, which enhance innovative capacity (Li & Liu, 2013).

3. IMPLEMENTATION OF TALENT CULTIVATION MODE

3.1 Optimization in Curriculum to Meet Employment Demand

At present, the establishment of specialized subjects in higher vocational schools, to certain degree, has broken away from and lagged behind the development of petroleum industry in China; besides, there is repeated and seriously similar establishment of subjects in various domestic colleges and universities providing education of petroleum engineering, which has greatly hindered cultivation and training of applied talents in this field. It is essential for higher vocational schools to set accurate school-running orientation in order to establish their own unique school-running characteristics to finally secure competitive advantages and expand development space. There is certain pattern already established among higher vocational schools which should conduct profound analysis of their school orientation and competitive advantages. Moreover, those schools, according to the principle of "having what others do not have and owning what better than others", have to adopt the strategy of vicarious development to build their own unique school-running characteristics by exerting efforts in specific aspects for breakthroughs (Liao, 2014).

The cultivation of professionals in oil industry should be based on development of the society and special requirements of the industry. First of all, theoretical curriculum which is suitable for student should be set up or reformed to serve the purpose of academic study and lifelong development. There is the reform of modular-based curriculum, in which knowledge input is orientation, knowledge output is diversion of direction and cultivation of students' capabilities is the objective. By the reform, it is to change gradually from traditional course teaching with subjects as background to modular-based teaching centered on cultivation of professional competence. Specifically speaking, the modular-based curriculum system includes public courses and specialized courses which are divided into core specialized and modular-based specialized courses. The establishment of core specialized courses is the symbol differentiating the very specialty from others and serves as the foundation for existence and development of this specialty. As to curriculum setting, it is essential to take full consideration of core knowledge system of education and teaching of this specialty and to offer various modular-based specialized courses to students with different interests and under different training programs. Secondly, colleges ought to reform practical teaching and enhance training of professional skills. Thirdly, theoretical course hour must be strict control to make way for practical teaching, such as comprehensive training and comprehensive course design. Colleges need to lay more importance in the improvement of students' analytical ability, problem-solving ability, independent learning ability and research ability.

3.2 Strengthening of Teaching Staff Construction Featured as "Double-Identity Instructor with Double Capabilities"

By "double-identity instructor", it refers to those who are capable of being a teacher and also an engineer; and by "double capabilities", it is required that instructors have to possess strong ability of operation to be qualified for teaching tasks of cultivation of applied talents and also possess the ability to conduct technical research and achievement transformation. By strengthening efforts to construct qualified teaching staff featured as "double-identity instructor with double capabilities", it will help college students enhance their professional quality and skills. First, the schools can organize instructors in this field to have their training or professional practice on job sites and in design or research institutes by taking advantage of good relationship with oilfields and schoolfellows in order to enhance teachers' capabilities in practice and technological development. Besides, efforts should also be made to invite experienced technicians in oil and gas field production units, research or design institutes to work as part-time instructors in the schools so as to bring about latest technology, information and process applied during field practice of scientific researches and production. As a result, teachers will enhance their capabilities through the process of teaching activities and mutual communication. Second, it is essential for the schools to establish professional title evaluation system of instructors with "double capabilities". As the higher vocational education emphasizes on practical and technical capabilities of instructors and also on cultivation of students' professional ability, the professional title evaluation of instructors should start from the very concept of applied education to carry out independent professional title evaluation system in application-oriented colleges and universities. Besides, the instructors' experience of enterprises training in rotation, technical service and visiting scholar will be considered

as important in evaluation which will emphasize on examination of instructors' practical abilities to combine theories with technology (Liao, 2014).

3.3 Enhancement in Professional Competence

To begin with, curriculum system and evaluation system should be set up for training of professional competence in vocational colleges. In addition to specialized teaching, a professional competence curriculum system should be built, which runs through the whole three years of higher vocational education. The first year is for the student to learn specialized knowledge and to set up a career goal; the second year emphasizes on fostering professional skills; the third year is more about comprehensive professional competence and professional ethics. Under a proper evaluation system, students will improve their team spirit, cooperative awareness, competitive spirit, etc.. Their professional competence will be enhanced by using evaluating means that combine evaluation from both teachers and students, dynamic assessment and static assessment, and formative evaluation and final evaluation.

Moreover, students' professional competence can be improved by the cooperation between colleges and enterprises. The school-enterprise cooperation includes approaches as cooperative education, cooperative cultivation and cooperative employment. Students are able to integrate theory with practice through cooperative training, inviting technical experts from enterprises and specialists from government functions to engage in curriculum revision and involving students in school-enterprise projects. In this case, students are able to experience enterprise culture, improve acceptance for enterprise and enhance their own professional competence.

Lastly, it is necessary to open the second classroom to strengthen professional awareness of students in higher vocational and technical colleges. Efforts should be made to create opportunities of extracurricular learning and exercises for students and to open the second classroom by means of project study and practice so as to cultivate students' professional quality. Moreover, such activities as volunteer labor, social investigation, social services and work-study program should also be carried out to help strengthen students' sense of mission and social responsibility and to help raise their awareness of hard work and self-reliance in order to lay a firm foundation for them to build good occupational ethics consciousness in the future. During the social practice activities, students should be trained to learn communication, tolerance, competition and cooperation in their work. Besides, students should also be trained to develop the good habit of disciplined compliance through strict management, effective regulations on behaviors as well as emphasis on punctuality. With the good habit being developed, it is possible to internalize those professional norms which are deeply rooted in students' mind as their individual moral qualities and to finally apply those norms in real practice (Fan, 2013).

