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Research on the Training Mode of Electronic Information "Novel Engineering" Talents Based on "Transversal Competencies"

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Abstract: Amid globalization and informatization, this paper addresses the core demand for talents in the new generation of the information technology industry — one of the national strategic emerging industries — by focusing on a training model for electronic information "novel engineering" talents through the enhancement of "transversal competencies". With "transversal competencies" as the core, we explore the matrix relationship between "transversal competencies" and curriculum system, innovate teaching methods, integrate curriculum resources, build a hierarchical practical training and practice system, empower a multidisciplinary knowledge system and an ideological and political education system by AI, implement the OBE concept, propose a "three-combination" mechanism for teachers, and promote the training of application-oriented high-quality talents.

Keywords: novel engineering; electronic information; transversal competencies; talent training mode

1. Introduction

In the context of globalization and informatization, the emergence of emerging technologies such as artificial intelligence, big data, cloud computing and new energy opened the prelude to the fourth Industrial Revolution. With the continuous progress of science and technology, the competition of the global industrial chain is becoming increasingly fierce. In order to enhance the core competitiveness of the country, The State Council issued *Decision of the State Council on Accelerating the Fostering and Development of Strategic Emerging Industries*, which listed the "new generation of information technology industry" as one of the seven national strategic emerging industry systems, increasing support and promoting the rapid development [1,2].

Around the above national development strategy, talent has become one of the keys to breaking through the bottleneck of the development of a new generation of information technology industry. The core foundation of electronic information is the cornerstone of the development of the new generation of information technology industry. Therefore, it is urgent to accelerate the realization of the strategy of strengthening China through the training of "novel engineering" talents in electronic information [3,4]. Talent training is the process of combining education and talent cultivation. At the National Education Conference in 2024, emphasis was placed on the fundamental task of nurturing virtue and

talents to strengthen the education system, enhance the talent training model, and comprehensively promote the reform of the application-oriented "novel engineering" talent training model in local universities. [5].

Electronic information "novel engineering" talents are required to have not only a solid theoretical foundation but also a strong innovative spirit, practical skills, teamwork ability, lifelong learning capacity, and other comprehensive qualities. These comprehensive qualities are the connotation of "transversal competencies", which refer to the general rather than discipline-specific abilities required in work and life in contemporary society, and emphasize the integration and penetration of multiple abilities. The cultivation of "transversal competencies" has become a new trend in education reform and development [6,7].

This paper focuses on implementing the fundamental task of nurturing virtue and talents, conducting research on the training model for electronic information "novel engineering" talents based on "transversal competencies", enhancing teaching quality and talent cultivation, and fostering well-rounded professionals with strong moral values, intelligence, physical fitness, aesthetics, and practical skills.

2. Construct the Matrix Relationship Between "Transversal Competencies" and Curriculum System of Electronic Information Talents

Under the background of the construction of "novel engineering", the training of electronic information talents is not limited to the construction of knowledge system, but should pay attention to the cultivation of "transversal competencies". To meet the six basic abilities required by enterprises and industries for students, the connotation of "transversal competencies" of electronic information talents is summarized from the aspects of international vision and global consciousness, project decision-making and professional norms, individual and team role commitment, independent and lifelong learning, information acquisition, processing and synthesis. The exploration and practice of multi-dimensional and multi-disciplinary cross-integration education system is carried out to build a through-the-line curriculum system (Figure 1).
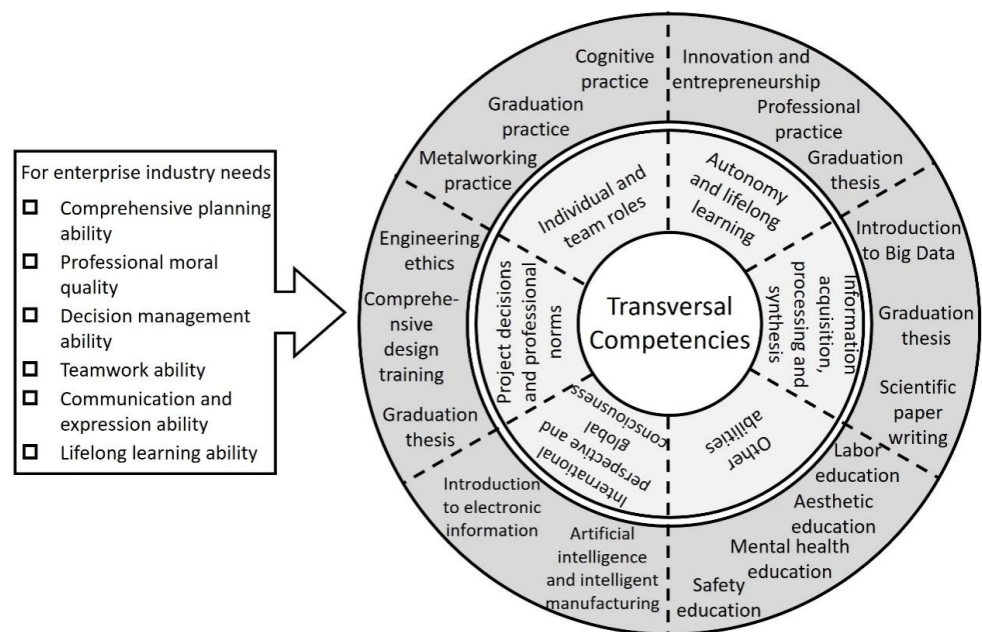

Figure 1. The matrix relationship between "transversal competencies" and curriculum system.

