Study on the Cooperation Mechanism of the Professional Training of Engineering Master

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Abstract. With the development of our country’s industrialization, the demand from industrial and mining enterprises, engineering and construction sectors towards high level, practical engineering personnel is rising. However, the current way of training Engineering Masters in universities still remains some drawbacks. The unclear training key points, unreasonable curriculum, the communication between schools and enterprises is not enough and some other factors lead to the fact that the graduates cannot meet the enterprises requirements. In order to improve the professionalization of Engineering Masters and to make them can play a role in China’s economic development, it requires universities to make some improvements in some aspects like teaching, management and etc. It also requires the resource sharing between universities, the cooperation between schools and enterprises. Then we can get a win-win result.

Current Situation of Professional Training of Engineering Master

The degree of Engineering Master in our country is approved by the Academic Degrees Committee of the State Council in 1997 and takes a large percentage in the graduate of Professional Degree. Summarize the existing engineering master's professional training research, analyze the existing problems and reasons in the current training mode and explore the effective engineering master's professional training mode, are very meaningful to further improving the quality of Engineering Master's training and solving the structural contradiction between the professional quality of the engineering master and the needs of economic social development.

The research results of the professional education of engineering master can be roughly divided into two categories. One is study a particular training part, like introduce the core content and key points of total quality management to analyze the education quality management of Engineering Master, discuss quality management and process control in the quality of thesis, or investigate and survey the current situation of the implementation of the dual tutorial system in Colleges and proposed some measures, etc. Another is to summarize the experience in specific area and university, such as compare the difference between China and America, from which we can know that the American universities have detailed training information, reasonable curriculum structure, diversified training mode and some other methods that is really worth to be learned by us, or summarize the training mode of Engineering Master in some domestic colleges and universities to analyze the reason of their success. The existing research results have given some advices on the reform of the professional training mode of engineering masters.

The Existing Questions in the Professional Training Mechanism of Engineering Master

Engineering Master is a professional degree related to qualifications in engineering field. The part-time engineering master only will take in the students who have the over-three-year working experience, and more emphasize on academic practice.

The Existing Problem in External Professional Education Mechanism

First, the engineering masters just appeared less than 20 years. The rules and regulations are still not
perfect. 1997, the degree committee of the State Council considered and adopted ‘the program of Engineering Master’s degree program’. 2005, commission guidance in the basic requirements for professional degree of master of Engineering in the detailed description of the engineering master degree thesis topics. 2009, the office of academic development ‘on the development of full-time Master of engineering training program guidance’ on the training objectives of the full-time Master of engineering, learning methods, curriculum settings, and other requirements. Overall, since 1997, the rules of the education for engineering masters released by country is not very many on quantities, the content is relatively rough and the requirement is not strict, leading to that the attention from universities in implementation process is not enough.

Secondly, enterprises don’t pay much attention to this and don’t participate in that too much as well. The practice in enterprises for engineering masters is very helpful and useful. However, in a long term, the enterprises think that training personnel is just the responsibility of universities, and they just need to use personnel, so they didn’t pay much attention to training personnel. With the accelerating process of China's industrialization, enterprises’ demand of high level, applied engineering talents is rising just relying on universities cannot to provide the professional level of higher engineering talents for enterprises. The awareness of the enterprise should change.

The Existing Problem in Internal Professional Education Mechanism

The university is the main internal training part of engineering masters, but they still have some serious questions. The difference of curriculum system between Engineering Master and Master of Science in Engineering is not apparent. The way that teachers used to teach these two is very similar. Zhi Li (2010) did a questionnaire investigation about the current Guangdong’s training situation of engineering masters. The result showed that the universities’ teachers didn’t know engineering masters much. Among the 74 teachers that attended the research, only 6 of them said that they knew engineering masters very well, but around 90% of them only knew a little or nothing. Third, the motivation of the reform of teaching is not enough. Le-ping Zhang (2012) chose one Research University to survey their training situation of engineering masters. The result showed that, even though a lot of teachers thought that it was very important to train the practice ability of engineering masters and to make a probable study goal.

The engineering master itself also has contradictions. Also most student lack of learning enthusiasm often in a passive state. Therefore, solve the contradiction between work and learning is the premise to improve the professional training’s quality of non-full-time Master of engineering student.

Professional Training Mechanism of Engineering Master Based on Cooperative Cultivation

The Uniqueness of Engineering Master

Engineering master has its own uniqueness, compared with other professional master's degree or master's academic master. First of all, the master of engineering is interdisciplinary talents. Secondly, the master of engineering is the practical talents. One of the major characteristics of the education of engineering master is based on engineering reality. The graduates need to combine the theoretical knowledge and practical problems effectively, and keep in touch with production practice in the training process. Thirdly, master of engineering is innovative talents. So, improve the professional level of engineering master should be one of the key part in the process of building the training mechanism.

Cooperation Training is Helpful to Improve the Professional Level of Engineering Master

The professional level of engineering master must be improved in practice, but it is difficult to achieve by just relying on the strength of the university itself. On the one hand, although the majority of colleges and universities have engineering laboratory and teaching practice center, but because different have different level of scientific research and the influence, there are differences existing in both the engineering practice of the teacher's experience or the hardware facilities. The
unbalanced distribution of the educational resources is hindering social development in educational fairness and national education.

