Academic Education Publishing House

Higher Education and Practice Vol. 3 No. 8, 2026

Research on the Cultivation Path of Innovative Talents for Postgraduates of Water Conservancy Engineering based on Multidisciplinary Cross-Integration

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Abstract: In view of the obvious discipline barriers and insufficient innovation ability training in the training of traditional master's degree students in water conservancy projects, it is difficult to adapt to the emerging development needs of intelligent water conservancy, ecological water conservancy and other industries. This paper explores the path of cultivating innovative talents based on multidisciplinary cross-integration, so as to provide support for improving the training quality of master's degree students in water conservancy projects and meeting the high-quality development needs of the industry. Based on the core orientation of multi-disciplinary cross-integration, combined with the characteristics of water conservancy engineering discipline and the law of postgraduate training, this paper constructs a multi-dimensional cross-training path framework by using logical induction method, and clearly puts forward the four-dimensional training path of ' modular reconstruction of curriculum system-cross-domain co-construction of practice platform-cooperative empowerment of teacher team-diversification of evaluation mechanism '. The curriculum system covers interdisciplinary modules such as water conservancy project, agricultural engineering and civil engineering. The practice platform adopts the trinity mode of interdisciplinary scientific research platform, school-enterprise collaborative practice base and interdisciplinary scientific research project. The teacher team adopts the double tutorial system of ' interdisciplinary tutor + enterprise technical tutor '. The evaluation mechanism takes into account both academic ability and engineering innovation effectiveness. The construction of a multi-disciplinary cross-integration training path can effectively break the disciplinary limitations of the traditional training model, improve the interdisciplinary knowledge integration ability and innovative practice ability of the master's degree candidates in water conservancy engineering, and meet the needs of the industry transformation and upgrading for compound talents. It can provide a practical plan for the reform of master's training in water conservancy engineering and related engineering majors.

Keywords: Multidisciplinary Integration; Water Conservancy Project; Innovative Talents; Evaluation Mechanism

1. Introduction

The new round of national infrastructure construction acceleration and the in-depth implementation of the rural revitalization strategy have promoted the continuous expansion of the boundary in the field of water conservancy projects [1], showing a development trend of deep integration of "water conservancy-agriculture-earth and wood." Whether it is the upgrading of farmland water conservancy irrigation system, the comprehensive management of rural water system, or the construction of inter-basin water transfer project, the safety guarantee of water conservancy project structure and other key projects, all require employees not only to have a solid foundation of water conservancy specialty, but also to master the farmland water conservancy regulation and control of agricultural engineering, soil and water conservation technology, as well as the structural design and construction management of civil engineering. Interdisciplinary knowledge and skills [2]. As the core carrier of high-level water conservancy personnel training, postgraduate education undertakes the key

mission of conveying innovative power for the industry [3].

However, from the current training practice, most colleges and universities still follow the traditional single-disciplinary training model [4]. The curriculum system focuses on traditional water conservancy directions such as hydrology and water resources and hydraulic structures, and has a serious shortage of cross-integration with agricultural engineering and civil engineering. The practice link is mostly limited to the single subject scene of water conservancy, and lacks cross-domain project experience; the single subject background and weak interdisciplinary guidance ability of the faculty team lead to the solidification of the knowledge structure of the graduate students, which is difficult to meet the innovative needs in complex engineering scenarios [5]. In this context, it is an inevitable choice to break the barriers of disciplines and build a multidisciplinary cross-integration training path characterized by "water conservancy project-agricultural engineering-civil engineering" to solve the current training dilemma and improve the quality of personnel training [6].

2. Research on the Modular Reconstruction Path of Curriculum System

In order to break through the discipline barriers of traditional curriculum, it is necessary to construct a three-dimensional curriculum system of "water conservancy basic module-interdisciplinary integration module-frontier thematic module," in which the interdisciplinary integration module focuses on the two directions of agricultural engineering and civil engineering. Through the organic connection of curriculum content and the systematic combing of teaching logic, the deep integration and efficient connection of multidisciplinary knowledge can be realized [7].

The water conservancy foundation module focuses on traditional core courses such as hydrology and water conservancy calculation, hydraulic structure principle, water resources planning and management, consolidates the foundation of water conservancy specialty for postgraduates, and ensures a solid foundation for interdisciplinary training. At the same time, the course content is optimized, and the cross cases of agricultural water conservancy, water conservancy and civil engineering are integrated into the traditional courses, such as adding the structural design cases of farmland water conservancy facilities in the "Principles of Hydraulic Structure" to lay the foundation for interdisciplinary learning.

