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Research on the Reform of Graduate Cultivation Mechanism under the Background of "Double-First Class"

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Abstract: Graduate education is the source of Chinese high-level talent cultivation. The quality of graduate education will directly affect the development of China's core competitiveness. Through in-depth analysis of the cultivation objectives of graduates majoring in geological engineering and the main problems in the cultivation process, this paper proposes the establishment preliminary ideas for the cultivation strategy under the background of "double-first class". The strategy is stepwise for teaching objects. It changes according to the stage where the students are in.

1. Introduction

Different from the academic degree, the professional degree aims to cultivate applied high-level professionals who have a solid theoretical foundation and adapt to the actual work needs of a specific industry or occupation [1]. The close integration of academic and professional is one of the outstanding characteristics of professional degree education. The Ministry of Education proposed for the first time in 2009 that some colleges and universities across the country will recruit fresh undergraduate graduates as full-time professional degree graduate students, and added 50,000 full-time professional degree graduates' enrollment quotas that year. Subsequently, the enrollment reform of full-time professional degree graduate students has been intensified year by year. On the one hand, it is reflected in the scope. The enrollment scope has been expanded to all professional degree categories and fields approved or filed by the Academic Degree Office of the State Council. On the other hand, it is reflected in the number. The number of enrollment is increasing year by year. By 2011, the number of planned enrollment nationwide reached 148,000 [2][3][4]. Under the policy guidance of the "National Medium and Long-term Education Reform and Development Plan Outline (2010-2020)" and the "National Medium and Long-term Talent Development Plan Outline (2010-2020)", each university fully develops formulation of cultivation programs for full-time professional degree graduate students according to its own characteristics [5].

China University of Geosciences (Beijing), as the first batch of key universities in China for the construction of the "211 Project" and the "985 Advantage Discipline Innovation Platform", is also the main lead university for professional degree education in the field of geological engineering in China. Therefore, under the premise of drawing on the successful experience of other universities' cultivation programs, China University of Geosciences (Beijing) combines its own school-running

characteristics and special geographical advantages, takes the training of professional degree graduate students in the field of geological engineering as a pilot, and proposes the stepped distribution characteristics and the characteristics of teaching objects. The implementation of the "stepwise" training model at different stages of the students has played a demonstrative role in the cultivation of full-time professional degree graduate students.

2. Status Quo of Cultivation of Graduates Majoring in Geological Engineering in China University of Geosciences (Beijing)

2.1 Features of Geological Engineering

The major of Geological Engineering is an applied discipline that applies the basic scientific knowledge of geology and solves related geological problems in the practice of social development. The talents trained in the Geological Engineering major mainly serve in the fields of geological survey, mineral exploration, mining development, transportation and municipal construction, national defense construction, and environmental protection. At the same time, it can also play a certain role in the practice of human scientific exploration of space, deep sea, deep earth, and polar mysteries. The practice of human geological engineering and the geological environment are mutually restricted, and the implementation of Geological Engineering and the protection of the geological environment are unified. Therefore, in order to meet the needs of current social development, there is an urgent need to cultivate compound talents who have a solid professional foundation, broad professional fields and strong ability to solve practical professional problems, but also have innovative spirit and strong adaptability [6][7].

2.2 Cultivation Goals of Geological Engineering

The field of Geological Engineering is based on the theory of earth science. It focuses on geological surveys, mineral resources exploration and evaluation, and great engineering geological issues. It uses geological survey, geophysical survey, geochemical survey, remote sensing technology, rock and soil drilling, engineering survey and construction technology, test analysis technology, computer technology and so on as means. It is the leading engineering field of national economic construction services. Therefore, it is required that graduates of this major must have a solid theoretical foundation of earth science and professional knowledge in geoscience and management. They should be familiar with the current situation and development trend of the field at home and abroad, and have the ability to scientifically choose comprehensive technical means to solve related problems in the field.

