Research on the Training Mode of Postgraduate Based on the Triple Helix Structure of Subject Characteristics, Industry Characteristics and Regional Characteristics—Taking Environmental Engineering in XUST as an Example

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Keywords: Subject characteristics; Industry characteristics; Regional characteristics; Environment engineering; Training mode.

Abstract. Taking Xi'an University of Science and Technology as an example, this paper summarized the key problems existing in the cultivation of postgraduate majored environmental engineering. The training mode of postgraduate majored environmental engineering based on the Triple Helix structure of subject characteristics, industry characteristics, and regional characteristics was constructed on the basis of analyzing the characteristics of the university in subjects, industries and regions. It hopes to provide the same guidance for education reform of postgraduate majored environmental engineering in XUST and similar universities.

Introduction

Graduate education, which treated as the highest level of higher education, shoulders the great mission of cultivating high-level talents who engage in scientific research and scientific and technological innovation [1]. From the strategic height of building an innovation-oriented country and the great rejuvenation of the nation, China has always attached great importance to the development of postgraduate education and made remarkable achievements in the world. By 2018, there were more than 2.73 million graduate students in China, including 389,000 doctoral students and 2.342 million master's students. However, with the rapid development of graduate education scale and professional fields, graduate education in China has gradually revealed many problems that are needed to be solved urgently. The main points are as follows: firstly, the postgraduate training work is out of line with the needs of economic and social development. Secondly, there is a serious phenomenon of homogeneity in the cultivation of graduates of the same major in universities. Thirdly, there are many problems in graduate education, such as a single training goal, a relatively lagging curriculum system, and unreasonable practical teaching. Fourthly, there is a lack of innovative ability for graduate students.

Therefore, taking Xi'an University of Science and Technology as an example, this paper focuses on the critical problems in the process of training graduate students majoring in environmental engineering majors, moreover, this paper studies the training model of graduates of environmental engineering majors based on the three-spiral structure of "subject characteristics, industry characteristics, regional characteristics."
The Present Situation and Problems of the Cultivation of Environmental Engineering Graduate Students at Xi'an University of Science and Technology

Cultivation Status

Xi'an University of Science and Technology's environmental engineering major is based on the original majors of hydrogeology and engineering geology and is based on the needs of social development. Obtained the right to grant a master's degree in environmental engineering in 2003, a master's degree in environmental science and engineering in 2005. In 2003, a second-level subject in mining environmental engineering was established under the doctoral program of the first-level subject in mining engineering. The second-level doctorate of environmental engineering was adjusted to the first-level subject of geological resources and geological engineering. By 2019, Xi'an University of Science and Technology has formed a relatively sound subject system in the fields of Ph.D., Master, and Engineering. The number of graduate students in environmental engineering and master of the environment has grown to more than 80. Development of environmental pollution control materials as the main direction.

Problems

Firstly, the integration of the dominant subjects of Xi'an University of Science and Technology is not enough, and the characteristics of its own subjects are not clear. From the perspective of the development course of the environmental engineering subject of Xi'an University of Science and Technology, each stage is closely related to the advantages and strong subjects of mining engineering, geological resources and geological engineering of Xi'an University of Science and Technology. Although with the support of these subjects, the environmental graduate professional subject system is becoming more and more perfect, the main research directions of environmental engineering graduate education are still traditional water, gas, solid waste pollution treatment, environmental materials, etc. The vision only stays on this subject, and rarely pays attention to the advantages of mining engineering, safety engineering, geological resources and geoengineering, the development trend of strong subjects, research progress and major key issues. So it is difficult to integrate and use the quality resources of these subjects to form its own distinctive subject characteristics.

Secondly, there is insufficient awareness of the actual needs of society, and the target industries and regions for services are not clear. The development of each subject must be based on practical issues facing the economy and society and meet their actual needs. And this demand varies by industry and by region. However, the core requirement of land reclamation in energy mining areas in western China is how to control soil erosion and protect the surface ecological environment. Therefore, the need that faces specific industries and specific regions is an inevitable choice for a subject to realize its characteristic development. In terms of training objectives, the training of environmental engineering graduate students at Xi'an University of Science and Technology has not fully realized this. In the process of postgraduate training, too much emphasis was placed on the teaching of universal and general theories and methods, while ignoring practical teaching with distinctive industry and regional characteristics. Postgraduates have only mastered some theories and methods in books and lacked attention and reflection on practical problems in specific industries and regions. Therefore, when graduate students face a specific project or project, they often show no choice.