The interdisciplinary integration module is divided into two core directions to accurately meet the needs of the industry. The first is the cross direction of agricultural engineering, which sets up courses such as farmland water conservancy system design, agricultural soil and water conservation engineering, optimal allocation of agricultural water resources, irrigation and drainage engineering technology, and focuses on cultivating graduate students' ability to solve problems related to farmland water conservancy. The second is the cross direction of civil engineering. Courses such as structural design and construction of water conservancy projects, mechanical analysis of water conservancy projects, engineering quality inspection and evaluation, and budget estimation of civil and water conservancy projects are offered to improve the quality of graduate students in the construction and management of major water conservancy projects. According to the research direction and career planning, graduate students can choose 1-2 cross-direction modules independently and complete the required credits.

The frontier topic module needs to invite experts and scholars in the fields of water conservancy engineering, agricultural engineering, civil engineering and other fields to carry out special lectures, covering intelligent farmland water conservancy technology, major water conservancy project structure innovation, interdisciplinary research frontier achievements, etc., to broaden the academic vision of graduate students. At the same time, the interdisciplinary joint teaching mode is implemented, and teachers of different disciplines jointly design the course content and carry out teaching. For example, the course of "Comprehensive Design of Inter-basin Water Transfer Project" is responsible for water resources allocation design by water conservancy teachers, agricultural engineering teachers are responsible for farmland irrigation adaptation along the line, and civil engineering teachers are responsible for engineering structure design, so as to improve the cross-integration and practical adaptability of the course.

3. Establish a Dual-Mentor System of

"Interdisciplinary Tutor Group + Enterprise Technical Mentors"

Establish a double tutorial system of "interdisciplinary tutor group + enterprise technical tutor" to ensure the guidance quality of interdisciplinary training. The tutor group is composed of teachers of water conservancy engineering, agricultural engineering and civil engineering. The members are determined by strict selection criteria (with interdisciplinary research experience, rich experience in scientific research projects, outstanding teaching ability, etc.). Each tutor group is equipped with 1 water conservancy engineering tutor, 1-2 agricultural engineering or civil engineering tutors, who are jointly responsible for the academic guidance and scientific research direction control of graduate students, so as to ensure that graduate students can get all-round guidance in the process of interdisciplinary learning and research.

Enterprise technical tutors are experts with rich practical experience in the cross field of water conservancy, agriculture and civil engineering in the industry, such as the person in charge of farmland water conservancy construction project and the director of major water conservancy project construction. They are responsible for guiding the practical links of graduate students, helping graduate students understand the needs of the industry and improve their practical skills. At the same time, we will build an interdisciplinary teacher exchange platform and organize regular academic seminars and teaching exchange activities for teachers of water conservancy, agriculture and civil engineering disciplines. Support teachers to participate in interdisciplinary research projects, further training, and enhance interdisciplinary teaching and research capabilities.

4. Research on Cross-Domain Co-Construction Path of Practice Platform

Create a three-in-one practice platform system of "interdisciplinary research platform in school-enterprise collaborative practice base-cross-domain scientific research project," and provide graduate students with a real "water conservancy-agriculture-civil engineering" cross-practice scenario.

At the school level, the laboratory resources of water conservancy engineering, agricultural engineering, civil engineering and other disciplines are integrated, and an interdisciplinary research platform is established. The research focuses on the optimization of farmland water conservancy system, the structural safety of water conservancy projects, soil and water conservation and ecological restoration, and is equipped with professional interdisciplinary experimental equipment to provide graduate students with interdisciplinary research experience [8]. For example, a 'Comprehensive Laboratory of Farmland Water Conservancy and Structural Safety' was built to support graduate students to carry out experimental research on structural design and performance testing of farmland irrigation facilities.

At the school-enterprise level, deepen cooperation with water conservancy design institutes, subordinate units of agricultural and rural departments, large-scale civil construction enterprises, water groups, etc., and build off-campus practice bases. In view of the actual projects such as farmland water conservancy construction, major water conservancy hub projects, and comprehensive management of rural water systems, the practice content is designed to allow graduate students to participate in the whole process of project research, scheme design, construction supervision, and completion acceptance, so as to improve the ability to solve practical engineering problems. For example, cooperate with the local agricultural and rural bureaus to arrange graduate students to participate in high-standard farmland water conservancy facilities construction projects; participate in the structural construction practice of inter-basin water transfer project in cooperation with large civil engineering enterprises [9].