**The Construction of the Professional Cooperative Training Mechanism of Engineering Master**

To make the mechanism better, we need to think about both the external and internal training way, and achieve the cooperation between colleges and universities, universities and enterprises.

Sharing resource among universities is the foundation of forming cooperative training mechanism. Joint cultivation between enterprise and enterprise is the core of the formation of cooperative training mechanism. Schools and enterprises establish joint training base, and provide a good learning environment for engineering masters, are conducive for the training units to combine the engineering master’s training objectives and enterprise actual need and explore the training mode of its own characteristics, and realize the ‘mass customization production’ of engineering masters. The support and supervision of the government is the guarantee for the formation of cooperative training system. Effective external constraints ensure cooperation cultivation mechanism can be fully implemented. Do effective continuous monitor, inspect and evaluate to the implementation of training units, urge enterprises to participate in the training cooperation, and regularly investigate the situation of engineering master’s practice in the internal enterprises.

**Establish the Specific Strategies of the Cooperative Mechanism of the Professional Training of Engineering Master**

China University of Petroleum (East China) is known as the cradle of oil technology talent. It is the first batch of Engineering Master's degree granting units, and one of the comprehensive educational reform units of the Ministry of education professional degree graduate. The new talents’ cultivation cannot be separable from the all-round cooperation from universities and enterprises in the talent training, transportation and usage.

**Cooperation between Colleges and Universities**

Universities should clearly know that the training objectives of engineering master are of mainly by the practice, but the scientific research is not the core. So in the curriculum setting, we need to focus on the training objectives to optimize the framework of curriculum system. While, the school's teachers were used to focus on academic research and lack of engineering practice experience, so cannot give effective guidance to the engineering masters. Therefore, on the one hand, the universities need to improve the professional level and practical teaching ability.

Ministry of education degree in management and research for health secretary, deputy inspector Xu Zhongbo, suggest that colleges should collaborate, try a combination of different types of universities unions and different disciplines as well, to play their respective advantages, and establish the education platform of inter professional, inter school and inter regional talents. China University of Petroleum (East China) and some domestic and foreign similar institutions explore to establish regional Petroleum Universities' union. At the same time, use the comparative advantage of China's engineering master education, to establish a standard of regional engineering master in our country to promote the free flow of graduates in the region gradually.

**Training Cooperation Strategy between Colleges and Enterprises**

Allow enterprises to participate in the training of Engineering Master's teaching, is an important means of postgraduate’s professional training. Liao Zhen-liang (2014) believed that creating the practice base outside school and setting off out-campus tutor was a result that colleges and universities cannot meet the engineering requirements of graduate students to seek the help from the outside society. Some colleges ‘just practiced for practice, and created for create’. This wrong motivation made this culture mechanization, coupled with the current enterprise was not ready to receive engineering masters, especially full-time engineering masters, to practice, making the cooperation between school and enterprise cannot receive good results. Therefore, the enterprises have responsibility and obligation to help the College to train Engineering Master. This training is
not only floating on the surface of the titular mentor or contract signed, but the deeply take part in the cultivation of engineering master. Because the university lack of understanding of enterprises' personnel needs. Therefore, it is very important that the enterprises send representatives to participate in the making of engineering master’s training plan.

China University of Petroleum (East China), actively explore the domestic and foreign practice base for the engineering graduates. In our country, we establish teaching practice base in the major domestic oil companies, and set up a joint training base with oil enterprises. Selecting graduate students to participate in overseas practice will not only enhance the practical ability of graduate students, open their eyes, but also improve the ability of cross cultural communication, which benefit the training of inter-disciplinary talent a lot. However, due to the operation of overseas internship base is very short, students practice teaching arrangements, student management and other aspects has yet to be further studied and straightened out.

The Cooperation Training Mode of School and Enterprise

Except training personnel, China University of Petroleum (East China) also explores a new type of school-enterprise cooperation model—the regional alliance of school enterprise cooperation. In May 2013, schools and CNPC’s Central Asian natural gas pipeline company, Chinese oil company of Kazakhstan, and Amu River gas company signed an agreement on the framework of talent training strategic cooperation, established regional union of cooperation at home and abroad between school and enterprise, and carried out long-term cooperation in terms of member enterprises of foreign and Chinese employees’ training and talent-supporting cooperation. At the same time, establishing the Central Asian teaching and Training Center aims to the regional recruiting of engineering masters, as well as short-term training of personnel.

The cooperation mode of school and enterprise has been greatly welcomed by the enterprise. School plans to further expand this model, to build the teaching and training center in the Middle East, Asia Pacific, South America, North Africa and other regional, covering China's oil region at home and abroad. Along with the construction of the regional alliance of cooperation of school and enterprise, except the course study, the other training steps of engineering master is gradually completed overseas, and provides variety of ways for the professional training.

Conclusion

Improving the professional level of engineering master, to let students after graduation can quickly adapt to the enterprise’s environment, need the participate in the construction of a professional master of professional training and cooperation mechanism from government, colleges and universities, enterprises and so on. According to this unique characteristic of engineering master, colleges and universities should combine their reality to reform the existing training mode, establish unions with other colleges and universities, and combine the enterprise to direct the students of engineering master. This process also needs enterprises to participate in actively, and the government gives support and supervision, in which will make the cooperation mechanism reach to maximize utility.

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