

Exploration and Practice on the Cultivation of Postgraduates Majoring in Electronic Information in Chongqing Under the Background of *Made in China 2025*

Gang Wei, Guofang Gao^{*}, Zhengqin Cao, Yang Mo, Qilin Yi

School of Electrical Engineering, Chongqing University of Science and Technology, Chongqing, China

Email address:

ecqweig@163.com (Gang Wei), gaoguofang_cqust@163.com (Guofang Gao), caozhengqin@vip.sina.com (Zhengqin Cao), 3112291707@qq.com (Yang Mo), 1435513868@qq.com (Qilin Yi)

^{*}Corresponding author

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Abstract: In 2015, the State Council issued *Made in China 2025*. The cultivation of professional postgraduates under the background of *Made in China 2025* has become a hot spot. At the same time, *Made in China 2025* also puts forward new requirements for talent cultivation in Chinese universities. Chongqing has the largest electronic information industry cluster in the world and the largest automobile industry cluster in China. Electronic information is the largest pillar industry in the city. At present, there are few colleges and universities in Chongqing to train electronic information professionals (Masters), which is very mismatched with the rapid industrial development in Chongqing. As a result, the current situation of the existing training system of master's training in electronic information in Chongqing can not meet the talent demand of the electronic information industry in Chongqing. This paper carries out the exploration and practical research on the postgraduate training system from the aspects of the setting of the interdisciplinary curriculum system, the reform of the training mode guided by the industrial demand, the perfect cross-training process, the construction of the curriculum system with Chongqing and industry characteristics under the needs of the new economy, and the construction of innovative practical projects that meet the new requirements and highlight the leading role of enterprises. Combined with the positioning of "local, open and applied", this paper meets the needs of local social and economic development for advanced applied talents of electronic information, constructs the curriculum system of graduate students majoring in electronic information, and creatively explores new countermeasures for the cultivation of graduate students majoring in electronic information under the new situation, to improve the traditional cultivation mode of professional master students in Colleges and universities, Apply the connotation of new engineering to the reform of training mode, effectively improve the training quality of master's degree students majoring in electronic information, and provide a strong guarantee for the training of senior technical talents facing the electronic information industry (especially the electronic information industry in Chongqing).

Keywords: *Made in China 2025*, Digital Information, Professional Master, Talent Cultivation

1. Introduction

The State Council issued *Made in China 2025* in 2015. Since then, major universities have carried out a lot of research and practice. When the China National Knowledge Infrastructure was taken as the source of the literature with "Made in China 2025, specialty, education" as the keywords, 457 documents were retrieved. As we can see, keywords such

as "Made in China", "Intelligent Manufacturing", "Higher Vocational Colleges", "Vocational Education", "Teaching Reform", "Cultivation Mode", and "Innovation and Entrepreneurship" are relevant research in this field. The *Made in China 2025* plan puts forward the development concept of industrial power, which is slowly transformed from the traditional labor-intensive industrial group to the high-tech skill industrial group, to achieve the goal of

industrial development and reform. Under the background of the new era, According to the requirements of China's industrial transformation in the future, higher education needs to actively innovate, cultivate and improve the professional quality of professionals, and promote the upgrading and transformation of China's manufacturing industry [1]. Facing the *Made in China 2025*, Compound talents majoring in electronic information should not only master the knowledge of intellectualization, digitization, and networking but also can integrate business, management, promotion of information technology, and professional knowledge. For the problems in the process of the intelligent manufacturing production system, students should have the innovative ability to find, analyze and solve problems. Therefore, Graduate students majoring in electronic information should have excellent practical skills to become compound talents with technical skills in the intelligent production processes. As an important part of professional talent cultivation, colleges and universities should give full play to their advantages and promote educational reform under the national strategic development. Under the *Made in China 2025* strategic plan, to achieve the development goal of industrial upgrading, colleges and universities need to reposition the training direction of graduate talents majoring in electronic information based on national development and market demand, to cultivate high-quality professional and skilled talents to meet the needs of society [2].