3.4 Strengthening of Cultivation of Vocational Skills

It is the objective of higher vocational education to cultivate high-quality and skilled professional talents with good professional abilities. With vocational skills contest, it is possible to further enhance professional abilities and practical skills of talented students in the schools and also to bring about reform of relevant teaching tasks. In vocational skills contest, the core specialized knowledge will be integrated in each stage of the contest and students will take part in the contest in group. In this way, students will have their capabilities of professional learning and communication and coordination in organizations cultivated to lay a firm foundation for them to have further command of real vocational skills. Besides, students will develop certain awareness of job competition by attending the vocational skills contest, and will also be propelled to make solid training to enhance their mental and comprehensive quality. Moreover, it is necessary, during the contest, to control competition rhythm in a good way and to complete every operational procedures in a careful and orderly manner, through which students will be cultivated to build carefully working attitude, fighting spirit and competition awareness. Students who have participated and performed excellently in the contest will be favored by enterprises.

Vocational skill contests like China Petroleum Engineering Design Competition and Petroleum Equipment Innovative Design Competition greatly promote the improvement of students' skills for actual work and faculty construction in higher vocational colleges. Besides, these contests enhance school-enterprise cooperation, lay foundation for further exchange, and accelerate the development of vocational teaching in China (Wang & Xin, 2015).

3.5 Improvement of Teaching Method of Skills Training

As to teaching practice concerning the specialty of petroleum engineering, it is essential to organize the curriculum according to posts in production field in order to meet requirements of the production units. Therefore, it is significant that instructors for practical training strive to make explorations to improve their teaching methods by taking advantage of their own teaching experience and according to individual characteristics of students. The following is several teaching methods. Object teaching: preparing real objects such as drilling hand tools, wrench, chain tongs and grease guns perceptual practice to equip students with knowledge of professional facilities and equipment through cognition of real objects. Demonstration teaching: Guiding students to conduct operations with real objects to equip students with essential points of operation. Simulation teaching: offering repeated teaching and training of various skills through simulation operation platform to make students gradually familiar with basic tools, main facilities and equipment as well as technological process of production. On-the-spot

teaching: As to schools with on-campus training bases, they can simulate real situations such as overflow, well kick, blowout and leakage in production field as training programs to students and can also offer practical skills training for regular post of spudder. In this way, students will be able to have field experience of procedures and methods of various production processes so as to apply theoretical knowledge acquired in real operations in a direct manner. As to schools without on-campus bases, they should build training bases in their closely related production units and select students to observe operations on field under specific programs. Besides, efforts should be made to seek opportunities of hands-on operations by students so that students can combine theoretical knowledge acquired with real practice through operations. "Question guidance" teaching: Leading, through creation of specific question situations, students to acquire knowledge actively and apply knowledge learned to solve questions when they are confronted with questions in learning. Group teaching: Operation demonstration is a key link in practical teaching, and operation demonstration and guidance will be more effective by means of group teaching. This is because that students will obtain a better observation of operation demonstration by teachers in the group and will be given more opportunities for hands-on operation during the process (Li & Cheng, 2013).

3.6 Acceleration in base construction

First of all, it is necessary to strengthen efforts to build on-campus training bases. To solve those many problems of off-campus production practice in an effective way, it is significant to build certain on-campus training bases in order to offer platform for students to conduct hands-on operations. For instance, schools can establish petroleum engineering simulated training center to combine the specialty of petroleum engineering with such subjects as computer control, network communications and computer graphics and to conduct simulation of such production processes as drilling and petroleum production. Besides, there should be development of drilling simulator, petroleum production simulator and petroleum deposit simulator to create the necessary environment for students to engage themselves, for several times, in the process of engineering parameters design, virtual training and results analysis.

Secondly, it is essential to strengthen efforts to build training bases outside schools. Decision makers ought to deepen reform on practical base construction according to the need of practical teaching and management. Bases should be built focusing on Daqing Oilfield Technology and Training Center with other bases, such as borehole operation companies, drilling service companies, well drilling engineering technology institutes, etc.. Practical teaching including reservoir engineering, oil recovery, drilling engineering and others allows students to combine theoretical knowledge with actual production, improve their interest, hands-on, problem-solving, and analysis abilities.

CONCLUSION

Under the background of remarkable progresses of petroleum industry, China has no obvious advantages in terms of both technology and talented personnel as compared with various foreign petroleum enterprises. The international competition and competition among industries and enterprises are, in the final analysis, competition of talented personnel. The higher vocational petroleum engineering schools, as training base of advanced application-oriented personnel majoring in petroleum engineering, are still confronted with daunting tasks and heavy responsibilities. Cultivation of innovative talents is a common need for the oil industry and quality improvement of vocational colleges. The author believes that students' theoretical level will be improved through curriculum reform. Also, their capacity of scientific research will be enhanced by experiment, scientific research training and other practices. There is no doubt that graduates with fine comprehensive quality, solid theoretical knowledge, outstanding professional competence, good adaptive capacity, analytical ability, problem-solving ability and independent working ability will be favored by the employers.

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