International Bilingual Education Reform and Practice of Mining Engineering under “One Belt and One Road Initiative”

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Abstract. As the advance of the "One Belt and One Road Initiative", the mining industry in China has been provided with great opportunity to acquire rapid and globalized development, along with new challenges. In light of the problems in the internationalized mining engineering education, such as late start-up, weak foundation, lack of sources and urgent needs, the curriculum system, teaching materials, implementation and evaluation are analyzed. Then it is suggested that internationalized mining engineering education should establish international course system, explore training approach and training staff on the basis of bilingual education. For the purpose of cultivating technical and managerial talents under the perspective of Big Engineering Concept, comprehensive and international viewpoint are further studied. Through the "inviting-in and stepping-out" strategy, the reform combine the bilingual and professional training in a multilevel, multidimensional and progressive way. It can be concluded that the bilingual education may come into play as linguistic medium, global perspective and communication bridge for the advance of mining enterprise globalization. The current study may provide sound reference and foundation for the further development of mining engineering internationalization.

Introduction

In 2018, there were several international transactions in mining industry: Zijin Mine acquired Nevsun, a Canadian mining company; Luoyang Molybdenum Industry acquired NSRC; Shandong Gold and Brick Gold Company bought shares from each other, and Chifeng Gold Mine acquired Laos Copper and Gold Mine[1]. With the promotion of the globalization initiative of "one belt and one road", China's mining globalization momentum has also brought about a deep impact on the development of mining industry[2]. First, the international flow of mining engineering technicians has become normal, and the global vision and ability have become the basic requirements of mining industry practitioners. Second, the internationalization of mining engineering education has become an urgent task. The scope of the countries along the route has increased exponentially, and the internationalization of mining engineering education is also in the forefront, providing support for the global mining industry.

Inheriting the engineering education model of the former Soviet Union and combining with the needs of social and economic development in China, a unique mining engineering education system in China has been formed. There are some differences between the curriculum system and the engineering education system in certain European and American countries. In addition, different language systems in Chinese and foreign education result in insufficient international vision and poor international communication ability for the students in China. The standards of mining design, mining process and mining management methods are far from the international standards and regulations. Objectively, it restricts the pace of internationalization of China's mining enterprises, leading to many detours, losses and heavy costs in the process of internationalization of China's mining enterprises.
Existing Problems in the Internationalization of Mining Engineering Education

Lack of Systematization and Planning in Curriculum System

The original intention of bilingual teaching is to use mother and foreign languages to systematically study the knowledge and skills in a certain professional field, and to use two languages to realize free switching between different modes of thinking. At present, most mining universities regard bilingual teaching as a supplementary or parallel course for professional courses, which is positioned as an extension of general English or an independent professional English course. This kind of curriculum lacks the coherence and continuity in the professional learning system. It only aims at language learning and ignores the study of professional knowledge. As a result, the teaching effect of bilingual mining courses is often unsatisfactory. Therefore, in the process of internationalization teaching of mining engineering, we should aim at the training goal of internationalized talents, proceed from the top structure of the training system, aim at the compulsory and optional contents of professional knowledge and bilingual demonstration, and meet the transition and cohesion of courses at all levels.

The Inadequate Applicability of Curriculum Resources

The lack of internationalized curriculum resources and teaching-aiding approaches is an important reason for restricting the internationalization of mining education in China. In the process of internationalization, there are some difference between the original textbooks of similar courses abroad or the teaching materials which are integrated in the form of English-Chinese translation of foreign documents and the textbooks formed by translating Chinese textbooks into English. Also there is gap concerning the educational background, the training mode of students and the mining theories at home and abroad. As a result, the applicability and effectiveness of current curriculum resources are poor. Therefore, the selection and application of bilingual textbooks, exercises and reference materials should be discussed in the construction of bilingual curriculum resources.

Inadequate Teaching Skills for Internationalized Teachers

Teaching of mining engineering under global context has always been difficult to achieve both ends\[3\]. On the one hand, teachers with strong professional foundation have poor international communication ability and insufficient international vision; on the other hand, foreign language teachers have rich experience in international communication, but their professional knowledge is not systematic and specialized. Therefore, there is a lack of teachers who can not only manage international exchanges, but also know the professional framework in teaching, which directly affects the design and implementation of international mining teaching. Then it is necessary to improve the selection and training mechanism and assessment system in the process of internationalization of mining industry so as to ensure the qualifications of the major teachers.

