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Exploration and Practice of Innovation and Engineering Ability Training Model for Electronic Information Majors

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Abstract

In response to the problems of fixed teaching content and outdated practical teaching methods in the current training of electronic information professionals, this paper explores teaching reform from the aspects of building the diversified collaborative education system, constructing disciplinary and professional curriculum systems, reconstructing the practical teaching systems, and cultivating teachers. Through interdisciplinary integration, the traditional ability cultivation mode is transformed into the diversified collaborative innovation and engineering ability cultivation method, which comprehensively promotes the improvement of students' practical and innovation ability.

Keywords

Electronic information; ability cultivation; education system; practical teaching system.

1. Introduction

The "New Engineering" is a direction proposed for the reform of engineering education in China based on new national strategic development needs, new international competition situations, and new requirements for moral education and talent cultivation[1-3]. In April 2021, General Secretary Xi Jinping emphasized during his visit to Tsinghua University the need to promote the construction of "four new" disciplines, including new engineering disciplines. This important speech highlights the close connection between new engineering disciplines and the integration of industry, academia, research, and application, as well as the cultivation of engineering capabilities. Electronic information majors, as traditional engineering majors, are also "new engineering" majors that can promote the development of emerging industries such as cloud computing, artificial intelligence, intelligent manufacturing, and robotics. They are the leading force for innovation driven development[4].

Our university's electronic information major has taken the "Electronic Information Characteristic Major Group" as an opportunity for development, and has carried out reforms in talent innovation and engineering ability training models, achieving good teaching results. It is a specific practice and exploration to cultivate talents with strong disciplinary foundations, strong innovation and engineering abilities, and high comprehensive qualities.

2. Existing Problems in Talent Cultivation

In recent years, Our country has continuously implemented innovation driven development. Under the new economic background characterized by "new technologies, new industries, new models, and new formats", higher and updated requirements have been put forward for the cultivation of engineering talents, especially electronic information professionals, forcing universities to provide better engineering education services from the "supply side". Under the

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current situation, the common problems in the process of engineering education in universities are as follows:

2.1. Solidification of teaching content plan

In the process of talent cultivation, due to the pursuit of stability, teaching content and plans often focus on fine-tuning with minimal changes. Market demand is more sensitive and timely to new electronic information technologies, which conflicts with the stable and fixed teaching mechanisms of universities.

2.2. Lack of strong interdisciplinary specialization

Professional individual barriers are severe, with relatively independent content and few interdisciplinary teaching projects, which cannot meet the current demand for talent cultivation in the development of cross-border integration industries.

2.3. Insufficient practical teaching methods

The teaching process is mainly conducted through classroom teaching, while the practical teaching method is relatively lacking due to constraints such as venue and equipment, which does not match the goal of improving engineering skills.

2.4. Lack of dual teacher training mechanism

Under the current assessment system, teachers lack self-awareness to improve their engineering abilities, their own engineering education literacy is inadequate, and they are not sensitive to technological changes and training needs in the new economic process.

Therefore, starting from the industry's demand for electronic information engineering and technical personnel, and based on the local background and characteristics of electronic information majors in our university, it is urgent to explore a reform of the electronic information engineering ability training mode that is in line with the actual situation of our university.

3. Exploration and Practice of Talent Cultivation Reform

3.1. Starting from the needs of regional economic development and students' learning and cognitive processes, the "learning-practice-research-innovation-evaluation-education" education system has been constructed

Starting from the characteristics and educational features of our university's electronic information major, combined with the key industrial needs of local economic development in Shandong Province, we have constructed five characteristic course groups: "Artificial Intelligence", "New Generation Information Technology", "Modern Equipment Manufacturing", "Modern Electrical Technology", and "Sensing and Detection Technology", as well as a training system for professional practice, research and innovation, and entrepreneurial experience. We have integrated ideological and political courses into the training system, and established a diversified evaluation and feedback mechanism of "government-university-enterprise-student" to promote continuous improvement of talent training programs and objectives.

3.2. Optimize and reconstruct the engineering practice teaching system with the characteristics of "hierarchical, modular, and multi integrated"

We construct the layered and progressive practical curriculum system based on the three levels of "knowledge acquisition, application, and creation": "foundation layer, improvement layer, and innovation layer". The practical aspects of the foundational layer focus on acquiring fundamental knowledge. Emphasis is placed on the application of professional knowledge in the improvement layer. The innovation layer focuses on knowledge creation. We have

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modularized the practical aspects of the course, optimized the practical hours and content, improved students' engineering design and practical innovation abilities, and constructed a multi integrated practical teaching system.

3.3. Build the tiered innovation practice system consisting of in class practice-innovative clubs-off campus bases-research platforms to enhance students' engineering application abilities

We have established innovative clubs that adapt to the characteristics of our profession and established off campus practice bases to allow students to delve into enterprises. Relying on doctoral programs in computer science and technology, master's programs in electronic information, and advantageous research and practice platforms such as the National Supercomputing Jinan Center, we have provided solid hardware support for the cultivation of innovative engineering practice capabilities.

3.4. Promote the construction of a multidimensional teacher training system and comprehensively improve the level of teacher engineering

We have established a well structured "elderly, middle-aged, and young" lesson preparation team, fully leveraging the role of experienced teachers in passing on knowledge and guidance. At the same time, young teachers are required to have at least six months of corporate practice, actively participate in corporate research projects, and be included in assessments and professional title evaluations to improve the engineering practice ability of the teaching staff.

3.5. Continuously improve the quality of talent cultivation by establishing a diversified evaluation and feedback mechanism

Adhering to the combination of professional characteristics and local regional economic development needs, we have formulated the talent training plan and established the diversified evaluation system of "government-university-enterprise-students" to comprehensively evaluate the level of education, professional settings, teaching staff, talent training, etc. from both macro and micro dimensions, and applied the evaluation results to the formulation of the training plan.

3.6. Organically combining "ideological and political courses" with "curriculum ideological and political education" to enhance students' ideological and political awareness and initiative in serving the regional economy

On the basis of the explicit dissemination of socialist ideology with Chinese characteristics in ideological and political courses, we integrate teachers' political identity into professional course teaching. By imparting knowledge and skills, students can be influenced by their thirst for knowledge, achieving an organic combination of moral character and talent cultivation.

4. Conclusion

This paper takes the transformation and upgrading of traditional engineering majors in electronic information as a research pilot under the background of rapid industrial development, focusing on clarifying the professional education ideas that serve society and the industry. We practice the "output oriented" engineering education philosophy, macroscopically optimize talent training programs and school enterprise cooperation programs, and microscopically strengthen curriculum construction and teaching design. We have identified the pain points in the transformation and development of traditional engineering majors and proposed solutions to continuously improve the quality of talent cultivation through innovative training systems. The reform involves the integration of industry and education, school enterprise cooperation mechanism, optimization of talent training programs, curriculum

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system, practical teaching system, and continuing education mechanism. It can be extended to traditional engineering majors in other applied undergraduate colleges and play a good reference role.

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