2.3 Current Status of Graduates Who Major in Geological Engineering in China University of Geosciences (Beijing)

China University of Geosciences (Beijing) is one of the universities with the largest enrollment for graduates in geological colleges in China. It has become an important base for cultivating high-level talents in geosciences in China. In particular, the major of Geological Engineering is its largest core major of graduates. There are currently more than 1,600 graduates majoring in Geological Engineering, accounting for about 1/3 of its graduates. In 2017, the school enrolled more than 590 graduates in Geological Engineering, accounting for 1/3 of the enrollment of the whole university.

3. Main Problems Existing in the Process of Cultivating Graduates Majoring in Geological

3.1 Quality of the Source of Students

First, there is a big gap between students' academic level and practical ability. As the way colleges and universities enroll professional degree graudate students still generally refer to the admission method of academic graduate students, in terms of scores and practical ability, they are more inclined to judge the level of scores. As a result, candidates are only immersed in the improvement of theoretical knowledge and neglected the learning of professional practical skills [4].

Second, the undergraduate majors are diverse and the foundations are quite different. Taking 2017 as an example, China University of Geosciences (Beijing) admitted a total of 597 graduate students majoring in Geological Engineering, of which more than 50 undergraduate majors were involved. In fact, in the course of teaching, it was found that these students' basic knowledge of geology was not systematic or very solid, resulting in slower understanding than other students and unable to keep up with the teaching progress of the instructor. Therefore, on the one hand, the students themselves need a period of time to repair the knowledge that the undergraduate should master. On the other hand, the teacher has the problem of how to fully take care of the students in the course of teaching.

Third, different research directions result in different research goals. Among the students who just started studying Geological Engineering for a master's degree, their research directions are different. Also taking 2017 students as an example, China University of Geosciences (Beijing) has opened a total of 30 research directions for graduates majoring in Geological Engineering. The differences in research directions led to different concerns among students. Therefore, when teachers taught them without emphasis, the expected teaching effect couldn't be achieved. It also easily made students lose interest in learning in the classroom [8].

Fourth, lack of a full understanding of the major and clear learning goals. At present, fresh undergraduates still dominate the composition of graduate students. Also taking the 2017 freshmen of graduates in China University of Geosciences (Beijing) as an example. Only 110 of the 597 graduate students majoring in Geological Engineering had work experience, and the rest were all fresh undergraduates. Under this circumstance, the first year in the graduate school for them were like the fifth year of them being undergradutes. From the example, it can be inferred that because of the lack of scientific research and practical experience, students have insufficient understanding of their own majors, and lack of clear learning goals, students' subjective initiative is not strong, and there are often phenomena such as passive attitude in class.

3.2 Tutor Team Building

Through years of teaching practice, it has been proved that the dual tutor system is implemented for professional degree graduate students-that is, there are some obvious shortcomings in the mechanism of co-training by an on-campus tutor and a corporate tutor. First, professional masters, like academic masters, need to do some projects on campus with teachers, which makes it impossible to meet the time requirements for their practice in enterprises. Second, due to differences in work organizations, nature, and tasks between the two types of tutors, the two don't have enough communication with students in the training process. Third, most of the corporate tutors are often responsible for the short scientific research work time and heavy tasks. Usually, they simply arrange some tasks for the students who participate in their research projects. They lack sufficient and long-term planning to improve the research capabilities of the students.

3.3 Practical Teaching

For engineering graduate students, the level of engineering practice ability is the prerequisite and measurement index for all innovative ability training. Paying attention to engineering practice will have an important impact on the cultivation of innovation ability of geological engineering graduate students [9]. At the annual meeting of the National Joint Conference of Deans of Graduate Schools of Graduates held in 2012, a core issue was raised, “One of the main manifestations of the quality of professional degree graduate education in China is that professional graduates have insufficient practical ability and weak innovation ability. [10]” The Ministry of Education has clear requirements for the practical teaching time and specific practical teaching content of professional degree graduate students. The practical teaching time of non-graduate graduates should not be less than half a year, and the practical teaching practice of fresh graduates should not be less than one year in principle. The content of practical teaching should be that students, under the guidance of the instructor of the enterprise (or school), revolve around the production and scientific research work undertaken by the instructor, independently or in cooperation with others to complete a certain aspect of the content. In recent years, the number of professional degree graduate students has been increasing, and the existing practice bases can no longer fully meet the cultivation requirements. Not only is there an urgent need to add new practice bases and explore new postgraduate training models, but also is there necessity to discuss how to comprehensively examine the production and practical ability of graduate students in enterprises [4].