In summary, facing the actual needs of society, clarifying service industries and regions, integrating and utilizing advantages, and strong subjects and high-quality resources is an inevitable choice for the cultivation of graduates of environmental engineering majors at Xi'an University of Science and Technology to achieve characteristic development.
An Analysis of the Cultivation Characteristics of the Postgraduate Students Majoring in Environmental Engineering in Xi’an University of Science and Technology

Subject Characteristics

Characteristic subjects are one of the university's core strategic resources coexisting with the university's academic tradition, culture, strategy, reputation, location, etc., and are where the university's core competitiveness lies [2]. In 2015, the State Council's "Overall Plan to Promote the Construction of World-Class Universities and First-Class Subjects" clearly stated that: Encourage and support the differentiated development of different types of high-level universities and subjects, and accelerate their entry into the world’s most popular or forefront [3]. Therefore, forming and strengthening the characteristics of subjects is not only an important starting point for the dual first-class Construction of universities but also an important cornerstone of graduate training.

Xi'an University of Science and Technology, which is the only mining college in Northwest China, has developed its own distinctive features in the fields of safety, mining, and geology after more than 60 years of development. In 2017, in the fourth round of national-level assessment of subjects, the school's safety science and engineering subjects entered Class A, and mining engineering, geological resources, and geoenvironmental subjects entered the C+ ranks. In 2018, Xi'an University of Science and Technology's "double first-class" construction plan explicitly identified "safety and geological and specialty subjects" as the core of the subject development of the university. Therefore, the postgraduate education of environmental engineering major of Xi'an University of Science and Technology should closely integrate the characteristic subjects of the school, fully leverage the advantages of the characteristic subjects, and build a subject background with "safety + environment," "mining + environment," "geology + environment," etc. innovative talent training model.

Industry Characteristics

Industry characteristics are not only an important path for universities to achieve a characteristic development path, but also a key element that constitutes university characteristics. Therefore, college graduate training must pay close attention to the development trend of the target industry, take the development needs of the target industry as the guide, take the target industry's industry standards as the criterion, take the professional ability + innovation ability as the core, and leverage the resources and platforms of the target industry. Take the road of character development.

Xi'an University of Science and Technology is the only coal university in Northwest China. It has always regarded serving the coal industry and supporting national energy security as its responsibility and mission. For a half century, the school has sent tens of thousands of technical, management, and scientific research personnel to the coal industry, and has produced thousands of research results. While strongly supporting the healthy development of the national coal cause, it has also created its own social position and industry positioning. Therefore, the postgraduate education for the environmental engineering major of Xi'an University of Science and Technology should closely focus on the development needs of the coal industry and rely on the industrial advantages of the coal industry to build an innovative talent training model with "coal + environment" as the industry background.

Regional Characteristics

Regional characteristics are not only a realistic choice to promote the healthy development of graduate education in universities, but also a concentrated expression of universities serving the local economy and society. Therefore, the training of postgraduates in colleges and universities should take into account the characteristics of the regional economy and society, give play to the functions of providing senior talent support to the locality, fully reflect the needs of the development of the pillar industries of the local economy, reflect the development direction of the emerging industries of the local economy, and reflect the requirements of the local economy for the quality of talents [4].

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Xi'an University of Science and Technology is located in Shaanxi, serving the social and economic development of Shaanxi and Northwest China. Therefore, the postgraduate education of environmental engineering major of Xi'an University of Science and Technology should closely focus on the social and economic characteristics and development needs of Shaanxi and Northwest China, rely on the geographical advantages of Shaanxi and Northwest China, and build a regional background with "natural resource development + fragile ecological environmental protection" innovative talent training model.