Taking computer major students as an example, cultivating the craftsman spirit of computer major students and realizing educational inheritance has become an important teaching goal of computer major teaching from the perspective of *Made in China 2025* [3]. Premier Li Keqiang repeatedly mentioned intellectualization in five projects and ten fields in the action plan. Intellectualization is the fundamental driving force for China to move from a large manufacturing country to a powerful manufacturing country [4]. To achieve the goal of Electrical automation, the electrical automation specialty is the core. Therefore, the electrical automation specialty in some higher vocational colleges must adapt to the new industrial upgrading. At the same time, it is necessary to reform and innovate the talent training scheme. As the core curriculum of the specialty, the reform of factory electrical control equipment is also imperative [5]. To carry out curriculum reform, we should innovate educational methods and adjust teaching contents to improve the quality of talent training and better serve the development of the industry. Give full play to and respect the characteristics of students, improve students' innovative consciousness, and finally achieve the educational goal of Building Morality and cultivating people. The proposal of *Made in China 2025* marks the formal implementation of China's plan to build a manufacturing power, which is inseparable from the cultivation of high-tech skilled talents. Teachers' professional development is the direct determinant of the improvement of the quality and level of higher vocational education and the key to the improvement of teachers' teaching ability, while students' development needs teachers' guidance and cultivation. "Teaching" plays a

vital role in "learning", and the professional development of higher vocational teachers is of decisive significance to the cultivation of higher vocational talents [6].

2. New Requirements of *Made in China 2025* New for Talent Training in Colleges and Universities

Made in China 2025 deploys to comprehensively promote the implementation of the strategy of making a strong country, proposes 9 strategic tasks such as improving the country's manufacturing innovation capacity, and promoting the deep integration of informatization and industrialization [7, 8]. It proposes to deepen the reform of the system and mechanism, improve the multi-level talent training system, further expand the opening up of the manufacturing industry, improve the organization and implementation mechanism and other eight aspects of strategic support and guarantee, put forward higher requirements for the training of application-oriented senior information technology talents in local colleges and universities.

2.1. Highlight the Cultivation of Characteristics and Enhance the Connotation of Education

Beginning in 2020, the original engineering master's 40 fields of enrollment will become a professional master's enrollment for 8 major industries in China. Among them, Electronic Information Professional Master includes New Generation of Electronic Information Technology (including Quantum Technology, etc.), Communication Engineering (including Broadband Networks, Mobile Communications, etc.), Integrated Circuit Engineering, Computer Technology, Software Engineering, Control Engineering, Instrumentation Engineering, Optical Information Engineering, Biomedical Engineering, Artificial Intelligence, Big Data Technology, and Engineering, Network and Information Security, etc. 12 fields or directions. This requires colleges and universities to face the industry, rely on the industry, apply the cutting-edge technology of the subject, cut into the industry segmentation field, combine the geographical characteristics, highlight the cultivation of employment needs, continuously form their characteristics and advantages, and enhance the educational content.

2.2. Combining Industry Characteristics to Reconstruct the Curriculum System

Made in China 2025 has the characteristics of high-end intelligence and high integration [9-11]. On the occasion of the fourth technological revolution (cloud, things, big, smart, mobile, etc.), we will attach importance to the leading role of information network technology in today's technological revolution and industrial transformation, aim at industry development trends, and integrate Cloud Computing, Internet of Things, Big Data, Artificial Intelligence, Mobile Internet, VR/AR, Human-computer Interaction, User Experience, and

other information network technologies, establish dynamic innovation and entrepreneurial special courses, reconstruct the curriculum system that combines information technology and traditional courses, and build a professional master's curriculum cluster adapted to the industrial structure [12-14], and take the road of character development of applied universities.

2.3. Based on Industry Needs, Strengthen Practical Training

Electronic Information is a comprehensive science and technology integrating the acquisition, transmission, storage, processing, and display of information, including a complete set of technology chains and innovation chains [15]. The new generation of electronic information technology continues to be deeply integrated with the manufacturing and service industries. The manufacturing and service industries are fully transformed and upgraded, and innovation and development are ushering in major opportunities. Based on practice and guided by projects, it promotes students' innovative spirit and enhances students' innovative ability.

2.4. Reconstruct the Employment Concept for Emerging Jobs

At present, overcapacity, shrinking technology research and development projects, and low demand for talents exist in some traditional industries. There are also a considerable number of college students who have not entered relevant professional industries for employment. *Made in China 2025* puts forward social needs and industry pain points such as the producer service industry and mass consumer life service industry, and guides students to change their traditional employment concepts and adapt to emerging jobs.

3. Current Status of Current Training System for Masters of Electronic Information Majors in Chongqing

Chongqing has the largest electronic information industry cluster in the world and the largest automobile industry cluster in China. Electronic information is the largest pillar industry in the city. Chongqing is also one of the important energy and chemical industry bases in China. It is rich in natural gas and shale gas resources. The energy and chemical industry is also the "6+1" key industry of the city. At present, traditional industries such as petroleum metallurgy and clinical medicine are facing industrial transformation and upgrading. The strategic layout of data artificial intelligence in Chongqing is driving a new round of industrial upgrading, industrial restructuring, and technological upgrading. There is a strong demand for high-level applied professionals in the field of electronic information.

