

A Tentative Exploration of the Educational Training Mechanism of Outstanding Engineers' Mineral Processing Engineering Major

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ABSTRACT: Based on a summary of the common issues regarding the "Engineering-type" talents of the mineral processing engineering major, this paper takes the example of the Xi'an University of Science and Technology, one of the second batch of universities listed in the "Plan for Educating and Training Outstanding Engineers (PETOE)", and explores the thinking pattern and scheme established by the educational training mechanism of outstanding engineers' mineral processing engineering major. It thereby provides the theoretical and practical foundation for the mineral processing engineering major to comply with the Outstanding Plan.

KEYWORD: Mineral processing engineering; Outstanding project; Mechanism

1 INTRODUCTION

In 2010, China's Ministry of Education launched the talent-cultivating plan of outstanding engineering. This plan proposed a new mechanism for universities and enterprises to work together in training talented engineers and demonstrated that the state attaches a great importance to technical talents. The top priority of this plan focused on how to cultivate the outstanding engineer; therefore how colleges and universities design the cultivating objects, formulate the cultivating schemes and effectively implement the cultivating process. It also required colleges and universities to conduct an exploration of practical enterprises. As one of the second batch of universities listed in the Plan for Educating and Training Outstanding Engineers (PETOE), the Xi'an University of Science and Technology introduced their mineral process engineering major in 2011. This program was one of the main mineral engineering programs of the university and its main role was cultivating the talented engineers required for practical projects, thereby orientating the production, technological improvements, product development and management of enterprises. Thus, it is necessary to explore, theoretically and practically, the educational training program that led to the establishment of a mineral processing major for outstanding engineers and cultivated the reserve talents of outstanding engineers with professional strengths.

2 COMMON ISSUES IN THE "ENGINEERING-TYPE TALENTS" CULTIVATION PROCESS OF THE MINERAL PROCESSING MAJOR

The *World Competitiveness Yearbook*, which is issued by the International Institute for Management Development of Lausanne, Switzerland, has stated for the past ten years that "The International Competitiveness of China's Scientific and Technological Research and Development Personnel" ranks in the middle list of countries, and its "Qualified engineers" rank towards the lower position, and in some years has been close to the lowest ranked country. Although China has the largest scale of project education in the world, most students cannot truly adapt to working positions in enterprises. The reason for this has been analyzed and is seen as being related to the fact that China's graduates in project majors have a weak capacity for innovation, tend to focus on examination papers, neglect design and are short of practical experience. Zhu Gaofeng, the former Vice Dean of CAE (the Chinese Academy of Engineering), also pointed out that China's current education orientation regarding projects suffers from the weaknesses of an incorrect current education positioning, an extremely detailed classification of subject majors, too narrow a knowledge scope among students, no solid scientific foundation and a lack of engineering drills. There are those main issues that summarize the exposed aspects of the process of cultivating engineering

talents among higher learning institutions and they will now be addressed.

2.1 The traditional solidified educational model - Dominated by imparting theoretical knowledge, when theory differs from the reality

The traditional solidified educational model mainly reflects an unrealistic cultivating program, indefinite cultivating objects, and an obsolete solidified educational thinking set.

The unrealistic practice of the cultivating program mainly demonstrates that its formulation by colleges and universities cannot keep up with the demand for enterprise development. The cultivating program formulated for many years is used to cultivate contemporary college students; however it cannot meet the demands of enterprises regarding the talents emanating from the major, and it leads to obsolete knowledge and a narrow knowledge scope among graduates. For example, with the ceaseless development of mineral processing technology in recent years and continuous innovation in the ways and means of processing mineral products, a lot of high-tech and modern equipment has been manufactured accordingly. However, if college students fail to master these new technologies in a timely manner, it will be difficult for them to get a job in an enterprise.

Indefinite cultivating objects mainly reflect the fact that no matter that they are national key universities or local regular higher learning institutions, they cannot sufficiently structure the objects according to the actual conditions of universities and colleges, therefore the cultivating objects of the same major are roughly similar. This cultivates an environment whereby students lack an awareness of innovation and an innovating spirit. For example, the experimental arrangement and professional curriculum design of the mineral product processing major in universities very rarely introduces new content, which would show they are adapting to modern mineral processing and application technology.

