ANALYSIS OF PRACTICAL ABILITY IMPROVEMENT FOR TEACHERS BASED ON THE "EXCELLENCE PLAN"

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Abstract. The "excellence plan" is aimed at developing high quality engineering and technical talents who have a strong ability for innovation, can adapt to the development needs of society and can work out strategies for making the country stronger. At the same time, the "excellence plan" colleges are required to build a team which would include high level full-time and part-time teachers with engineering experience. This paper analyses the current situation of teachers' ability for engineering practice and practical ability from the following points of view: bringing into play subjective initiative, interacting practical experience among teachers, adjusting the practical teaching link, training for teachers' positions and training double-tutors with cooperation between schools and enterprises.

Keywords: *Engineering Practice Ability, Excellent Engineers, Higher Engineering Education, Professional Teachers*

INTRODUCTION

The training plan of excellent engineers' education ("excellence plan" for short) is a major reform project which carries out the national medium and long-term education reform and development plan outline (2010-2020) and the national medium and long-term talent development plan (2010-2020). It is aimed at obtaining high quality for engineering and technical talents who have a strong ability for innovation, can adapt to the development needs of the economical society and can help the country to take a new developed road of industrialization, for building an innovation-originated nation and for the strategy of reinvigorating China. At the same time, the "excellence plan" requires "excellence plan" colleges to build a team which involves high level full-time and part-time teachers who should have engineering experience. As teachers of higher engineering education, they can directly influence students' training quality of engineering practical ability. If teachers don't have enough engineering practical ability and specific hands-on experience, they can't lead to engineering practical knowledge. There are some differences between knowledge in textbooks and operation, running, maintenance and overhaul of equipment. The saying "It is better to use no book rather than trusting a single book completely" can explain the difference perfectly. So, in the context of the "excellence plan", an important part of teaching reform is to enhance engineering practical experience of teachers. So far, in order to strengthen the building up of teaching staff, every college has been raising the threshold of requirements for teachers. They want teachers who have doctor's degree or overseas educational background. In order to introduce fresh blood, some colleges don't want people who have graduated from their own school. But, this does not solve the problem of teachers' practical engineering ability and it does not fit the purpose of training engineers in the context of the "excellence plan". Therefore, enhancing college teachers' engineering practical ability for carrying out the "excellence plan" is a major issue. During the course of implementing the "excellence plan", the strength of teachers' engineering practical ability directly determines the quality of each teaching link of colleges. Teachers who have strong engineering practical ability can make good use of laboratories in colleges, training facilities, university-enterprise cooperation bases, off-campus practical bases and so on. An important guarantee for the "excellence plan" is to combine students' objective circumstances in order to improve their operational ability. This

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paper analyses the current situation of teachers' ability for engineering practice and puts forward effective ways in order to improve the teachers' engineering practical ability.

1. THE INSUFFICIENT ENGINEERING PRACTICE OF HIGHER ENGINEERING EDUCATION TEACHERS

At present, the higher engineering talent training situation is not ideal in our country. One of the problems is that some teachers do not have engineering experience and despite the fact that they have a strong foundation of knowledge, their operational ability is weak. What is more, they know little about the current situation concerning development and the development needs of technology, which is the subject matter of their teaching. So these teachers are incapable of introducing ideas, theories and methods of engineering effectively. Thus, this can lead to lack of engineering practical ability in engineering seniors.

1.1. The problem of sources of young teachers

Now colleges and universities employ fresh MSc or PhD holders; especially colleges and universities increase their number and a lot of young instructors have been hired by universities in recent years. These teachers don't have practical experience, they have been trained in the traditional way. They are good at transferring basic knowledge to their students, but they don't have practical experience (Zhang, H., and Deng, C. 2012.). After graduating, postgraduate students enter the universities, but they don't have a chance to practice. This happens because most young teachers don't have practice experience and some universities can't train them well. As a result, they depend on textbooks. Young teachers must prepare themselves while they are teaching, so their teaching isn't ideal. Lack of practical ability, which is the backbone of the development of colleges and universities, may fail to produce qualified talents.

1.2. Existing problems of middle-aged and old teachers

Middle-aged and old teachers in colleges and universities have a professional theoretical basis, abundant teaching and scientific research experience, they are the mainstay. However, they have been educated the traditional way. Some of them are weak in engineering practice, and they don't have experience in solving engineering problems. With the change of the aim of developing talents, they have ended up with a limited engineering practice experience, which doesn't suit the demands of the "Excellence Program". In addition, the concept of modern higher engineering education has a huge development and change in ideas and methods. So, the updating of modern engineering practice does not meet the requirements of modern society industrial technology, as it is in the hands of middle-aged and old teachers.

