Relying on the Industrial University and the Deep Integration of Industry and Education, Cultivate Intelligent Manufacturing Application-Rriented Undergraduates

Di ZHANG

College of Mechanical and Electronic Engineering, Shanghai Jianqiao University, Shanghai 201306, China

15049@gench.edu.cn

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Abstract: Under the trend of the global manufacturing industry developing towards intelligence, the traditional training mode of mechanical professionals should also be adjusted to adapt to the current development of "intelligent manufacturing" in China. This paper analyzes the current demand for talents in the manufacturing industry and some problems existing in the traditional mechanical talent training mode, puts forward the mode of deep integration of industry and education to cultivate intelligent manufacturing application-oriented undergraduate talents, and expounds how to solve some problems faced by current teaching from the aspects of training mode, practical curriculum reform, teaching staff construction and curriculum ideology, Thus, it can cultivate the professional knowledge, engineering application ability and practical ability of intelligent manufacturing process and related electrical control system in mechanical manufacturing industry, which can meet the needs of local economic and social development and industrial structure adjustment, have good ideological quality, humanities and Social Sciences quality and professional ethics, Technical application-oriented compound talents who can engage in product digital design, intelligent manufacturing, intelligent transformation of production line, intelligent management and application of production line system in the field of intelligent manufacturing of mechanical manufacturing industry and other related industrial fields and product design.

1. Introduction

Under the trend of global manufacturing industry developing towards intelligence, the United States has formulated the policy of "revitalizing the framework of American manufacturing industry", the German government has put forward the "industry 4.0 strategy", and the Chinese government has successively promulgated and implemented the "made in China 2025" strategy, opening the era of intelligent manufacturing. Subsequently, the Shanghai Economic and Information Technology Commission formulated and released the "Shanghai intelligent manufacturing action plan (2019-2021)", the new mode of intelligent manufacturing will be further promoted and applied[1]. As the main bearing area of the science and innovation center, Lingang New Area will make strong efforts in intelligent manufacturing, gather intelligent high-end industries, build an international intelligent manufacturing center, and actively promote technology application and industrialization with professional parks as the carrier, major projects as the starting point and functional platforms as the support. In "intelligent manufacturing" In this context, the manufacturing industry needs to transform to intelligence. Therefore, the traditional training mode of mechanical professionals should also be adjusted to adapt to the current development of "intelligent manufacturing" in China[2].

Shanghai Jianqiao university is a private university located in Lingang New Area, which focuses on undergraduate education and trains front-line application-oriented professionals in production, construction, management and service. Application-oriented Undergraduate Colleges and universities refer to undergraduate colleges and universities with application-oriented orientation, serving the local economic development and providing advanced professional and technical talents for the local. Therefore, students majoring in mechanical design, manufacturing and automation

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(Intelligent Manufacturing) of Shanghai Jianqiao university should have the ability to adapt to this modern economic and social development. Intelligent manufacturing is a further form of manufacturing industry after automatic manufacturing. It contains many current advanced technologies and has the characteristics of high automation, networking and inheritance. Its complexity and systematicness constantly cross and integrate knowledge fields and disciplines. How to improve the comprehensive application ability of students of related majors, Improving students' employment adaptability is a key problem to be solved in Colleges and universities, especially in applied undergraduate education.

In order to meet the requirements of modern engineering for the cross integration of knowledge fields, the traditional mechanical majors continue to develop towards the training goal of integrating "machinery, electricity, control, Internet and computer". This requires students to systematically study and practice the structure, principle and control basis of electromechanical equipment, which is closely combined with engineering practice. In particular, they need to integrate theory with practice, and pay attention to the cultivation of engineering practice application ability and innovation ability. Based on the above situation, we need to make changes and adjustments in talent training mode, teaching content and teaching practice in the process of cultivating applied compound talents facing the industrial upgrading of modern manufacturing industry, so as to meet the requirements of intelligent manufacturing and industrial upgrading for human development. Only in this way can we train people to meet the needs of local economic and social development and industrial structure adjustment, have good ideological quality, humanities and Social Sciences literacy, professional ethics, have professional knowledge, engineering application ability and practical ability of intelligent manufacturing process and related electrical control system in mechanical manufacturing industry, and be able to produce and manufacture in intelligent manufacturing field of mechanical manufacturing industry and other related industrial fields In the field of product design, it is a technical application-oriented compound talent engaged in product digital design, intelligent manufacturing, intelligent transformation of production line, intelligent management and application of production line system, etc[3].

