Optimization and Practice of Talent Cultivation Scheme of "Regression Project" in Mining Engineering Specialty

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Abstract. In view of the problems that the training system of domestic mining engineering specialty is prevalent in the past for a long period of time, there are many problems such as lack of talent cultivation, lack of academic tendency, lack of teacher engineering and weak practice. Jiangxi University of Science and Technology learn from the domestic industry in the field of top institutions of high-end disciplines development concept and application-oriented undergraduate, vocational education orientation of personnel training ideas, through the construction of "school-based-the participation of the mine" and the "theoretical study - engineering practice - innovation and development" of the integrated curriculum platform, including the curriculum system, teaching content, practice, teaching operation, teaching materials, teacher training and management mechanisms All-round reform, carried out a diversified, cross-scale practice of exploration and innovation, formed a set of more complete and the implementation of the effect of improving the mining project compound talent training program. The effect of the implementation in recent years shows that the smooth implementation of the scheme can help the mining engineering graduates to complete the rapid transformation of the mining technology compound talents under the new situation and help to realize the training objectives of the outstanding engineers.

Keywords: Mining engineering · Talent training program
Excellent engineer training program · Engineering education certification
Innovation practice

1 Introduction

In recent years, with the continuous improvement of production technology and equipment level, safety and environmental protection requirements in the mining field, the employers' requirements for the quality of mining engineering technical personnel training are also rising. Mining engineering professional culture in foreign universities has greatly changed a lot over the past decade, the teaching content of the mining engineering design is in close contact with the demand of mining industry, emphasizes that mining enterprises participate in the university education [1, 2], the design of each course is formed by the unofficial contact between school teachers and mining colleagues. In the process of training, foreign universities attach great importance to the

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cultivation of students' engineering practice ability [3], and take the mining enterprises participating in higher education as important means to improve the comprehensive ability of graduates of mining engineering. However, in the domestic mining engineering training system there has been prevalent problems including single talent training mode, lack of industry adaptability and serious academic tendency, engineering deficiency of teaching staff and weak practice link for a long period of time in the past, which is difficult to adapt to the demand of mining enterprises for mining engineering and technical personnel in the new situation [4–6].

Jiangxi University of Science and Technology mining engineering was established in 1958, after steeling itself for more than half a century gradually it has established national specialties with certain influence in the industry and geographical advantages, it passed the first batch National Accreditation of engineering education among the mining industry, was approved the "excellent engineer training program". As for how to develop and improve program of mining engineering in the new situation, how to improve the necessary supplement during undergraduate teaching process according to the needs of the construction industry talent market professional knowledge system and comprehensive quality training module, Jiangxi University of Science and Technology explore the practice and innovation of diversification and cross scale, it absorbed the high-end development idea from top universities in the industry including China University of Mining and Technology, Northeastern University and other universities, at the same time it referred to application type undergraduate with distinctive characteristics in this industry, discipline development of the concept of high-end, training idea of vocational college oriented talents [7], it has formed a set of training program of compound talents which was complete and of which the implementation effect has been improved obviously.

2 Goal and Significance

2.1 Overall Goal

Adopt the means of 'three the same time' including the enterprise experts participate in the talent training program revision at the same time, participating in the theory and practice of teaching at the same time and participate in the mechanism of target evaluation management at the same time, through revising the training plan, innovating training model, optimizing the curriculum, updating the curriculum system, refining teaching contents and methods, strengthening practice, strengthening enterprise participation, realize the goal of making return project as the core, enhancing mining engineering majors' practice and manipulative ability, cultivating innovative and creative ability adopt the means of 'three the same time' including the enterprise experts participate in the talent training program revision at the same time, participating in the theory and practice of teaching at the same time and participate in the mechanism of target evaluation management at the same time, through revising the training plan, innovating training model, optimizing the curriculum, updating the curriculum system, refining teaching contents and methods, strengthening practice, strengthening enterprise participation,

realize the goal of making return project as the core, enhancing mining engineering majors' practice and manipulative ability, cultivating innovative and creative ability.

