

Establishment and Practice of Higher Educating System of Outstanding Mining Engineer

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Keywords: Outstanding Mining Engineer; Educating Plan; Collaboration between University and Enterprise; Higher Education

Abstract. Mining industry plays an important role in Chinese National Economy with more than 10 million persons serving for it, yet the quality and capacity of Chinese mining engineers has lagged far behind developed countries. In this paper based on “Plan for Educating and Training Outstanding Engineer”, according to the mining industry status and trend, the Plan for Educating and Training Outstanding Mining Engineer (PETOME) is put forward, which consists of educating objectives, educating standards, the educating plan of higher school and the enterprise plan. At the same time some questions and solutions in the practice of PETOME is claimed. Good results are achieved after PETOME practice in Shandong University of Science and Technology.

Introduction

Mining industry has been important for the world economy by providing mineral resource and energy resource for other industries and it is closely linked to people's life. According to incomplete statistics [1], the people engaged in mining engineering is more than 30 million people in the world, and the mining industry employees is more than 10 million in China. Among these persons the mining engineers are the main important technical forces, and their qualities and abilities are directly related to the level and success of the entire mining industry. The mining industry is a hard industry with high risks which needs the collaboration of many different departments. It also has many strict standards for mining engineers, such as good psychological quality, competent and adaptable to hard working environment [2]; having the basic knowledge of mining theory and method; ability to design mines; management ability of production; basic scientific research capacity; working responsible and high cooperation ability. There are many mining engineers in China, but the quality and knowledge has still lagged behind developed countries.

The Plan for Educating and Training Outstanding Engineer (PETOE) was put forward by Chinese National Education Ministry and was put into effect in 2010. It aimed at improving the engineer quality, training various types of high-quality engineers with creative capability and adaptable to meet the needs of the economic and social development, at last making China change from a big engineering education country to a powerful country. Shandong University of Science and Technology (SDUST) is one of the second admitted schools for PETOE by the Education Ministry. Guided by the main ideas of PETOE, according to the common standards of the Education Ministry [3-5] and the special standards of the mining industry, the plan for educating and training outstanding mining engineer (PETOME) is formed eventually, to training outstanding mining engineer for China.

Educating objectives and training system of PETOME

Education objectives

The objective of PETOME is to educating high-level mining engineers facing mining industry future and the world so as to meet the needs of Chinese economy development. The outstanding

mining engineers should be full developed in moral, intellectual and physical education; they should have the knowledge of the natural science and humanities, and master the basic engineering knowledge and professional knowledge of solid deposit mining (focusing on underground coal mining); they should have strong design and construction capability about mines, the basic capacity of research and development; they also have large engineering idea, consciousness of creation and innovation, the ability to acquire knowledge individually, social skills, organizational skills and international perspective.

Education requirements

The training requirements of PETOME consists of possessing the quality of loving work and working hard, good engineering professional morality, strong social responsibility and high humanistic spirit, grasping the basic theory and knowledge of mining course, mastering the theory and methods of planning and designing mines, with a strong engineering drawing and computer-aided design capability, having the basic ability of organizing production and technology management, and can be engaged in mining construction and management, knowing the new theories, new methods, new techniques, new equipments in mining engineering and the professional status and its trends, being familiar with the laws, policies and regulations about the production of solid mineral resources, design, safety, environmental protection, having the ability of obtaining modern information and professionally developing by study, having a strong ability of organization management, communication, environmental adaptability and teamwork skills, and the initial capacity in coping with crises, having a strong innovative consciousness and the initial innovating capacity, and having the initial capacity of communication, competition and cooperation in the cross-cultural environment with an international perspective.

Plan for educating and training outstanding mining engineer

PETOME is divided into four levels, which are public basic education, discipline-based education, professional education and enterprise engineering practice, with center for educating practice ability and innovation. According to PETOME it is four years to train outstanding engineer in the undergraduate time, using the "3+1" educating model. During four years, it is three years to study and accept training in school, and it is one year to design and practice in the mine. The college developed educating program related to the stage of three years in school; the enterprise and school made the training program of practice and graduation design in the enterprise for a one-year time. Figure 1 shows the detail composition of four-year program.