The obsolete solidified educational thinking set mainly reflects the fact that engineering education overemphasizes professionalization and scientification, but neglects the features and requirements of a project itself. That is, during the students cultivating process, the obsolete thinking set pays no attention to concerns about the content of the project notion, ethics, project safety and environmental protection. It means that students lack the education and cultivation with regard to project awareness at the beginning of enrolment. Subsequently, they are unable to acquire knowledge, deal with issues and solve issues from an engineering perspective when confronting the actual issues later. For example, the course Design of Coal

Preparation Plant in a mineral processing major requires students to establish a definite engineering awareness. Subsequently, no matter course designing process or the practice in a factory or designing institute, students will be able to consider an effective factory-building layout, a reasonable arrangement of equipment, an effective processing of mineral products, and a reasonable emission from solidified waste when thinking about the design content beforehand, avoiding the embarrassment of a lack of professional awareness.

2.2 Traditional practical link - Obsolete practical teaching methods and means

The traditional practical link of the mineral processing major in China's universities is composed of practical content both inside and outside schools. The former part mainly includes the course design, mineral processing major experiment and graduation design (paper); the latter includes cognition practice, production practice, and graduation practice at the sites of coal mineral enterprises. Through the study and investigation of the related teaching practice of higher learning institutions, the following issues can be ascertained.

① The professional knowledge related to the practical link mainly centers on theoretical courses and cannot meet the actual application, especially the cultivating object demand of "Engineering talents". ② The long-term university-enterprise cooperating mechanism leads to imperfections and does not introduce enterprise projects as part of the practical link, which causes a reduction in enthusiasm regarding the cultivation of talents and a decrease in initiative during internship, affecting the effect of an engineering practical link. ③ A large number of engineering course university teachers lack engineering practical experience and do not learn about what happens in actual enterprises. The teaching process still adopts the traditional teaching model and framework. Moreover, most universities have not formulated the corresponding policies that encourage young teachers to work in enterprises and enrich their engineering practical experience.

2.3 Traditional assessment evaluation system - Testing ways of mechanical memorizing

The question, whether the teaching tests and the appraisal of student performance is scientific and reasonable, is an urgent issue that needs to be resolved for the cultivation of engineering capacity. Usually, the method and content of evaluating students' learning performance in universities focus on basic knowledge testing. The students adopt a mechanical memorizing method to recite theoretical knowledge. Therefore this is not a scientific or systemic approach for checking and ratifying the

student performance, assessing the effect of practical teaching and managing the practice process. “Engineering talents” should be tested by confronting the practical issues without course teaching as reasonable evaluation results cannot be obtained by the traditional testing methods.

3 THE EXPLORATION OF THE MINERAL PROCESSING MAJOR IN ESTABLISHING THE EDUCATION CULTIVATING MECHANISM OF OUTSTANDING ENGINEERS

Since its establishment, the Xi'an University of Science and Technology has constructed two main cultivating orientations in the selection of a coal cleaning method and comprehensive mineral utilization. In 2011, against the development backdrop of one of the second batch of universities listed in the “Plan for Educating and Training Outstanding Engineers (PETOE)”, and in accordance with the related requirements of the Outstanding Plan, the leading committee on the mineral processing engineering major analyzed the insufficiency of the original teaching model, gradually implemented the preparation and exploration of the Outstanding Plan's cultivating program, and exerted a great deal of effort in constructing the educational cultivating mechanism of outstanding engineers, taking the engineering talents cultivating objective as the foundation and focusing on the cultivation of students' basic theory, skills, scientific research, engineering application and innovation, and management ability. Furthermore, in combination with the teaching practice of majors related to minerals, the Xi'an University of Science and Technology has: taken the actual engineering education as the background; taken social demand as the orientation; made full use of the university-enterprise cooperating and domestic-foreign exchange platform; mobilized all kinds of domestic and foreign resources including universities, enterprises and engineering circles; and made great efforts in improving the engineering awareness, engineering quality and engineering practice ability of students on the mineral processing major. In summary, it has explored breakthroughs in the following aspects.