The Training Mode of Postgraduate Majored Environmental Engineering Based on the Triple Helix Structure of Subject Characteristics, Industry Characteristics and Regional Characteristics

The Internal Logic Relationship of the Three-helix Structure of "Subject Characteristics-Industry Characteristics-Regional Characteristics"

The specialization of the graduate training model should include three aspects of characteristics, namely: subject features, industry characteristics, and regional characteristics. The three are not a simple superimposed relationship, but rely on each other, promote each other, and cross-influence [5] to form an organic whole, that is, a triple helix structure that spirals upwards and jointly supports graduate education (as shown in Fig. 1).

Disciplinary characteristics are gradually formed by long-term accumulation in the process of continuously meeting the needs of industry and regional development and constantly solving the bottlenecks in industry and regional development. For instance, coal mining and utilization is an important industry in this particular region of Shanxi Province. Part of the particularity of the coal industry naturally becomes a part of the characteristics of local economic and social development in Shanxi Province. The coal resources in the region of Shanxi Province have special features in terms of geological occurrence and quality, which in turn have become part of the characteristics of coal mining and utilization in this specific area. It can be seen that the subject characteristics, industry characteristics, and regional characteristics interact and influence each other, and the overall spiral evolves and improves. However, it is worth noting that the organic combination of subject characteristics, industry characteristics and regional characteristics are achieved through the demand and supply of talents, which will inevitably affect the cultivation of talents.

The Construction of Postgraduate Cultivation Model under the Three-helix Structure of "Subject Characteristics - Industry Characteristics - Regional Characteristics"

Develop Distinctive Training Goals. Relying on the three major characteristic subjects of "safety, mining, geology." Our school cultivates "safety and geological characteristics" composite senior
talents facing the west and serving the coal industry, who understand the basic theories and knowledge of the three subjects of safety, mining, and geology. Meanwhile, these senior talents need to systematically master the professional knowledge and skills of environmental subjects, having good scientific research and innovative practice capabilities.

**Design Characteristic Theory Teaching.** Firstly, add basic, introductory courses in the fields of safety, mining, and geology to graduate students in environmental engineering, and encourage graduates to choose or supplement courses across majors, colleges, and schools to lay a solid foundation for graduates' expertise. Secondly, the implementation of corporate tutors' classroom plans requires that each professional course must be taught by corporate tutors, with less than 1/3 of the total class hours to help graduate students understand the reality and stay close to practice. Thirdly, encourage diverse teaching methods. According to the teaching content, it can flexibly take various forms such as lectures, discussions, experiments, observations, to stimulate the professional interest and initiative of graduate students.

**Integrate Characteristic Practice Teaching.** Firstly, integrate laboratory resources of the university, and organize and arrange experimental experiments of the university in accordance with the research direction of graduate students, which ensures the pertinence and systematicness of graduate internal practice.

Secondly, strengthen field practice teaching outside the school, and require graduate students to choose production, design, management and other units of different nature to conduct field practice for more than 6 months according to their research directions, and regularly submit practice progress reports and summary reports regularly to ensure the authenticity and effectiveness of graduate students' off-campus practice.

**Establishing Characteristic Training Management.** Firstly, actively promote the reform of the curriculum and practical assessment methods, reduce the examination of paper-based knowledge, and focus on the operational ability assessment. Secondly, set up a mentor group to give full play to the role of corporate mentors in the opening and defense of postgraduate dissertation thesis, taking into account Problem-oriented and subject-oriented, and strive to high academic value and high practical value of thesis. Thirdly, to innovate and establish graduates' multiple achievements award standards and mechanisms, eliminate the disadvantages such as "thesis only," and focus on the incentive of application results.

**Conclusion**

Aiming at the key problems in the training of postgraduate students of environmental engineering majored in Xi'an University of Science and Technology. The training mode of postgraduate majored environmental engineering based on the Triple Helix structure of subject characteristics, industry characteristics and regional characteristics were constructed on the basis of analyzing the characteristics of the university in a subject, industries and regions. It hopes to provide useful references for postgraduate majored environmental engineering at Xi'an University of Science and Technology and similar universities.

**Acknowledgment**

Financial support for this work is provided by academic degrees & graduate education teaching reform and research projects of Xi'an University of Science And Technology (No.2016YY14), which is gratefully acknowledged.

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