

Exploration on the Construction Reform of Geology Specialty with Deep Integration of Artificial Intelligence under the New Engineering Background

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Abstract: Under the background of the construction of new engineering and the rapid development of artificial intelligence, the traditional talent training mode of geological specialty has been difficult to adapt to the needs of social development, and geological colleges and universities should timely reform and explore the construction of geological specialty. Guangdong University of Petrochemical Technology has carried out reform and exploration in the construction of geology majors, emphasizing the talent cultivation concept of "student-centered, result-oriented and demand-oriented, focusing on the cultivation of the ability to solve complex engineering geology, and aiming at improving the ability to innovate and practice". Focus on curriculum system reform "multidisciplinary cross, diversity training," prominent "actively guide, according to their aptitude" teaching mode, strengthen the practice teaching of "linkage between colleges, in order to promote teaching", the quality of teaching monitoring emphasis on "effect of businesses to participate in the teaching process, management and the whole process of", realize to improve the talent training quality.

1. Background

The 19th National Congress pointed out that the principal contradiction facing Chinese society has evolved into one between unbalanced and inadequate development and the people's ever-growing needs for a better life. Under the background of new era, the development of geological industry also faces new situation and challenge, on the one hand, the conventional mineral reserves increase, the global commodity market supply exceeds demand, national and social capital's devotion to conventional mineral exploration is reducing year by year, need from traditional extensive geological industry, mining and energy, promoting green, circulation, low carbon development; On the other hand, with the continuous progress of the central supply-side structural reform and the high emphasis on ecological civilization, the deep integration of

geological industry with urban and rural development, Marine development, information network and livelihood construction will be promoted. Deep earth exploration, unconventional energy exploration, Marine mineral resources exploration, regional environmental resources evaluation, new agricultural development services, major engineering construction services, new material mineral resources exploration and other services are quietly emerging, hydraulic geology, urban geology, agricultural geology and tourism geology ushered in a broad space for development. As the main position of geological talent training, geological colleges and universities should carry out bold reform and innovation in specialty construction and talent training at the right time [1-3].

In recent years, under the background of the Ministry of Education vigorously promoting the construction of "New engineering" and "Artificial Intelligence Innovation Action Plan for Colleges and Universities", domestic colleges and universities have adjusted their talent training programs to meet the needs of higher education talents training in the new era of education power [4-6]. To optimize the construction of disciplines, promote characteristics and advantages, guangdong institute of petrochemical college of petroleum engineering for the construction of high level science and engineering college of guangdong province, to have been built in geological specialty "resource exploration engineering" to try to carry out under the background of "new engineering" + "artificial intelligence" professional construction. The overall reform objectives are reflected in the following four aspects:

(1) To explore the establishment of colleges and university-oriented specialty -- industry union, focusing on applied teaching and engineering object oriented application-oriented talent training mode.

(2) Form a high-level teaching team integrating geological engineering with artificial intelligence and big data computing

(3) Construct a curriculum system of "applied theory" teaching and "geological engineering object oriented" practice teaching, and complete the construction of appropriate professional courses and teaching resources.

(4) Complete the overall optimization of all teaching links and teaching management through the reform of teaching methods, practical teaching, evaluation system and teaching management on the principle of standardization, scientization and operationalization.

2. Problems in Traditional Geology Specialty Education and Teaching

Domestic geological colleges and universities have trained a large number of talents for the development of China's geological industry. However, with the change of The Times, the traditional education and teaching concept and talent training mode are difficult to adapt to the development of The Times, and some new problems appear.

(1) The traditional talent training concept does not meet the needs of the industry

The traditional talent training concept of geology majors lays too much emphasis on theoretical teaching [7]. In the national economic construction, the geological industry is faced with more engineering geology problems, and the students trained by colleges and universities cannot keep up with the talent training concept of "demand-oriented", resulting in insufficient talent innovation.

(2) The traditional curriculum system teaching model does not meet the needs of the industry

The curriculum system of traditional geology majors is too single and does not pay enough attention to interdisciplinary courses and diversified ability cultivation of students [8]. In particular, the rapid development of "artificial intelligence" in the new era is not fully reflected in the current curriculum system of talent cultivation.

(3) The traditional teaching practice platform does not meet the needs of the industry

The practice platform of traditional geology majors is more confined to the field geological

practice [9], which is insufficient for the combination and application of modern information technology and methods and serious decoupling from geological enterprises. As a result, it is difficult for graduates to quickly get into the state and adapt to the working mode and mode of enterprises.

(4) The traditional teaching quality control system does not meet the needs of the industry

The traditional teaching quality monitoring system of geology majors does not pay enough attention to the teaching process and objective evaluation mechanism of teaching quality [10], and geological enterprises, brother universities and the public are less involved, which also leads to the difficulty of student training quality to meet the needs of the industry and society.