3.1 *Establish a scientific feasible talents cultivating program of outstanding engineers*

The Outstanding Plan's cultivating program of the mineral processing major at undergraduate level is arranged like the cultivating model of a 4-year educational system, which uses a “3+1” coalition of universities and enterprises; a 3-year undergraduate course studying period, and a 1-year period with an

enterprise to cultivate engineering practice. The three-year course-learning period can be classified as 2 years of basic ability cultivation and a 1-year detailed professional ability cultivation. The cultivation of basic ability mainly relies on the teaching of basic courses like mathematics, physics, computing, foreign languages, management, and economics so that students learn psychology and the science of humanities. It also implements the reform of teaching content, intensifies the cultivation of basic ability, and promotes the formation of innovative methods and tools that help students think innovatively; all of these lead to students learning about the engineering profession and the frontiers of academic information, and create a solid foundation for an engineering capacity. The cultivation of professional ability training focuses on the learning process regarding mineral processing professional basic courses and professional major courses, integrates scientific research results and subject frontier knowledge into the course content, improves the quality of professional educational, and cultivates the basic quality of engineers and their proficient professional ability. The cultivation of professional practice ability provides students with a deeper knowledge of the mineral processing enterprises frontier; furthermore it makes them appreciate the importance of the engineering site, learn about the domestic and foreign mineral processing enterprises environment as well as the commercial and social environment, and learn about advanced enterprise technology, advanced ideas and advanced equipment. It also cultivates both an engineering practice ability and management operating capacity, increases their understanding about the enterprises and society and helps them adapt their knowledge to both enterprises and society.

3.2 *Cultivate a batch of teachers with an engineering and international background*

The key step to realizing the cultivation of outstanding engineers is to recruit and develop strong teaching staff with abundant experience and a high level of engineering technology. To promote the development of an outstanding engineer education, the Xi'an University of Science and Technology has formulated the principle of “cultivating and introducing university tutors and employing enterprise tutors” by using the following measures. ① Utilize the supporting policy of the High-level Talents Introduction Implementation Methods of the Xi'an University of Science and Technology. Moreover, actively introduce high-level, leading, talented teachers and young supporting teachers who have a practical engineering background. ② Take one-year and above practical enterprise experience as one of the

conditions for giving young teachers professional technical titles. ③ Allocate older teachers to guide the young teachers, perfect the cultivating system for young teachers, and help young teachers qualify for a teaching post. ④ Employ excellent and talented enterprise personnel from outside education to participate in teaching activities and professional guidance, so as to promote a steady flow of talent between the university and enterprises. On the one hand, the cooperation between university tutors and enterprise tutors can provide students with a deeper understanding of mineral enterprises so that they can master the production technology and arrangement of equipment; on the other hand, it gives students a closer contact with the engineering profession, enriches their professional knowledge and benefits future investigations and research into enterprises.

3.3 *Integrate a batch of enterprises with a consciousness of responsibility*

As the endpoint of the demand for talent, enterprises can not only provide engineering technicians with abundant experience, but can also assist with the cultivation of the engineering-type talent of colleges and universities. Based this, they can provide a point of reference in the form of jobs, which help cultivate the engineering talents of colleges and universities. Therefore, the establishment of an “Outstanding Engineer” education mechanism and the smooth development of a cultivation plan must provide full allowance for guidance from enterprises. In recent years, utilizing the advantage of their provision of a key discipline in the Shaanxi Province, the mineral processing major, the Xi'an University of Science and Technology has implemented both scientific and technological cooperation with mineral enterprises in many aspects and has jointly cultivated researchers with both enterprises and research institutes. Currently, the enterprises that are closely related to this major include Shaanxi Nonferrous Metals Holding Group Co., Ltd, Shenhua Shendong Coal Group Corporation Limited, and Ningxia Coal Industry Group. The cooperation in both training and technological development, the technological application and the familiarization of students with excellent enterprises has established a solid foundation for the formulation and implementation of the enterprise cultivating program objective of the “Outstanding Engineer Plan”.

4 CONCLUSION

Based in the Shaanxi Province and serving the Western area, the Xi'an University of Science and Technology, through an active formulation and perfection of the educating cultivating mechanism of outstanding engineers on a mineral processing major, has provided a theoretical and practical foundation for a mineral processing engineering major to comply with the Outstanding Plan. On one hand, this can improve the overall level of mineral processing technology and technological innovation ability; on the other hand, it is beneficial to cultivate the mineral experts and supporting talents with technological theory and practical experience. The strengthening of engineering drills in a mineral processing major, the cultivation of students' analyzing ability and their ability to solve engineering issues, the intensification of practical ability and innovation ability, and the eventual realization of the cultivation of talents in mineral processing and mineral comprehensive engineering technicians, will all be of great significance with regard to improving the processing of the selection of coal cleaning methods, and resolving the contradiction between supply and demand with regard to the comprehensive utilization of minerals.

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