Exploration and Practice of Interdisciplinary Integration Cultivation of Talents Majored in Intelligent Manufacturing Engineering under the Background of New Engineering Education

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Abstract: Under the background of new engineering education, intelligent manufacturing engineering major, as the core of future manufacturing development, puts forward new and higher requirements for engineers and technicians. To solve the problems existing in the construction of intelligent manufacturing major and the demand of manufacturing talents in the future, this paper puts forward a multi-aspect interdisciplinary integration talent training method driven by industry demand, teacher team building, discipline competition and project through the integration of teaching methods with industry characteristics and the integration of teaching concepts of cross-disciplines, so as to improve students' abilities to apply knowledge and solve problems, and improve the cultivation mode of intelligent manufacturing engineering talents.

1. Introduction

The continuous emergence of new technologies such as blockchain, big data, Internet of Things and edge computing promoted by the gradual advancement of national new engineering and "Double First-Class Initiative" construction, coupled with the two-way development of the integration of production and education, makes it difficult for colleges and universities to rely on their own resources to realize the cultivation of intelligent manufacturing engineering talents [1-4]. The fundamental reason is not only that the major of intelligent manufacturing engineering is characterized by interdisciplinary and integrated innovation, but also that the new engineering and "Double First-Class Initiative" construction require the cultivated talents to have a rich theoretical knowledge system, excellent practical skills, excellent innovation awareness and good competitiveness, which are difficult to achieve only by relying on the teaching resources of colleges and universities. The cultivation of intelligent manufacturing engineering talents is bound to be realized if universities and enterprises can integrate their own resources to complement each other [5-6].

2. Problems Existing in the Construction of Intelligent Manufacturing Engineering Major

2.1. Insufficient Teaching Resources

Intelligent manufacturing engineering is an emerging major that focuses on cultivating talents for the development needs of intelligent manufacturing industry. As an integrated field with multi-disciplinary integration, it requires more professional, targeted and refined talents, especially for engineering applications. At present, most of the intelligent manufacturing engineering major is still based on traditional machinery for teaching, with insufficient teaching resources, which easily leads to the lack of students' professional knowledge in the field of intelligent direction. As a result, students majoring in intelligent manufacturing engineering have little difference from those majoring in mechanical design, manufacturing and automation, resulting in a certain gap in the goal of cultivating talents.

2.2. Lagging Teaching Idea of Interdisciplinary Integration

At present, the teaching staff of the major of intelligent manufacturing engineering in some colleges and universities are all formed by the transfer of teachers from various departments of their own schools without adding new and highly professional teachers. For example, the teachers of intelligent manufacturing engineering major in the Faculty of Mechanical Engineering are mainly teachers of electromechanical, automation, mechanical design and other majors. However, intelligent manufacturing engineering is a multi-disciplinary field-oriented major, in which students should not only master the knowledge of traditional machinery but also integrate the related knowledge in multi-disciplinary fields such as big data, computer, internet of things, computer, physics, and materials, which needs to be integrated into the cultivation program and syllabus. At the same time, as a new major, it also needs cutting-edge new textbooks and richer interdisciplinary teaching contents and means to break through the predicament of the existing traditional teaching.

3. Measures for Cultivating Intelligent Manufacturing Engineering Talents

3.1. Industry Demand-Driven Cultivation Program

The cultivation of intelligent manufacturing engineering talents needs to be designed from the top cultivation program of professional curriculum planning, oriented to solve complex engineering problems that integrate multi-disciplinary professional knowledge, adhering to the integration of industry application scenarios as the specific application object, so as to train talents engaged in intelligent manufacturing engineering industry. The specific cultivation program is mainly reformed from theoretical courses, experimental courses and practical training courses. In addition, specialized courses for industry background applications are offered through cooperation and communication with enterprises to understand the needs of enterprises. At the same time, the specialty education of the second school for students majoring in intelligent manufacturing engineering is strengthened, and specialized courses integrating interdisciplinary subjects are taught in an orderly manner.