3.4 Academic Dissertation

As far as current dissertations are concerned, no distinction is made between different types of graduates. There is a unified standard for the quality of dissertations to evaluate the results of graduate education. Obviously, there are shortcomings. For example, the topic selection of a master's degree thesis for a professional degree graduate does not need to solve scientific problems in theory, but it must have a clear application field and possible practical value, and it should be derived from applied topics or actual production practices. At the same time, the form of dissertation can be diverse, such as investigation and research reports, optimization of various geological survey plan designs (including geological survey, mineral exploration, geophysical survey, geochemical survey, hydrogeological engineering geological environmental geological survey), and the preparation of final report, etc. However, in the actual teaching process, most of the dissertation of professional degree graduate students is more inclined to theoretical research in the topic selection, lacking the application content of production and practice. As a result, the professional degree papers in the final evaluation cannot be evaluated objectively because some experts are not able to discriminate them well [4].

4. The Establishment of a “Stepwise” Cultivation Mechanism for Graduates under the Background of “Double-First Class”

The process of human learning includes three stages: perceptual knowledge, rational knowledge and practice. The connotation of the stepped development theory proposed by Zhu Xun, the former Minister of the Ministry of Geology and Mineral Resources of China, is that the development of things has the property of leaping from one step to a higher step over time [12]. In the application of the stepwise development law to promote the process of scientific development in actual work, the following five aspects should be grasped: respect the law, be brave to innovate, practice earnestly, proceed step by step, and reflection [12]. In the application of the stepwise development law to promote the process of scientific development in actual work, the following five aspects should be

grasped: respect the law, be brave to innovate, practice earnestly, proceed step by step, and spend time on introspection [12]. Therefore, China University of Geosciences (Beijing) carries out its cultivation practice for professional degree graduates majoring in Geological Engineering according to the theory of “stepwise development” and the characteristics of the major. Students are taught in accordance with their actual level. Under a cyclical cultivation mode, students are guided to gradually understand, familiarize and master the essence of Geology. In this way, they are able to form good study habits.

4.1 The First Stage: Theoretical Learning Stage.

Whether they are professional degree students or academic degree students, the theoretical study is very important. For professional degree graduate students, they not only need to learn basic theory, but also learn a certain amount of practical knowledge. Based on this, China University of Geosciences (Beijing) can adopt the following teaching model, that is, students can freely choose the time period of theoretical study as long as they can ensure that they complete the required credits and compulsory courses during the three-year graduate study. Students with weak basic knowledge can choose to study in school first, and then practice in the enterprises (institutions). Students with a solid theoretical foundation can first go to the enterprises (institutions) to participate in production and scientific research, and then return to school, choose relevant courses for practical scientific problems encountered in scientific research and production to improve theoretical basic knowledge. In the theoretical study stage, the school should not only increase the proportion of elective courses and appropriately reduce the proportion of compulsory courses, but also pay attention to reducing the number of hours of a single course and increasing the types of courses in order to provide more choices for different types of graduate students. The purpose of the theoretical study stage is to train graduate students how to combine the actual production and scientific research to choose the content to be learned, how to learn to continuously improve the learning ability of graduate students and the ability to solve practical production and scientific research problems.

4.2 The Second Stage: the Practical Stage.

The three-year study time of master's students is nothing more than the theoretical study in the school and the practical teaching in the enterprises (institutes). It can be seen that the practice (intern) stage is a very important stage during the three-year study period of graduate students, especially for professional degree graduate students. The timing and number of times of the practice must consider the actual situation of graduates, tutors and the scientific research and production of enterprises (institutes). The key is to communicate in a timely manner between colleges and enterprises (institutions) and between tutors on and off campus to ensure that the total time of the practice phase during the three-year study period of graduates is not less than one year. This model is neither a so-called “two-stage”, nor a “three-stage” or “multi-stage” model. It is believed that this should be a “random” or “flexible” cultivation model.