1.3. Evaluation system of colleges and universities

At present, there are some unreasonable factors concerning title assessment and teaching evaluation system in colleges and universities, a fact which isn't conducive to the cultivation of engineering practice ability for teachers. Academic papers, as well as levels and number of longitudinal subjects are the main standard of title assessment. We are not concerned about longitudinal subjects and technical service programs, so some teachers may ignore engineering practice as a result of the defects of title assessment; they just focus on exploring the basic theory. In assessing teaching performance, some colleges and universities just pay attention to what teachers do, their evaluation results and teaching reform.
So far, there hasn't been a better assessment system for teaching engineering practice ability. Even if teachers want to improve their engineering practice ability, they face a lot of assessment pressure, and they have to focus on theory teaching and longitudinal research learning.

1.4. Problems associated with engineering training practice

Colleges and universities have their own majors. There are factors which may block engineers from cooperating with enterprises. Due to lack of money and technical service training programs, they are not exposed to science and technology innovations created by the economic transformation. So, there is no improvement of engineering practice ability. Enterprises don't want to create positions for teachers without money. Due to this fact, teachers have little chance to practice. Thus, enterprises can't play a role in developing the engineering practice ability of young teachers.

2. DISCUSSION AND CONCLUSIONS

2.1. Improving teachers' initiative to develop engineering practical ability

Strengthening college teachers' engineering practical ability can strengthen their initiatives. Every teacher should become a first class qualified teacher in handling processing equipment; control engineering, besides adjusting to state requirements (Guo, X., and li, Y. Yongjiang Shi, 2013), should lend basic theoretical knowledge to teaching business and strong engineering practical ability in the domain of petroleum and petrochemical industries. Modern higher engineering education demands engineering practical experience and stronger innovation ability for teachers. At the same time, teachers should grasp the chance that the development tendency of modern petroleum and petrochemical industries provides and become familiar with new technology, new equipment, new materials and new products (Feng, Z, 2013). In this way, we can cultivate modern engineers with innovative spirit and practical ability. So, this is the premise for improving their engineering practical ability on their own and the urgency of the task.

2.2. Enhancing the interaction of engineering experience between teachers

We have professionals in different domains. Every teacher has his own specialized research direction and teaching courses. Teachers should exchange information, they should teach and learn benefitting from each other and imparting the experience of engineering practice to each other. This can improve every teacher's comprehensive cognitive competence. Middle-aged and elderly teachers accumulate abundant practical experience in both teaching reformation and scientific research innovation. So, we should dig into this proficiency and pass the valuable wealth of engineering practical experience to the young. This way the sequence "pass, help, take" can be achieved. If their activity is mobilized, a new specialized environment will be created, which will help young teachers considerably. At the same time, steps to establish appropriate guidance should be documented in paper and supervising should lead to sharing engineering experience. Inheriting the tradition of helping lessons, young teachers should teach on the platform that the help of old teachers provides. If this is done, old teachers and young teachers will cooperate to guide students' curriculum design and graduation projects. Teams of scientific research tasks should have a certain age level. It is of vital importance that a certain percentage of young teachers should enter into the project of educational reform, scientific research and technology service. Let young teachers take part in engineering practical exercises into reality.

2.3. Adjusting the practical teaching link, teachers' rotation in practical training posts

The "excellence plan" comes in the mode of "three plus one"; in other words, students are taught for three years on campus and practice one year in enterprises. So teachers' work is increased and the engineering practical background of teaching staff is improved. However, the demands and goals of the "excellence plan" cannot be carried out if training is done in the traditional way. In order to achieve the requirements of one year practical training, we should use the method of practice in