At the project-driven level, graduate students are encouraged to participate in interdisciplinary research projects such as the National Natural Science Foundation of China and major scientific research projects at the provincial and ministerial levels, such as "Research on Key Technologies of Farmland Water Conservancy Modernization under the Background of Rural Revitalization" and "Research on Structural Safety and Durability of Major Water Conservancy Projects." Through the promotion of specific research tasks, the integration and application of interdisciplinary knowledge of "Water Conservancy-Agriculture-Civil Engineering" can be realized, and the scientific research and innovation ability of graduate

students of water conservancy projects can be improved.

5. Research on the Evaluation Mechanism of Innovative Talents from the Perspective of Diversification

A comprehensive evaluation system of ' multiple evaluation subjects, multi-dimensional evaluation indicators and multiple evaluation methods ' is constructed to accurately adapt to the interdisciplinary training objectives of 'water conservancy-agriculture-earth and wood'.

In terms of the evaluation subject, the integration of the tutor group (water conservancy, agriculture, civil engineering tutor), peer experts, industry and enterprise experts and other forces to form a three-dimensional evaluation pattern. Among them, enterprise experts focus on evaluating the practical ability and industry adaptability of graduate students to ensure that the evaluation results meet the needs of industry development [10,11].

In terms of evaluation indicators, in addition to traditional course scores and academic achievements, core indicators such as interdisciplinary knowledge application ability, practical innovation ability, and project participation are added [12]. The application ability of interdisciplinary knowledge can be assessed by interdisciplinary curriculum design, comprehensive case analysis report and so on. Practical innovation ability can be evaluated through practical reports, technical scheme design, patents, innovative design works, etc. Project participation focuses on the performance of graduate students participating in 'water conservancy-agriculture-civil engineering' cross-domain projects.

In terms of evaluation methods, the combination of process evaluation and summative evaluation is carried out, and various methods such as course assessment, scientific research achievement evaluation, practical performance evaluation and defense evaluation are adopted. For interdisciplinary courses, the assessment method of "theoretical examination + practical design" is adopted. For example, in terms of theoretical assessment, graduate students are required to complete the complete design scheme of farmland irrigation system in a certain area; in view of the practical link, the method of 'enterprise appraisal + tutor evaluation' is adopted to ensure that the evaluation results are objective and comprehensive. At the same time, for graduate students participating in interdisciplinary projects or corporate practices, project reports, technical solutions, corporate appraisal opinions, etc.can be included in the core evaluation basis to replace some academic paper requirements and strengthen the innovation and practical ability of graduate students.

6. Conclusion

The purpose of this study is to solve the practical problems of prominent discipline barriers and insufficient cultivation of innovation ability in the training of traditional master of water conservancy engineering, which is difficult to adapt to the needs of the integrated development of 'water conservancy-agriculture-civil engineering', and to provide a feasible path for the industry to transport compound innovative talents. The research process systematically sorts out the industry needs and training status, and summarizes and constructs a complete training system covering the four dimensions of curriculum, teachers, practice and evaluation. This study constructs a three-dimensional curriculum system of "water conservancy foundation-interdisciplinary integration-frontier topics," establishes a double tutorial system of "interdisciplinary tutor group + enterprise technical tutor," creates a trinity practice carrier of "on-campus scientific research platform-school-enterprise practice base-interdisciplinary project," establishes a comprehensive evaluation mechanism with multi-subject participation, and the four cooperate to form a closed-loop training path. This training path effectively breaks through the limitations of single subject training, can effectively improve the interdisciplinary knowledge integration and innovative practical ability of graduate students, and accurately meet the needs of talents in the fields of farmland water conservancy and major water conservancy projects. In the future, it is necessary to carry out long-term practice verification in more colleges and universities, improve its operation mechanism, and provide more practical reference for the reform of postgraduate training in water conservancy projects and related engineering majors.

Acknowledgments

This research was supported by the Higher Education Teaching Reform Research Project of

Heilongjiang Province (Project Nos. SJGYY2024213, SJGYB20261015, SJGYB20260303, SJGYB20260682 and SJGYB20260860).

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