Building of school training program

The school educating program of PETOME is divided into three levels which are public basic education, basic education of mining engineering and professional education of mining engineering, in order to make the students master humanities, social and natural science, basic engineering knowledge, specialized knowledge, skills and capacities in mining engineering.

According to the common requirements of engineering personnel training and the demands of training social talents with high quality, in order to lay a foundation of promoting Quality Education, the public basic education consists of two modules: integrated foundation and basic skills. The module of integrated foundation includes ideological and political courses, physical education course, military courses and practice, the humanities and arts, social sciences, natural sciences courses. In the module of basic skills, the main courses are foreign language, advanced mathematics, physics and computer courses etc.

The objective of basic education of mining engineering is to make the students possess the basic knowledge and ability of natural science and corresponding theories. It includes four modules: engineering mathematics, solid mechanics, machinery electronics, and geology and survey.

The professional education of mining engineering is divided into two modules which are the general mining knowledge and characteristic courses according to the teaching advantages of SDUST. The general courses consist of "coal mining science", "shaft and roadway engineering", "mining pressure and strata control", "mine ventilation and safety", mining machinery and hydraulic transmission", "mine design", "mine transportation and hoisting" and so on.

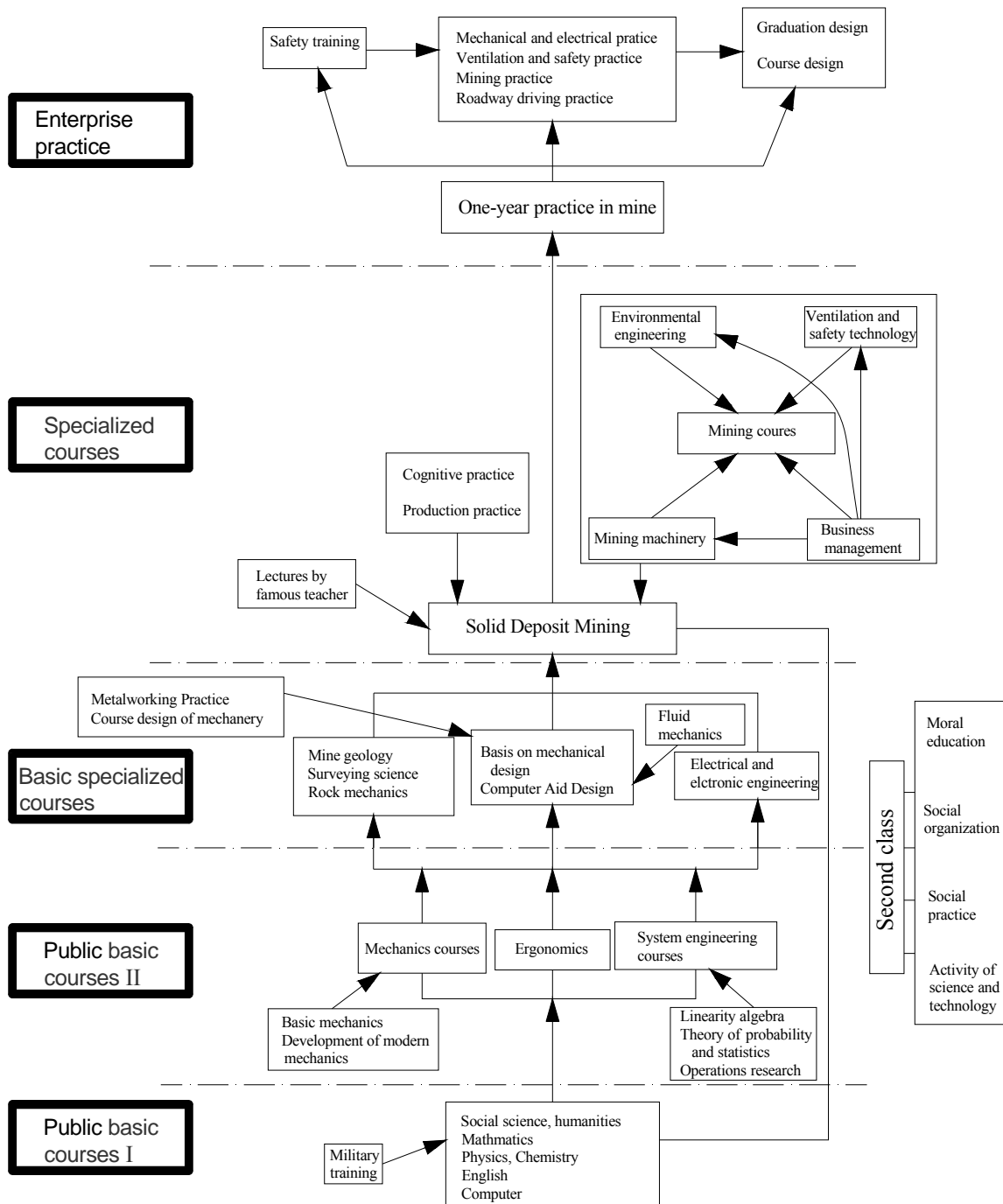


Fig.1 Detail composition of the four-year undergraduate program in PETOME

Construction of school-enterprise training program

Based on training the ability of theory application and engineering practice, training the ability of mine design, construction and management as the center, the school-enterprise training program of PETOME is divided into three levels: the enterprise engineering education, the professional characteristics practice and the mining design. In the training program the applied engineering course training, the special subject of mining engineering, enterprise practices and the integrated mine design is emphasized, so as to make students have interest on study theoretical knowledge, increase the ability of engineering analysis, solving practical problems and innovating in the field of mining engineering gradually and systematically.