2.2 Implementation Significance

Optimization of professional training in Jiangxi University of Science and Technology mining engineering is based on a series of national teaching guidelines including the national engineering education accreditation, outstanding engineers training program, training plan and based on a practical exploration of training mechanism to change their educational ideas and innovating talents training mechanism. The smooth implementation of the scheme will help solve the mining engineering majors' problem of gap between basic theory study and industry application practice, and effectively improve the students' ability of engineering practice and innovative ability, enable them to be familiar with geological background of the working area, technical links including ore types, metallogenic mechanism, investment and development of mining, mining enterprises construction, mining process, quickly access to the enterprise technical personnel role, help mining engineering graduates to transform into compound mining engineering technology talents in the new situation.

3 Optimizing Contents of Talent Training Scheme

3.1 The Professional Training Goal

With the engineering education concept of 'face engineering, face the world, face the future', guided by the national economy and mining demand, cultivate mining engineering professional engineering and technical personnel with good humanistic moral quality, have the strong team cooperation ability, master mining engineering related basic theory, able to analyze professional theory and use knowledge to deal with practical problems, have ability of mining engineering project construction and operation practice, have strong innovation ability, good ability of interpersonal communication and organization, international competition ability, social service consciousness and entrepreneurial acumen.

3.2 Achievement Index of Personnel Training

Implement the optimized talent training program, the graduates of mining engineering should have the following knowledge and ability:

(1) Have higher quality of Humanities and Social Sciences, sense of social responsibility and professional ethics of mining engineering;
(2) Master the relevant basic knowledge of natural science and rich knowledge of economic management in mining engineering;
(3) Have the basic theory knowledge of mining engineering basic knowledge and mining engineering basic theories, master mining geology, mechanical mine, safe mining related basic theory and basic methods in the design of nonferrous metal mines and know the development status and trend of mining engineering;

(4) Have the basic ability of flexible application of professional theoretical knowledge and technical means to analyze and deal with practical problems in mining engineering;
(5) Familiar with the basic methods of literature retrieval, information retrieval and use of modern information technology to obtain professional knowledge;
(6) Have the ability to develop, research and design new technology, new technique and new equipment for mining engineering, and have a strong sense of innovation and entrepreneurship;
(7) Be familiar with laws and regulations covering design, production, operation and research of the mining engineering related fields, understand the general and specific policy of national and regional environmental protection, green mining and sustainable development, able to scientifically understand mining engineering field's position in the global economic and social development;
(8) Have strong interpersonal skill, language ability, organizational management ability and certain potential to be core backbone of the team;
(9) Have the correct attitude and career planning ability of lifelong learning and self sustainable development;
(10) Have a certain international vision and multi-cultural communication and cooperation ability.

4 Personnel Training Scheme

The basic idea of optimizing the mode of talent training: with national development, market demand as the goal, cultivating students' ability as the basis, combine highlighting scientific research with teaching, strengthen the link of practice teaching, carry out integrated teaching combined by 'produce, study and research'.

4.1 Training Mode

Use "three plus one" training mode for modular teaching which means learn the school public basic courses and professional basic courses for three years, learn and practice in the cooperative practice base or mining enterprise for one year. The technical and managerial personnel of mining enterprise fully penetrate the training process of students, collective sixth semesters and eighth semesters arranged are one academic year in total. During this period, students must participate with plan in the planning, design, construction, management, acceptance and all production links of the mining enterprise' process of project, and collect relevant technical data to complete the graduation project. The main practice links designed and independently set up by every core course 'base + professional + innovation' (practice inside and outside school are included) are in accordance with the 'Curriculum Guide + project driven' training mode, which means to choose the typical project cases suitable for teaching in mining enterprise cooperated and teachers' scientific research project. Use laboratory equipments which are similar to the engineering design, keep the teaching content and field engineering remain basically the same, enable students to quickly adapt to the identity of mining

engineering technician, so as to shorten the probationary period, help to realize the goal of cultivating outstanding mining engineers.

4.2 Culture Method

Based on the 'three plus one' talent training mode, schools, mining enterprise continue to improve according to the dynamic demand of talents in the industry and the development trend of industry front end irregular personnel training program. In order to fully exercise the students' fieldwork and application ability, cultivate students' innovation consciousness and design ideas, the first two weeks during the summer of the fourth semester was for the cognitive visiting practice in the mining enterprise, enable the students to understand the nature of this profession, arouse the enthusiasm of students. And require the students to complete credit of the relevant curriculum modules prescribed by the training program in Jiangxi University of Science and Technology and mining enterprise the first seven semesters, in the last semester study and practice in the mining enterprise, and complete the graduation project.