So far, the major of mechanical design and manufacturing automation (Intelligent Manufacturing) in the College of mechanical and electrical engineering of our university has not been able to fully meet the needs of cultivating high-quality and high-quality application talents through the existing teaching system. The main reasons include:

(1) The proportion of teaching practice needs to be further increased. At present, talent training tends to cultivate students' professional theoretical knowledge and lacks the cultivation of students' practical knowledge, resulting in the low level of students' practical ability in the training process. In the existing teaching mode, there is no good combination of theoretical teaching and practical teaching. There are many theoretical contents of some basic courses and professional basic courses, and there is a lack of support from practical cases of enterprises. However, our students' basic theoretical knowledge is weak, especially their ability to analyze mathematics and applied mathematics. Too much theoretical teaching often leads to unsatisfactory teaching effect. During the teaching process, in the teaching, teachers do more, students take less initiative, teachers instill more, students understand less, single teaching more, students study less, cramming more and heuristic guidance less. The teaching evaluation method is single, and the final scores of students are basically weighted by the final examination papers and usual scores.

(2) The content quality of practice needs to be improved. The professional practice curriculum system has been adjusted macroscopically, and the courses such as in class practice, in class experiment and independent practice have been completed. However, the practice teaching link mainly serves a single course, there are many verification projects, and there is a lack of overall design and innovation of systematic, comprehensive, design and research innovation projects. There are few practical links that can highlight the organic integration and comprehensive application of intelligent manufacturing knowledge, and in the practical link, students only participate passively, and there is a lack of cultivation of students' innovative consciousness in content design.

(3) There is still a gap from the "double qualified" teachers. Most teachers lack sufficient

enterprise work experience, young teachers have less contact with enterprise posts, focus on theory and ignore practice, and the construction of “double qualified” teachers is limited to paper and can not be implemented. Due to the lack of engineering experience and experience, front-line teachers are unable to fully explain the problems encountered in practice. They are unable to do their best in practical teaching. Curriculum teaching is superficial. It is difficult for students to cultivate problem-solving and analysis ability, and to cultivate students' professional application ability and professional quality.

(4) Teachers' all-round teaching ability needs to be cultivated and strengthened. Some professional course teachers still teach professional knowledge and cultivate students' professional skills, ignore the education of students' Ideological and political work, and there is an ideological misunderstanding of emphasizing teaching rather than educating people. In addition, the mechanical professional curriculum has strong theoretical, engineering and practical nature, and the direct relationship with “curriculum ideological and political education” is not obvious. Most teachers of this major do not understand the connotation of curriculum ideological and political education, do not want to understand how to combine curriculum ideological and political education with professional teaching, and can not naturally carry out curriculum ideological and political education in the classroom.

The existence of the above problems will hinder the cultivation of technical application-oriented compound talents with good ideological quality, humanities and Social Sciences literacy, professional ethics, mechanical professional knowledge and engineering application ability. Therefore, it is necessary to rely on the enterprise cooperation units of Lingang University of technology to adjust and improve the existing teaching mode, so as to meet the requirements of the national strategic transformation of manufacturing industry on the comprehensive application ability and innovation ability of engineering application talents.

2. Methods to Solve Teaching Problems in the Project

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2.1 Optimize the Talent Training Mode, Improve Students' Comprehensive Ability and Enhance Students' Employment Competitiveness

Actively seek various opportunities for further cooperation with Lingang University of technology, strengthen the positioning and grasp of market demand, actively carry out social research and talent market research with the participation and support of enterprises, hold discussions and discussions with senior engineering and technical personnel of enterprises for many times, clarify the direction of professional construction and talent training, and take the market and enterprise talent demand as the core, According to the characteristics of our school, we should formulate a talent training plan.