Through the step-by-step deepening curriculum system, students are equipped with interdisciplinary and cross-ability comprehensive qualities in various fields, which are constantly improved with the advancement of the learning stage. This system provides a

solid foundation for students' future development in an international, teamwork and continuous learning environment, and cultivates application-oriented electronic information talents that meet the needs of enterprises and industries. Through the matrix relationship between "transversal competencies" and curriculum system, we comprehensively and systematically integrate and link up the mathematics and science curriculum groups, specialized basic courses, specialized courses, professional expansion courses, humanities and social sciences courses, etc., build a multi-disciplinary interdisciplinary knowledge system from basic knowledge to advanced application. Furthermore, course contents, teaching methods and practical links are set up step by step to realize the spiral improvement of "transversal competencies".

3. Empower a Multidisciplinary Knowledge System and an Ideological and Political Education System by AI

In order to meet the complex and dynamic needs of modern engineering education under the background of "novel engineering", it is necessary to cultivate electronic information talents with "transversal competencies" empowered by AI. In terms of teaching concept, knowledge system, teaching resources and teaching team, AI technology is used to carry out teaching innovation and curriculum resource integration, deeply integrated knowledge graph technology linking multi-disciplinary knowledge points, integrated diversified teaching resources, perfect digital teaching material system and formed systematic knowledge network. AI and big data technology are used to integrate teaching resources and school-enterprise collaboration resources, innovate project-based teaching concepts, quantitatively evaluate teaching effects, optimize teaching strategies based on feedback, and strengthen high-level teaching teams. At the same time, the multi-disciplinary curriculum knowledge system, teaching materials resources, teachers, laboratories, practice and training bases are organically combined to build a new knowledge system and resource base of interdisciplinary integration, which provides students with intelligent and personalized learning paths, and improves the efficiency of talent training.

Focusing on the curriculum's ethical and professional values — such as mission responsibility, critical thinking, scientific attitude, and craftsmanship — we systematically identify key educational elements to develop teaching cases and formulate an implementation framework (Figure 2). Through AI-driven approaches, we implement quantitative evaluation, real-time feedback, and continuous curriculum improvement to ensure the integration of ethical and social awareness into education. This helps students understand the relationship between AI-driven technological progress and societal responsibilities, fostering their professional integrity and civic consciousness. Through learning feedback, the curriculum ideological and political goals can be effectively, layered, organic and imperceptibly dissolved and integrated into the whole teaching process, and the cultivation of "transversal competencies" can be strengthened.
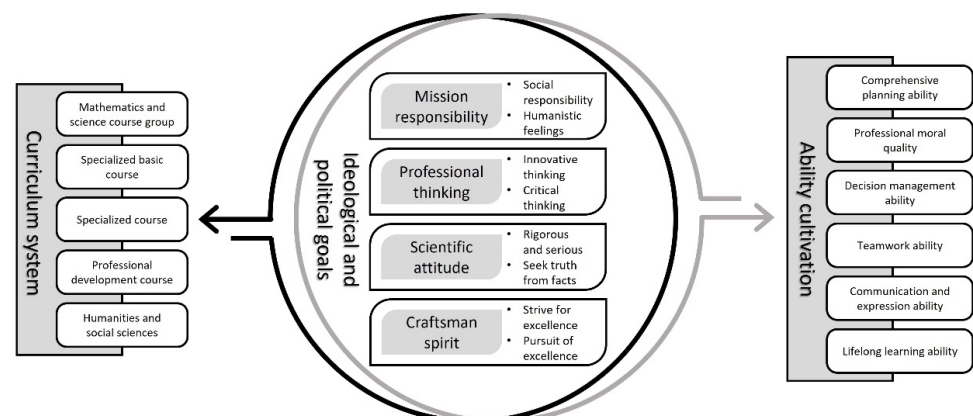

Figure 2. Curriculum ideological and political education system.

4. Pay Equal Attention to Both Theory and Practice, and Build a Multi-Level and Hierarchical Practical Training and Practice System