different places and different times. That is to say, when theoretical courses and specialized courses are finished, we must get in a practical teaching link as soon as possible, so that students can understand basic theory deeply and improve their practical intelligence. This way the spiral type teaching ideas can be confirmed. Different subjects of practical training will be taught by teachers who have different specializations. But, everyone doing his best only is not good enough for the comprehensive development of teachers' team overall strength. So, teachers should take part in practical courses in which they are not involved as auxiliary teachers. Then, after accumulating enough practical experience, they should rotate in the post of practical training. For example, the personnel training plan of "petrochemical excellent mechanical engineers", in our college, has put forward such a training plan on enterprise learning, concluded the yield, operation, design, manufacture and security detection of petroleum and petrochemical equipment, as well as modern management of petroleum and petrochemical enterprises. Practical training of sectional multi-point starts at junior level. It contains professional production practice, professional manufacture practice, comprehensive training of professional design, facility maintenance training, equipment inspection and HSE (health, safety, environment) management practice in the industry. It also contains DCS (Distributed Control System), control system design and practice, safety test technology engineering application practice and graduation project. The content of graduation project increases the standard requirements in breadth and depth. Tutors adopt the double-tutors system. College teachers and industrial engineers cooperate to guide students' graduation projects, so that their works can be more practical and enhance the utility and innovative character of graduation project.

2.4. Inspiring young teachers to pursue field practice in relevant enterprises

What is learned from books is superficial after all. It's crucial to have it personally tested somehow. At present, academic teachers occupy a large proportion, they teach directly after graduating with a doctor's degree, but they don't have enough practical exercise. That does not fit the requirements of the "excellence plan" for teachers. Therefore, we should go into production practice. Production practice is the best teacher and the best way for improving engineering practical ability is to pursue field practice in relevant enterprises. The talent training plan of "petrochemical engineering for excellent engineers", in our school, requires that teachers of excellent classes should study in related enterprises, away from a teaching post for a minimum of two years, so that they are given the chance to come in touch with every link of petroleum and petrochemical equipment design and construction totally, such as survey, design, test, production, trial run, safeguard, overhaul, management and so on. They should also familiarize themselves with the limitations of every professional theoretical frame, master the applications of advanced technology and craft production, seek advice from engineering technicians of production line, get to understand the relation and difference between knowledge in book and practice. The above are very effective ways for teachers to improve engineering comprehensive ability. Hence, related schools should follow a schedule of training teachers of excellent classes in turn and by stages. At the same time, schools should undertake a certain technical workload and improve engineering practical ability as soon as possible, so that the practical training for students can be carried out more smoothly and in a better way.

2.5. Cooperating between schools and enterprises, promoting the development of double-professionally-titled teachers

The Ministry of education defines double-professionally-titled teachers as those teachers who have both the instructor's - or above - titles and at the same time have the professional intermediate - or above - technical titles, or have actual working experience in the professional line for at least 5 years, or take part in qualified professional skills training, or host the research or application of practical technology. That is to say, besides the basic college teachers' qualifications, double-professionally-titled teachers are required to have a higher level of professional engineering practical ability (Hui, X., Ji, L., and Xu, P., 2010; Xu, P., and Ding, S. Jianwu L i., 2011). A new mechanism will be established for cooperating between schools

and enterprises to train talents based on cooperating to win more. In other words, carrying out national medium and long-term education reform and development plan outline (2010-2020) can train high-level engineering talents, solve technical problems and develop enterprise culture for enterprises. The specific measures are advanced by the principle of "go out and come in".

A feature of the cooperation between college and enterprise training excellent engineers is that related enterprises should take part in depth and breadth. But, because of the characteristics of industry production, it should be noted that, as a typical petroleum university, our school is mainly directed at the subordinate enterprises of oil and gas companies. Due to this fact, it can't guarantee the space and time required by internship. Hence, it has put forward the idea of training cooperation between schools and enterprises, that is the so-called idea of "go out and come in". Teachers should try their best to lead students to related companies to have knowledge practice and production practice. Teachers can arrange students to take part in enterprise equipment modification, technology innovation and development of engineering projects. At the same time, schools can invite engineering technicians who are responsible for different departments in related companies to give seminars. These engineering technicians have abundant working experience and they understand related technological processes, equipment structure and working theory thoroughly. Students who have the theoretical foundation can develop a profound understanding with the help of elder professional engineering technicians. Students can improve from emotional cognition to rational cognition. At the same time, schools can consult with enterprises to install some wasted equipment and machines in practical rooms of schools and practical factories. Students can dismantle, maintain and install equipment by themselves to improve their practical ability, under the guidance of teachers. "Go out and come in", not only completes the training of excellent engineers in the "excellence plan" and increases students' production practical time, but also builds a team which contains high level full-time and part-time teachers who have engineering experience and have gone through the changes from the ordinary to the double-professionally-titled teachers.

Conflict of interests

Authors declare no conflict of interest.

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