The last term is set as the enterprise learning stage, implement double tutor system, each student is assigned a school instructor and business practice instructor, both of them are responsible for the whole process of the students training in the eighth semester, students learn specific enterprise training plan is set by two instructors after discussing, two teachers guide the students to complete the double coordination of graduation design.

According to the characteristics of mining engineering and the actual situation of mining enterprises, the whole practice module carries out teaching through the combination of centralization and decentralization. Enterprise learning stage mainly covers three aspects of learning content:

(1) Enterprise training. Contains the history and culture of mining enterprises, safety rules and regulations of education, mining and production process, the stope and practice work team, this part is mainly handled by mine human resources departments and enterprises mentor, school tutor participate in assessment and stage effect evaluation;
(2) Experiment and practice of specialized courses. This part of content is usually jointly implemented by the school teachers and the mining enterprise technical personnel, the purpose is to make part of the classroom practice content reproduce in the project site, deepen the understanding of students;
(3) Professional practice training. Including production practice, course design, graduation practice and graduation design, this part is mainly implemented by tutor of mining enterprise, the school instructor is responsible for tracking management and participate in the evaluation of final effect. Professional practice training is systematic learning of the related professional knowledge needed by specific mine production, and through the curriculum design, practice report and graduation design report and other assessment methods, train students to comprehensively use the knowledge they have learnt to solve practical problems in mining engineering, lay a good foundation for the subsequent occupation career development.

5 Implementation Effect

The experiment and practice teaching system in this training program makes training practical and innovative talents as its goal, closely combines theoretical teaching, experimental teaching and practice teaching, attaches great importance to the cultivation of students' innovation and practical ability. Emphasize overall planning and coordination arrangement of theory teaching and practice teaching, give full play to the advantages of experimental and practical feature of professional teaching, and comprehensively improve the level and quality of experimental and practical teaching, perform multi-level experiments and teaching and practice, construct experimental and practical teaching system built by the basic experimental platform, engineering practice and research platform, innovation platform (Fig. 1).

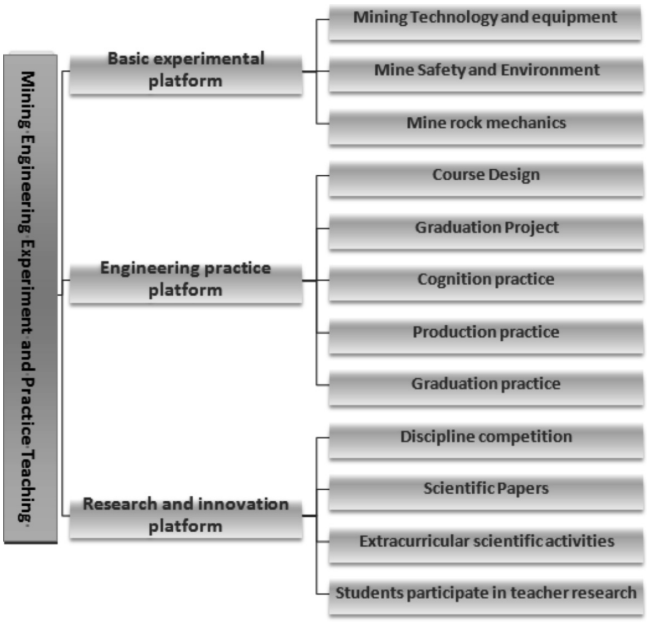

Fig. 1. Mining engineer experiment and practical teaching system

Professional personnel training program of mining engineering includes three major types of experimental and practical projects and integrate the experimental and practical teaching with scientific research. The implementation of projects such as "undergraduate tutorial system", "innovation and entrepreneurship training program for college students", "extracurricular science and technology competition for college students", "Research assistant program for college students" enable it possible to closely link the undergraduate experiments and practical teaching with scientific research. The program established experimental and practice project type of three levels of basic experiment (including demonstration experiment, verification experiment),

engineering practice and research innovation, which emphasizes the proportion of fundamental, designing and innovative experimental practice.