During the practice in the enterprise, we should pay more attention to the capacities and qualities such as being adaptable of enterprise environment with various interpersonal relationship and hard work conditions, the basic ability of teamwork, competition and cooperation, respect for partners, respect for competitors; we should make students master the knowledge of major occupational

health and safety, environmental laws and the mine standards; we should make the student master the knowledge of professional ethics, obey the principle of professional behavior, be responsible for the job and accomplish their duties with all heart.

Problems and solution of outstanding mining engineering engineer education

Although PETOME has achieved expected results after the practice of several years, as a new teaching model it is faced with some questions and needs to further study and solute. The main problems and solution methods are as following.

It is impossible to make a college student become an outstanding engineer in the four-year undergraduate education, and it needs a longer time, especially the field practice of 4~5 years. Be impatient for educating outstanding mining engineer.

The outstanding engineer is not equal to the chief engineer, and vice versa. The technical director in each department of mine may become an outstanding mining engineer.

The teacher team with “double division of type” should be built. Most teachers in the enterprise have rich engineering experience, but are not good at teaching. Teachers in high school are not good at production, and the engineering experience is relatively poor. So teachers for outstanding mining engineer should be trained by the enterprise and high school, and should become a stable team.

During the period of undergraduate, the excellent student should not have only a year of practice earlier than the common student, but also should be higher than the average student. It is difficult to graduate for students participating PETOME, because they must achieve good scores, good results of science and design, and have excellent capacity and skills.

Conclusion

On the background of the rapid development of mining industry and shortages of high-level mining engineer, by summarizing the experience and shortage in the process of cultivating undergraduate, through discussion by professional teachers, technicians and industry experts, PETOME is made by SDUST and mining enterprises at last. PETOME has clear educating objectives, detail training standards and feasible programs. It takes a firm step for developing outstanding mining engineers. PETOME has been put into practice since 2010 in SDUST, and the initial good results are obtained.

Acknowledgement

This paper is supported by China Natural Science Fund (51104093), 2010 education and teaching research fund “Stars Plan” (qx104004) of SDUST.

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