3. Exploration of Geological Specialty Construction under the New Engineering Background

3.1 Reform of Talent Training Mode

Geological majors should boldly try new talent training mode in order to meet the needs of interdisciplinary talents in geological field in the new era.

Specifically, the "2+1+1" training mode is adopted, in which 2 years are mainly for general education courses and professional basic theory courses of Earth science, 1 year is for the cultivation of geological professional knowledge and ability, and 1 year is for the classified cultivation of professional direction.

There are more than 400 geological enterprises and institutions in Guangdong Province, which are mainly distributed in the economically developed areas of the Pearl River Delta. These geological enterprises and institutions are of great benefit to the talent cultivation, production practice and improvement of employment quality of geological majors.

The training program includes two parts: study on campus and study in geological exploration enterprises and institutions, and corresponding training programs are formulated for the two stages of study respectively. Relying on the practice education center, more geological prospecting enterprises and public institutions should participate in the teaching process, and reasonably set up courses, hours and semesters for the teaching of geological prospecting enterprises and public institutions, so as to form a four-year teaching system. At the same time, in the process of continuous communication between the university and the enterprise, the training program is timely and dynamically improved according to the industry's demand for talents.

3.2 Teaching Team Building

On the basis of the existing teaching teachers, combined with computer, artificial intelligence, big data and other professional technical development, training and construction of geology professional teachers, in the subject declaration, industry-university-research cooperation, curriculum construction, teaching reform and research, and other aspects, to achieve deeper cooperation and integration.

The geological economic activities of geological enterprises and institutions in Guangdong province have a wide range of characteristics, including geological exploration, disaster geology, geotechnical engineering, surveying and mapping, geological exploration technology and so on. In view of the characteristics of geological exploration industry in Guangdong Province, under the framework of the professional group of geological Resources and geological Engineering, two scientific research and teaching teams of "Oil and gas reservoir geological engineering" and "oil and gas exploration geological Engineering" will be established, and two scientific research and teaching teams of "geological exploration technology" and "disaster geology prevention" will be expanded. In the construction of the four teaching teams, the method of introducing and training is

adopted to improve the teaching force, and the mode of "going out and inviting in" is adopted to train the double-qualified teachers, so as to achieve the purpose of scientific research feeding teaching back.

3.3 Curriculum and Teaching Resource Construction

The application of artificial intelligence in geological field is relatively early. In the 1980 s, the combination of artificial intelligence technology and computer hardware system was born when I was a practical geological exploration is a group of human skills, later gradually developed have geological research into various fields, such as artificial intelligence in remote sensing geology, well logging, seismic inversion and reserves calculation, 3 d model has forecast.

New engineering construction in the country, in the construction of geological engineering in geological industry should actively use of artificial intelligence application base, make full use of the virtual simulation technology innovation engineering practice such as teaching methods to explore establishing virtual reality teaching laboratory and practice base, etc., in the existing curriculum highlights the application of artificial intelligence, such as mathematics geology, remote sensing geology, etc.

The core majors drive the curriculum construction of related majors, constantly improve the teaching content, make it more closely related to reality, and gradually form the core curriculum group featured by the integration of major categories. In addition to the general courses and earth science courses set up by the school's curriculum platform, the professional core courses are determined to ensure the integrity and practicability of the professional knowledge system on the basis of realizing broad caliber training. Meanwhile, specialized courses integrating computer technology, artificial intelligence and big data are carefully selected and set up. At the same time, there are also a certain number of elective courses and practical courses, so as to perfect and finally build a set of distinctive "geology major" curriculum system and corresponding curriculum modules.

3.4 Reform of Teaching Methods

People - oriented, individualized teaching, scientific implementation of classified teaching. According to students' personal characteristics and development plans, students' practical ability and innovation consciousness are strengthened through various platforms such as engineering center, off-campus practice base, interest groups, student associations, professional competitions, teachers' scientific research projects and so on, using the credit system and elective courses. Through group discussion, heuristic questioning, after-class research and other ways, let the students actively participate in the teaching. Make full use of information technology, the teaching plan, outline, courseware, homework comments, experimental points, simulation papers and so on published on the Internet, according to the needs of selective, stage of the announcement, students can preview and review through the network, to achieve independent learning, at the same time to establish the interaction of students and teachers. So as to arouse the enthusiasm of students. We offer new technology lecture courses for senior students. By inviting enterprise experts or university professors to give lectures, we introduce the hot topics and development trends of subject research, so that students can understand the latest trends of subject development.

3.5 Practice Teaching

Students are encouraged to participate more in professional practice through various forms, such as the independent selection of off-campus practice bases, student associations and skills

competitions at all levels, teachers' scientific research projects, open laboratories, and college students' innovation and entrepreneurship training projects. Reform the experimental teaching form in class, increase the design, innovation, research experiment. Combined with the actual situation of the major, we will adopt the school-enterprise joint guidance and implement the double tutorial system for the students who have in-depth internship in enterprises. We invite experienced engineers and college teachers to guide students to complete the graduation project.