In fact, no matter what cultivation mode is adopted in the practice stage, it is not important. What is important is the close cooperation between universities and enterprises (institutions). They have a chance to learn from each other, and ensure that the production and scientific research tasks are completed on time, with quality and quantity. At the same time. They can ensure that students' practical ability, and their ability to discover and solve practical problems are systematically trained and significantly improved. It can be seen that the close combination of theoretical teaching and production practice is the most critical part of the professional degree graduate education and cultivation process. The combination of industry-university-research provides a good model for the

cultivation of graduate students' practical ability. In terms of graduate cultivation, Geological Engineering in China University of Geosciences (Beijing) and dozens of enterprises (institutions) have jointly work together. They give full play to the academic advantages of universities and the industrial advantages of enterprises (institutions) and form their characteristics of industry-university-research cooperation. For example, in order to implement ex-Premier Wen Jiabao's instruction of "actively promoting geological work to be more closely integrated with economic and social development, and more proactively serving social and economic development", China University of Geosciences (Beijing) used the tripartite cooperation with Henan Geological Survey Institute and Luanchuan People's Government to build the "Industry-University-Research Base of Luanchuan Mineral Resources and Geological Environment". It combined scientific research projects with teaching practice such as the National Twelfth Five-Year Plan of Science and Technology Support, and the Ministry of Land and Resources Industry Public Welfare Special Projects. Through nearly ten years of hard work, it not only has cultivated more than 50 masters (including 6 doctoral students) with solid basic theory, strong hands-on ability, and high comprehensive quality, but also submitted a number of major scientific research results to the country. It can be seen that the joint education model of industry-university-research cooperation is a very effective way of improving the quality of graduate cultivation and the overall practical ability of the teaching staff of colleges and universities. It is a form of graduate cultivation that is worth promoting. At the same time, industry-university-research cooperation can also help enterprises (institutions) to solve some technical problems in production and scientific research, so as to achieve the goal of a real university-enterprise win-win.

In addition, it is necessary to increase the construction of the school's laboratories, emphasize the close connection between the cultivation of graduates and the operation of scientific research instruments, so that graduates can truly integrate into all aspects of scientific research. The school should also encourage students to raise scientific questions, collect the samples and do testing by themselves. In this way, their innovation ability can be improved by improving their practical ability [11]. As mentioned above, the cultivation goals of graduates majoring in Geological Engineering are: graduates should master systematic geological basic theories and professional knowledge. They should be familiar with geological surveys, geophysical surveys, geochemical surveys, remote sensing surveys and other technical methods. They should have a general understanding of commonly used test methods in the field of geological engineering. They should be able to apply computer technology proficiently. It is important for them to be able to solve general geological problems encountered during the implementation of geological engineering projects. At the same time, they are also able to independently organize and implement the construction work of general geological engineering projects. Therefore, the establishment of a complete laboratory is very important for the cultivation of professional degree graduate students. High-level laboratory construction is an important guarantee for the school to reflect the advantages of Geology.

4.3 The Third Stage: the Dissertation Stage

In view of the different training goals of professional degree graduate students from academic graduate students, the National Engineering Master's Professional Degree Education Steering Committee has issued specific management measures for the "Trial Implementation of Different Forms of Engineering Master's Dissertations". The issue especially put forward specific requirements of the forms for the graduation dissertation of professional degree graduates. Flexible and diversified forms of expression are the most important feature of professional degree graduate dissertation. Product research and development, engineering design, applied research, engineering or project management, research reports and other forms can be used for the dissertation. Therefore,

the tutor and the dissertation assessment team should formulate different review requirements for the graduation dissertation of different types of master's degree graduates, and should give objective evaluations according to their respective training goals and characteristics [4].

5. Conclusion

In this paper, through in-depth analysis of the cultivation objectives of graduates majoring in Geological Engineering and the core problems encountered, it is clear that the focus of professional degree graduate cultivation is the cultivation of innovative practical ability. The cultivation mode should be stepwise that targets at the teaching object. It should also change according to different stages students are in.

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