In recent years, the application of mining engineering disciplines has led to achievements in scientific research, improvements in scientific research and experimental level of practical teaching as well as the introduction of advanced scientific research into experimental and practical teaching. For example, the self-developed "airflow meter correction instrument" is used for the mine ventilation, various types of airflow meter calibration in dust test courses, "The multi-point displacement meter of the surrounding rock" is used for the experiments in geotechnical engineering courses, "continuous monitoring instrument of intelligent acoustic emission " is used for the experiments of rock and soil stability monitoring in the laboratory, all these help to achieve a good experimental and practical teaching effect. The experimental teaching equipment is connected with the research equipment and scientific research equipment is accessible to undergraduate students, thus, the experimental teaching can be conducted in a smooth way and students can broaden their horizons. Through the implementation of projects of "undergraduate tutorial system", "extracurricular science and technology competition for college students" and other projects, students are encouraged to participate in scientific research projects, and their creative thinking and practical ability will be improved.

Mining engineering follows the development concept of "the interaction between school and business", actively make cooperation in running schools with large and medium-sized enterprises of high technological level and advanced equipment, and establish a long-term cooperative relations with Jiangxi Copper industry. In addition, it also built the long-term stable internship base. Mining engineering turns the problems after being handled and sublimated in the engineering practice into practical teaching project. It employs technical staff with practical experience as part-time teachers from the enterprise to explain the solutions of practical problems, to help widen students thought and improve their interests in learning. It combines the professional designed experiments and innovative special subject experiments with the actual production and technological innovation of the enterprises.

Mining engineering tries to set up a comprehensive professional practice courses to improve students' practical ability and innovative consciousness. The implementation goal of training plan for the excellent engineer fully considers the cultivation of the students' practice and innovation ability. The course of one credit is arranged at the end of the 6th semester. After completing the main course, the rest of courses is mainly student-oriented and provides special practice venues, the assessment method is submit their innovative practice works, the course requires the participation of all professional teachers, students are divided into 20 innovative practice groups with one instructor and five or six students in each group. Students are asked to submit practical works within one week. The contents of works are as follows:

Physical works: According to a mine, building the whole or part of the physical model (such as the development systems, ventilation systems, lifting systems, filling systems, water supply and drainage systems, mining methods, mining equipment, etc.) The specification of physical model should be submitted.

Digital works: Building a whole or a part of the digital model through the application of computer software, digital documents, brochures and paper printing materials should be provided.

Learning works: DV works of mining, mining animation, learning courseware, websites and other works. CD-ROM materials are required to be submitted.

By the end of the course, the professional assessment team will make evaluation and classification for students' entries, the evaluation level is divided into four categories excellent, good, qualified and unqualified. Then the assessment team shall recommend excellent works to participate in the professional practice contest national mining engineering.

6 Conclusion

The optimization of personnel training program of "returning project" is different from the previous personnel training model, teaching system and management mechanism. It is not just a simple three-year theory study at school and a year of practice of mining enterprise engineering, but according to national teaching reform of engineering education certification and excellent engineer education and training programs to grasp the overall construction goals. The program requires not only spending more time in the mining engineering practice, more importantly, integrate the concept of engineering education into the teaching system in mining engineering of undergraduate and carry it out in every aspect and process of professional teaching. Through the construction integrated curriculum platform joint personnel training mechanism of "school-based-with mine' participation" and "theoretical study-engineering practice-innovation and development", conducting all-round reforms including the curriculum system, teaching content, practice, teaching operation, teaching materials building, teachers training and management mechanism and nurturing the complex, applied talents with team spirit, innovation awareness and engineering capacity.

Cultivating graduates that meets the engineering and industry needs according to the optimized talent training program serves not only the nonferrous metals industry but also the local economic development. Personnel training actively adapts to the development needs of local industry, cultivate the quality of graduates that towards the grass-roots level, the practice and the project line and develop talents who are of solid foundation, practical and honest attitude. These talents are not only widely favored and put into an important position. Many of them has become executives and business backbone of enterprises. According to incomplete statistics, in recent five years, the proportion of graduates who chose to work in the local economic construction and non-ferrous industry as their first job has reached 94% in average. At least 10% of graduates have become middle-level cadres within five years.

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