When establishing the curriculum system together with the University of technology, we will adopt a cross composite structure of one axis and two lines, design theoretical courses to help students strengthen the learning of theoretical knowledge in Colleges and universities, and design practical courses to help students exercise their practical ability. At the same time, we need to strengthen the connection between theory and practice in combination with projects to promote students to actively participate in the learning of courses, Get the cultivation of comprehensive quality and ability.

Reform the current teaching methods and means, emphasize the practical teaching actions jointly determined by teachers and students in teaching activities, and guide the teaching process.

Strengthen the integration of practical teaching and theoretical teaching, rely on cooperative units, establish a perfect practical teaching system, emphasize the guiding role of various science and innovation competitions for students, integrate them into the professional practical teaching system, form an innovative and applied talent training mode with distinctive and professional characteristics, and formulate a training scheme in line with the training mode.

With the participation of enterprises, establish diversified teaching methods and teaching evaluation system. In the process of curriculum reform, we also need to continuously optimize the curriculum. Therefore, we also need to strengthen curriculum evaluation. The joint enterprises of colleges and universities regularly evaluate the curriculum structure in combination with the orientation of training objectives, so as to realize the reasonable adjustment of the proportion of course hours.

2.2 Optimize the Practical Teaching System, Strengthen Students' Practical Operation Ability, and Cultivate Applied Technical Talents with Bridge Building Characteristics

According to the actual needs of enterprises for talents, reform and improve the existing experimental and practical teaching system, improve the proportion of practical links in teaching links, and focus on strengthening the design of practical experimental links of basic theory. The teaching method of using simulation analysis and practical cases, supplemented by abstract theories and mathematical models, verifying professional theorems with curriculum experiments, and testing the mastery degree and application ability of professional modules with comprehensive practice is adopted, so that students can obtain the cultivation of hands-on operation and application ability through the practice link of integrating theory with practice at different stages.

Graduation project based on the actual project of the enterprise. In the graduation design link, the instructor selects the actual project of the enterprise for design, focusing on the project of physical production, so that students can better master the design method and control technology of modern electromechanical system in the design process, and put their own plan into practice through the application of professional knowledge.

Famous experts, researchers and senior managers from the industry are employed as part-time lecturers. Through lectures, collaborative teaching and other forms of communication, the cutting-edge problems of the machinery industry and key technical problems affecting the development of the industry are closely displayed in front of the students, which can not only exercise the scientific research ability, but also greatly broaden the students' horizons.

In combination with the objectives of curriculum reform, carry out a series of comprehensive innovation practice projects with enterprises, introduce actual projects of enterprises in the construction of practical training courses in schools, complete the design of supporting curriculum system and production plan, scientifically carry out practical teaching, and introduce teaching means such as virtual simulation and modern simulation processing in curriculum practice, Make the curriculum theory and practical operation closely linked.

Conduct in-depth docking with enterprises, build the project teaching case base, design typical projects in combination with different curriculum teaching objectives and tasks, realize the decomposition of training tasks at each stage of curriculum teaching, integrate advanced ideas and technologies into curriculum teaching, and strengthen the connection between theory and practice. Experts selected by enterprises and college teachers jointly carry out curriculum integration, and develop teaching materials / experimental guidance supporting the curriculum system in combination with curriculum teaching conditions.

Emphasize the guiding role of industry certificates, skill certificates and innovation competitions for students, integrate them into the professional practice teaching system, improve the participation of students at different stages in various competitions, and change the improved innovation activities originally only participated by senior students into curriculum assisted innovation activities jointly participated by senior and junior students, So that junior students have the opportunity to cultivate expansionary and innovative thinking, participate in and implement innovative practical activities through various competitions, and form an effective support for

existing theories through such activities.