The Lack of Scientificity in Curriculum Evaluation

The course of mining engineering in China is divided into examination-oriented course and evaluation-oriented course. Examination-oriented courses are credited with different weights on the basis of daily performance, mid-term performance and final exam performance. Evaluation-oriented courses are assessed in the form of papers, assignments or interviews, oral examinations, and so on. Comparing with the international comprehensive assessment mode, the final and fixed assessment mode in China can only examine the teaching results from the aspects of knowledge point mastery, which cannot truly reflect the students' control and application ability of mining professional skills, and lacks the dynamic feedback mechanism of teaching process. Therefore, the construction of the course evaluation system for the internationalization of mining industry should establish dynamic evaluation criteria, methods and feedback mechanism, and build assessment system to reflect the effect of teaching objectives.
Approaches to Internationalized Teaching Reform of Mining Engineering

The training plan for outstanding engineers puts forward higher requirements for the internationalization of mining engineering education. It aims to transform our country from a big country of engineering education to a powerful country of engineering education. It bridges between training of domestic mining talents and international mining talents to meet the needs of national strategies and industrial enterprises, and promotes students' engineering practice ability, innovation and international competitiveness. Bilingual teaching is an important means in the process of internationalization of mining engineering education, and it is the guarantee and foundation of promoting the construction of internationalization of mining engineering. Bilingual courses are offered in domestic mining engineering universities such as Northeast University, China University of Mining and Technology, Beijing University of Science and Technology and Central South University. Compared with other majors, bilingual teaching of mining engineering has some problems, such as late start, weak foundation, less resources and urgent needs. Therefore, bilingual teaching is the basis of international teaching in mining engineering.

Construction of Bilingual Curriculum System for International Mining Engineering

In the international curriculum design of mining engineering, we must grasp three research initiatives of deep mining, green mining and intelligent mining, command solid professional knowledge and practical ability training of outstanding engineers in the education and training plan, apply theories to engineering practice, strengthen engineering consciousness, reshape the spirit of craftsmen and cultivate engineering ethics. The goal of talent cultivation should be changed from subject-oriented to industrial development needs; talent cultivation should be changed from single elite and specialized talents to general and compound talents in terms of interdisciplinary aspect; and the way of running schools should be changed from closed to open system. The bilingual teaching of international mining engineering, the popularization of new knowledge, new technology and new methods in mining field realized by foreign languages, and the cultivation of new engineering talents with Chinese characteristics may resort to integrating advanced concepts. To follow the rules of language learning and cultivate practical ability, systematic scientific planning and multi-dimensional practice may come into play.

International Curriculum Design of Bilingual Mining Teaching

It is suggested to convert the traditional courses to the multilevel progressive curriculum design mode with fundamental courses for general purpose, professional basic courses and professional skill courses. Bilingual course in mining industry is no longer an auxiliary means or an extension of professional courses for Chinese majors. In the overall planning, we should emphasize the cultivation of comprehensive abilities such as language learning, language application, global thinking mode and professional knowledge command. A great variety of approaches may be employed to strengthen the practical ability, interdisciplinary ability and the potential of innovation and entrepreneurship in talent cultivation, and to ultimately achieve multi-level and multi-dimensional integration of professional foreign languages into professional teaching modules. From undergraduate to doctoral degree curriculum, general purpose English courses are offered for freshmen and sophomores with the main purpose of mastering core vocabulary; bilingual courses are offered for junior students, with emphasis on terminology and sentence patterns associated with the main courses; bilingual courses for senior students should cover core modules of mining industry. For graduate students in Grade 1 and Grade 2, reading and elementary translation training should be promoted to acquire patterns of mining professional papers; and the graduate students from Grade 3 to Ph.D. should gradually improve the writing of professional foreign language papers and foreign language thinking mode. At the implementation of all bilingual courses, professional listening and speaking training should be carried out by means of modern educational technology to achieve a balanced development of foreign language input and output. The following figure shows the combination mode between bilingual education and professional modules.
**International Bilingual Teaching Approach**

The channels of running an international university for mining engineering should integrate government, industry, enterprise and school, build an educational community of cooperation and mutual assistance and coexistence of interests, make up for the shortcomings of the existing mode of running a school, and conduct reform in personnel training objectives, training programs, teaching standards, practical approaches, assessment models, employment quality and transmission of information at all levels. To begin with, in light of the core areas of international competition, the main trends of domestic development and the needs of industrial upgrading, the training plan of mining talents is gathered, and the teaching module and skill levels are formulated according to the employment standards of industries and enterprises. With the due principles of education, foreign languages should be used as the media to create compound talents of mining industry. Furthermore, the cognitive training, social practice, scientific research experiment, production practice and entrepreneurship should be completed by using the teaching mode of school-enterprise cooperation, digital technology and engineering practice on the bilingual basis. Finally, international cooperation and joint training at home and abroad should be extensively carried out to directly improve students' international horizon and pattern. At the same time, the professional norms, professional ethics and emotional elements should be cultivated for professional performance.