College lead organization teachers and senior students take an active part in the national college students' geological skills competition ", "national college students logging skills competition", "national college students' exploration geophysical competition" and "national petroleum geological college students competition" and other major events, to the introduction of the geological class race course training system, strengthen students' practical ability and team cooperation consciousness, To achieve the goal of "promoting education through competition", and form a special project of talent training.

In view of the remote geological practice sites in our school, we take the initiative to establish contact with geological enterprises and institutions in the province to jointly build a geological practice base, and strive to build a national geological practice base for national geological colleges and universities, which is convenient for students to practice and expand the influence of our school.

3.6 Reform of Teaching Management

Strengthening the reform of teaching management can not only build "standardized, scientific and quantifiable teaching evaluation system", but also achieve the goal of "seeking more scientific and effective teaching methods and means".

On the basis of the existing teaching management system, for the new engineering and professional certification, combined with the geological features and characteristics of engineering construction, fully embodies the "student-centered, achievements and demand oriented" management rules, through the rolling optimization gradually formed a relatively mature geological specialty teaching management and teaching evaluation system.

3.7 School-Enterprise Joint Talent Training System

Continuously improve the school-enterprise joint training system, set up the "enterprise Advisory Committee", invited leading enterprises in the petroleum and petrochemical industry, geological exploration industry and local small and medium-sized enterprises and famous alumni to join the committee. "Enterprise Advisory Committee" is a university-enterprise association, a system guarantee for paying attention to applied teaching and application-oriented talents training for engineering objects, a guarantee for supervision and coordination of teaching implementation in industry-university-research bases, and a strong support for talents sharing and mutual benefit between enterprises and universities.

Through the "enterprise advisory committee", we can offer suggestions for the school's professional construction and talent training, provide order-type talent training for enterprises, provide students with the most practical production practice basis, and provide a platform for the school's scientific research.

4. Summarizes

New era geological industry transformation and the national major strategic puts forward new requirements for geological talents, Guangdong petroleum chemical industry college has explored

in geological engineering construction, emphasis on "take the student as the center, with results and demand as the guidance, in order to solve complex engineering geological ability training as the gripper, to enhance the innovation practice ability as the goal" of the concept of talent cultivation. Focus on curriculum system reform "multidisciplinary cross, diversity training," prominent "actively guide, according to their aptitude" teaching mode, strengthen the practice teaching of "linkage between colleges, in order to promote teaching", the quality of teaching monitoring emphasis on "effect of businesses to participate in the teaching process, management and the whole process of", realize to improve the talent training quality.

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References

- [1] Zhu Yanbo, Fan Fan, Lu Quanzhong.(2019) *Exploration of innovative talent training system for solving complex engineering geological problems -- A case study of Geological Engineering major in Chang 'an University* .*Geological education in China*, 28 (2) , 16-21.
- [2] Ding Mingtao, LV Xiating, Chen Tingfang. (2018) *Reform of geological engineering talent training mode in universities under the "Double First-class" construction* .*Geological education in China*, 27 (1), 25-29.
- [3] Ren FIFA, QI Mengxia, Guan Guan. (2017) *Discussion on cultivation objectives of Undergraduate major based on OBE Teaching Mode -- Taking Geological Engineering major of Tongji University as an example*. *Higher architectural education*,26(4),18-21.
- [4] Zhang Fan, Wang Kongwei. (2017) *Optimization of training direction and curriculum design of geological engineering specialty*. *China geological education*, 26 (2) , 20-24.
- [5] Ren Yunsheng, DING Qingfeng, Jin Jinhua. (2018) *Reform and exploration of geological undergraduate talent cultivation in Jilin University under the background of "Double First-class" construction and "Major Enrollment"*. *Geological education of China*, 27 (4): 9-11..
- [6] Yu Jicong, Liu Yuexiang, ZHAO Weizhen. (2018) *Thinking on the development of geological education in the new era*. *Geological education in China*, 27 (2) , 1-5.
- [7] Yang Guangshu. (2018) *Geological resources and geological Engineering discipline construction under the strategy of "double First-class" -- A case study of Kunming University of Science and Technology*. *Education modernization*,5 (01) , 125-128.
- [8] WU Shenghe, Yue Dali, Yin Zhijun.(2018) *Construction and Practice of Curriculum Teaching System Based on "Knowledge Construction, Thinking Training and Ability Training"*. *Geological education in China*, 27 (1), 53-56.
- [9] Lu Haifeng, ZHANG Pingsong, Liu Wenzhong.(2015) *Construction and thinking of production practice platform for geological engineering specialty* . *Geological education in China*, 24 (4) , 128-131.
- [10] Ding Mingtao, Zhang Yongwang, Chen Tingfang. (2017) *Training mode and practice of university geological engineering talents based on university-enterprise cooperation*. *China geological education*, 26 (1), 7-12.