2.3 Strengthen the Construction of Teaching Staff, Pay Attention to Improving Practical Teaching Ability, and Cultivate the Spirit of Loving Posts, Dedication and Innovation

Introduce high-tech, highly educated and highly qualified young teachers and applied teachers with rich enterprise work experience and practical background in key positions through multiple channels and forms. With the help of part-time teachers, carry out mutual assistance, cooperation and learning exchanges with full-time teachers to enhance the practical teaching ability of full-time teachers. In addition, young teachers are encouraged to go out of the “ivory tower”, visit and study the production and manufacturing process of the enterprise, understand the technical application and the actual needs of the post, guide teachers to be familiar with the enterprise production process and service system, establish basic professional awareness, and lay a foundation for the cultivation of counterpart talents. Build a high-level teaching team composed of high-level teachers and enterprise technical backbone with rich practical teaching experience, love and dedication, unity and cooperation and courage to innovate.

2.4 Create a “Collaborative Education” Mechanism for School and Enterprise Three Circles

Strengthen the construction of teachers' ethics and style, and establish teachers' awareness of educating people. Publicize and exchange the ideological and political ideas of professional courses through various forms and channels, such as lectures and training on Ideological and political education of some courses, discussion on Ideological and political Demonstration Courses of courses, collaborative lesson preparation between Ideological and political teachers and professional courses, and exchange of Ideological and political experience of courses, so as to improve the ideological and political education ability of professional teachers. Guide teachers to cross the “Ideological and political barrier” in professional course teaching, solve the island problem of Ideological and political course, and realize the turn from “Ideological and political course” to “curriculum ideological and political”. At the same time, establish a good school enterprise cooperative practice base to realize the collaborative education of professional course teachers and enterprise engineers. In all kinds of teaching activities, teachers should deeply study the national education policy and professional setting plan, strictly formulate the syllabus and teaching plan, accurately grasp the teaching opportunities and teaching methods, fully carry out the teaching of mechanical specialty in combination with the characteristics of specialty and ideological and political education, and solidly promote the first classroom of professional teaching in the “inner circle”, the quality education in the “middle circle” and the second stage of network education Under the “three circles” synergy of the three classrooms and the “three circles” of social resources brought by the “outer circle” school enterprise cooperation and the integration of industry and education, teachers and students work together to build a professional ideological and political education and Teaching System Integrating Ideological and political elements, professional teaching and comprehensive quality. Teachers and students make full use of internal and external resources, create professional ideological and political education in an all-round way and in the whole process, and jointly cultivate great country craftsmen.

3. Conclusion

Through the reform of teaching mode and teaching method, highlight engineering practice and comprehensive application in the training process of applied talents of mechanical design, manufacturing and automation specialty, strengthen the overall design of practical projects, so that students can master the basic structure principle and application method of electromechanical system, and learn the basic design and application of electromechanical control and application system on this basis Installation and commissioning methods.

Relying on a good practical teaching environment, design solutions in line with practical engineering application, so that students can comprehensively train and improve their basic knowledge, personal ability, interpersonal team ability and engineering innovation ability in the

whole process of comprehensive practice, so as to cultivate students' electromechanical comprehensive application ability and engineering practice ability, The purpose of stimulating students' awareness of scientific and technological innovation.

In the study of professional courses, students imperceptibly integrate values and ideology into value judgment and cognitive structure. Stimulate the students' enthusiasm of loving the motherland and machinery major. Understand that on the premise of learning solid professional knowledge and skills, we should cultivate our work style of love and dedication, hard study and strong will to overcome difficulties, so as to make a difference in our future work.

References

[1] Lu Chen. “Research on talent training mode of mechanical specialty under the background of intelligent manufacturing”. Industrial Technology Innovation, vol.5, no.1, pp. 113-114, 2019.

[2] Zhou Ji, Chinese Academy Engineering. Intelligent Manufacturing--Main Direction of”Made in China 2025”[J]. China Mechanical Engineering, 2015.

[3] Wei-Shuai L V. Development of Key Intelligent Manufacturing Technology and Reform of Higher Vocational College Curriculum. 2019.