3.2. Cross-Integration of Teaching Staff

Teachers, as the important soul teachers in talent cultivation, play an important role in university education. The major of intelligent manufacturing engineering has higher standards and requirements for teachers, so it is necessary to further optimize the structure of the teaching staff. Specifically, it is necessary to expand the knowledge research in the relevant direction based on the industry

background and relevant technologies, directions and means in the industry application field, so as to improve the strength of teachers of intelligent manufacturing engineering in this direction. In addition, if the resources of college teachers are sufficient, the college teacher resources can be integrated to mobilize teachers related to the major and industrial background of intelligent manufacturing engineering to conduct regular or part-time teaching, so as to gradually improve the rationality of teacher resources and effectively promote the optimization of teacher structure.

3.3. Project-Driven Cross-Integration of Specialized Knowledge

With the progress of society, the requirements of enterprises for college graduates are constantly improving, that is, they should have both strong specialized knowledge and high comprehensive quality. For the intelligent manufacturing engineering major that integrates the technical characteristics of multi-disciplines, it is even more necessary to promote the undergraduate teaching work by project driving. Colleges and universities should continuously increase the cultivation mode of tutor-student-task type, encourage the student teaching and cultivation method driven by subject competition and enterprise projects, put more students participate in various projects and change passive learning into active practice, promote the interactive integration of students' knowledge of different majors, stimulate their intrinsic potentials, and ultimately realize the improvement of students' ability to use knowledge and solve problems.

3.4. Modularization of Engineering Practical Training

At present, major universities have done some work on the integration of disciplines in engineering training platforms for intelligent manufacturing engineering majors, and built experimental platforms that integrate the knowledge of disciplines related to intelligent manufacturing technologies, such as big data, edge computing, Internet of Things and advanced manufacturing technologies. Many of them have developed digital twin technology, virtual reality integration technology, virtual reality technology and other technologies to enhance the interactivity of intelligent manufacturing engineering major, which have also achieved some results [7-9]. However, there are still some problems in the basic training of students in some colleges and universities, among which the experimental operability is the most prominent one. Many colleges and universities have built intelligent manufacturing training platforms with a high degree of integration and good sealing. Although they also incorporate multi-disciplinary technologies, the high integration forces students to have poor operability for the platform. As a result, the teaching effect of demonstrating the basic intelligent manufacturing technology can't be achieved only by operating the computer, and the information exchange between teachers and students can't be reflected. Therefore, it is necessary to build the experimental platform on the premise of modularization/easy operation/practicality, instead of simply embodying intelligence for the sake of intelligence [10-13].

3.5. Strengthening the Construction of Ideological and Political Theories Teaching in All Courses

In the new era, we need not only professional and technical talents with rich theoretical knowledge and excellent practical skills, but also social builders who love the country, are realistic and dedicated, and strive for perfection. To this end, our school has always attached great importance to the construction of ideological and political theories teaching in all courses. Since the intelligent manufacturing engineering major is new, once the curriculum system is determined, our school organizes the relevant teachers to take charge of the ideological and political design of one or two courses, design the ideological and political elements of the curriculum pertinently, and integrate the

ideological and political elements of the curriculum into classroom teaching and experimental training. For example, the teacher in charge of software engineering, a professional basic course in the direction of industrial software development and maintenance, led the students to find that none of the nearly 20 kinds of industrial software were made in China, involving core software products such as industrial design, industrial development, industrial simulation, industrial calculation, industrial control, etc., and covering professional fields such as electronic information, mechanical design, numerical control machining, electrical automation, database management, etc., so as to inspire students' ambition to serve the country. Another example is machine vision technology, a professional core course in the direction of intelligent equipment control integration, which encourages students to learn the craftsman spirit of researchers by observing China's efforts in scientific research and breaking through existing technologies. The experimental and practical training courses, especially off-campus probation courses and customized courses for enterprises, encourage students to be brave in innovation with examples of independent innovation of enterprises, integrate ideological and political education into professional courses, and do a good job in ideological and political education for students in a quiet way.

4. Conclusion

The transformation and upgrading of intelligent manufacturing under the background of new engineering education is the only way to upgrade China from a manufacturer of quantity to one of quality. The cultivation of talents in intelligent manufacturing industry needs to meet the requirements of the times. Therefore, local colleges and universities need to re-position, precisely connect and explore new ways to cultivate talents in order to meet the standards required by intelligent manufacturing industry in the new era. In this paper, the mode and measures of interdisciplinary integration cultivation of intelligent manufacturing engineering talents under the background of new engineering education were expounded, hoping to provide a reference mode and practice path for the cultivation of compound and applied technical talents of intelligent manufacturing engineering majors in colleges and universities.

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