**Construction of Bilingual Teaching Resources for Mining Engineering Internationalization**

In the construction of teaching resources, we should give full play the functions of the Committee of the Ministry of Education, establish teaching cooperative groups among universities offering relevant bilingual courses, integrate government, industry and enterprises, and jointly build an international orientation with Chinese characteristics. At the same time, according to China's resource distribution, resource types, regional characteristics, and mining development planning, we should screen the information that can be absorbed in foreign teaching materials, so as to achieve a critical application of foreign patterns. Finally, the current cases of major projects and recent achievements of scientific researches are integrated into practical teaching, so as to further optimize the teaching resources of domestic mining engineering.

In terms of teaching methods and strategies, with the rapid development of information technology, as well as the wide application of artificial intelligence and virtual reality, augmented reality and hybrid reality, the breadth of knowledge acceptance has been increased and the difficulty of knowledge acceptance has been reduced. Therefore, the bilingual courses of mining industry need to realize real-time interaction and teaching feedback by means of digitized and intelligent modern technology so as to reduce the cost of place, personnel and materials for practical teaching. At the same time, we can disperse professional knowledge and skills by means of virtual learning community, micro class and Mooc class. To realize the teaching mode of independent interaction, real-time feedback and multi-participation, it is suggested to integrate the interdisciplinary framework according to the professional work flow, and to accomplish the goal of comprehensive training of mining engineering talents in science, engineering and humanities.
Bilingual Teaching Staff Training for Internationalized Mining Engineering

According to the requirements of international bilingual teaching, the bilingual teaching staff of mining engineering has been systematically trained. First, we should change the orientation of curriculum, re-identify the needs of internationalized talents from the perspective of the overall awareness of personnel training. Bilingual teaching should be assigned scientifically at all levels of curriculum, which is an advanced parallel course in professional skills training. Teachers should have a specific purpose in both design mode and teaching methods. Secondly, we should integrate the community of teachers, improve teachers' professional background and language use ability, and encourage teachers to upgrade interdisciplinary teaching pattern through education, training and self-study. Employing industrial experts, enterprise engineers and full-time and part-time teachers to form a "multi-mentor" training mechanism. Furthermore, in the process of teaching, teachers should change their roles, provide guidance, assistance and suggestions for learners, become equal learning community, and promote learning autonomy, interaction and enthusiasm.

Comprehensive Bilingual Evaluation System of Internalized Mining Engineering

Under the demand of the global advance of mining industry, the assessment model should not follow the original mode, which focuses on the final assessment and separates the professional assessment from the foreign language assessment. First of all, we should take the international certification standards of mining engineering as a reference, and formulate the tracking process and stage assessment standards according to the momentum of major orientation. At the same time, using modern educational technology and teaching platform to achieve real-time interaction and teaching effect tracking feedback. It may not only meet the needs of students' personalized development of education, but also can systematically plan the process of assessment. Secondly, according to the content of the internship, real case analysis is added to the assessment, and more open topics are set to encourage students to cultivate innovative and creative abilities. Finally, on the basis of bilingual teaching design, the ability of using foreign languages for professional communication and solving professional problems is mainly examined according to the objectives for certain phase[6].

Summary

"The one belt and one road initiative" has brought opportunities and challenges to the development of mining industry. The internationalization of mining engineering education is the foundation and important support for the internationalization of mining enterprises in China. However, there are shortcomings and threats in the current international construction of mining engineering in the aspects of teaching system, curriculum design, teaching mode and evaluation pattern.

It is applicable to establish a comprehensive training model from undergraduate to doctoral learners. At the implementation stage of all bilingual courses, professional listening and speaking training should be carried out by means of modern educational technology to achieve a balanced development of foreign language input and output.

Training outlines for international mining engineering, internationalized curriculum system, teaching resources and teachers with international vision are important approaches to comprehensively improve the internationalization of mining engineering in China. The domestic mining engineering should go in line with the trend. Through the conduct of international joint training, the establishment of foreign practice bases, the "inviting-in and stepping-out" approach and other talent strategies, the international construction of mining engineering can be achieved.

References