Under the background of "novel engineering", meeting the needs of enterprises and industries for students' application ability and comprehensive quality in real scenarios, the key to the training of electronic information talents is to pay equal attention to both theory and practice. Keeping up with the industry leadership and responding to job matching, a multi-level and hierarchical practical training and practice system is built on the basis of solid theoretical foundation and systematic professional knowledge of training electronic information talents (Figure 3).
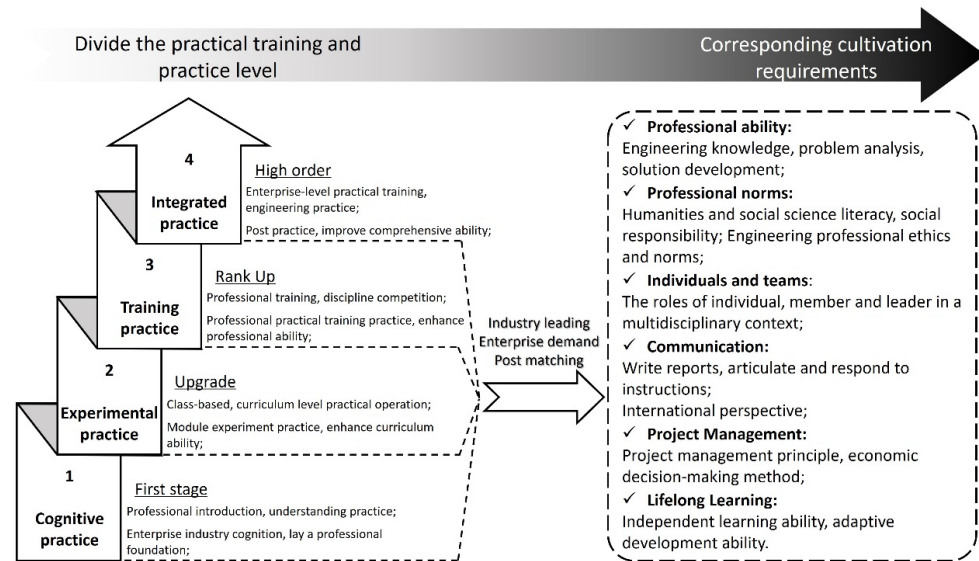
Figure 3. Multi-level and hierarchical practical training and practice system.

Through the combination of school and enterprise, theory and practice, the practical training and practice is divided into four increasing levels: cognitive practice, experimental practice, practical training and comprehensive practice. The cognitive practice focuses on industry cognition, job cognition and professional quality training, which helps students to initially understand the basic situation, job requirements and development trend of electronic information industry, and establish a preliminary cognition of future career. The experimental practice focuses on the basic experimental courses supporting the theoretical courses, and helps the students to exercise their operational skills and improve their ability to analyze and solve problems through course-level practical operation. The practical training focuses on discipline competitions and professional practical training projects, and helps the students to further improve their ability to solve complex problems and cultivate their "transversal competencies" such as project management and team cooperation through relatively complete project experience. The comprehensive practice focuses on the actual cases of enterprises and post practice, and helps the students to achieve the final training goal of independent completion of projects through the exercise of real situations and improve the comprehensive quality of professional practice ability, project management ability, team and communication ability, professional norms and other comprehensive qualities. Finally, the advanced practical level of students is cultivated.

5. Implement the OBE Concept, Promote the "Three-Combination" of Teachers, and Improve the Management Mechanism of Feedback and Continuous Improvement

Focusing on the fundamental task of nurturing virtue and talents of electronic information majors, we should pay attention to the promotion of the ability and responsibility

of "novel engineering" teachers. Integrating ideological and political elements are integrated into curriculum teaching, teaching research and scientific research are integrated, to innovate teaching methods and contents, curriculum system optimization and overall professional development are integrated. Therefore, a "three-combination" teaching team mechanism of "curriculum teaching + ideological and political education", "teaching research + subject research", "curriculum construction + professional construction" with moral education as the foundation. Focusing on the improvement of teachers' comprehensive quality, professional ability and job responsibilities, the improvement of teaching ability is achieved to promote the cultivation of students' "transversal competencies".

Implementing the concept of OBE, meeting the needs of enterprises and industries for the technical and professional development ability of electronic information "novel engineering" talents, according to the feedback and evaluation of talents by employers, continuous improvement is carries out in the aspects of quality standard system, teacher and student quality culture construction, and monitoring team construction. The education guarantee and management mechanism of student-centered, feedback and evaluation and continuous improvement is completed to improve the quality of teaching and cultivate high-level applied talents oriented by "transversal competencies".

6. Conclusion

The research and implementation of this paper will build and improve the electronic information "novel engineering" talent training model and management guarantee mechanism. Through the cultivation of "transversal competencies", a systematic education system is established to better link theory and practice courses, improve students' comprehensive quality and professional ability, and improve the quality and effect of training electronic information talents. The introduction of AI-empowered teaching innovates the education model, improve the accuracy of personalized learning and teaching decisions, and promote the application of AI technology in the teaching of other majors, universities and educational institutions. Ethical and social awareness elements are systematically integrated into the curriculum at all levels to provide a structured framework for the implementation of values-based education, strengthen the ethical education function, and train well-rounded talents for the future. The OBE concept is implemented to form a student-centered, feedback evaluation, continuous improvement education guarantee and management mechanism, which is extended to other "novel engineering" majors to achieve a comprehensive improvement in education quality. Finally, the electronic information "novel engineering" talent training mode based on "transversal competencies" can comprehensively improve the quality of education, promote the all-round development of students' ability, complete the teaching team and team building, improve the quality of talent training and service industry ability to meet the needs of enterprises and industries, and achieve a continuous rise in the employment rate of electronic information, more than 95% per year.

In a word, our research provides an effective example and practical experience for deepening education reform comprehensively, and has a wide range of application value.

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