At present, there are few colleges and universities in Chongqing that train electronic information professionals (masters), which is extremely incompatible with the rapid industrial development in Chongqing and presents the

following characteristics.

3.1. Outdated Curriculum Content Does Not Meet the Development Needs of Emerging Industries

Curriculum learning is the main way for engineering master's degree graduate students to master basic theories and professional knowledge and construct knowledge structure [16]. Highlighting practical application is one of the notable characteristics of professional master's talent training [17].

At present, the teaching content of the theory course for postgraduates majoring in electronic information is relatively old, which is divorced from the development of new technologies such as big data, artificial intelligence, edge computing, machine vision, and so on. Such courses are difficult to meet the development of electronic information technology, and it is also difficult to meet the requirements of the national strategic emerging industries for a solid foundation, innovative and complex talents.

3.2. The Traditional Engineering Practice Training Model Is Decoupled from Industry Characteristics

Engineering practice is an important teaching link of professional degree graduate education [18], but some colleges and universities do not fully understand the practice. Most of the engineering practice was formalism, and the effective effect of engineering practice education on the cultivation of graduate students' professional quality and practical ability has not been brought into play.

Most colleges and universities adopt a combination of intramural practice (centralized and decentralized practice) and off-campus practice (arrangement of schools and tutors). However, the electronic information industry involves artificial intelligence, big data, software engineering, control science, communications, and other related fields. Enterprises in these fields are high-tech, small-scale, and asset-light, which brings difficulties and challenges to the large-scale practical education arrangements for graduate students.

4. Exploration of Electronic Information Course System Under the Background of *Made in China 2025*

As an important channel for the cultivation of applied talents, local undergraduate colleges and universities, under the background of *Made in China 2025*, combined with the positioning of "locality, openness, and application-oriented", to meet the needs of local social and economic development for advanced electronic information application-oriented talents, and to build a postgraduate course system for electronic information majors to provide a strong guarantee for cultivating senior technical personnel for the electronic information industry (especially the electronic information industry in Chongqing).

4.1. Curriculum System Setting for Interdisciplinary

During the three-year training process of professional degree graduate students, a cross-training method of "course learning based on school-enterprise cooperation+industry-based engineering practice+project-based dissertation" is constructed.

4.1.1. Curriculum Learning System of School-enterprise Cooperation

Based on the characteristics of the industry, with colleges and universities as the main body of education, vigorously promote enterprises to enter the classroom, and construct a school-enterprise cooperation curriculum learning system, as shown in Table 1 below.

Table 1. School-enterprise cooperation curriculum learning system.

Course category		Content	Purpose	Educational subject
Compulsory course	Public compulsory course	Dialectics of nature, Theory and Practice of Socialism with Chinese Characteristics, Engineering Ethics, Scientific paper writing	Establish socialist core values and correct professional values and professional ethics	Colleges
	Professional Basic Course	Mathematical statistics numerical analysis, signal processing, image processing	Master the solid basic theory in the field of electronic information	Colleges
	Professional Foreign Language Course	Professional English	Master the application of English in the field of electronic information	Colleges
	Professional core courses	Scientific research data acquisition, artificial intelligence and applications, machine learning, natural language processing, 3D reconstruction and virtual reality, big data and cloud computing	Master the professional skills in the field of electronic information	School-enterprise cooperation
Elective course	Public elective courses	Document writing, Innovation and Entrepreneurship	Master the quality of humanities and innovation and entrepreneurship	Colleges
	Professional Elective	Digital image processing and machine vision, smart security technology, data visualization, new sensor technology	Master the cutting edge technology in the field of electronic information	School-enterprise cooperation

4.1.2. Industry-based Engineering Practices

Engineering practice is an important link in the training process of professional degree graduate students. Sufficient and high-quality professional practice is an important guarantee for the quality of professional degree graduate training. The industry and local characteristics of electronic information specialty are not obvious, and the cultivation of a master's degree in electronic information specialty is still in the exploratory stage.

With "engineering background"- "professional knowledge"- "practical projects" as the mainline, pay attention to the application of technology and the cultivation of vocational skills of students. At the same time, we should fully investigate the needs of industries and enterprises for talents, be guided by industry needs, and set up a rationally Curriculum system, timely innovate teaching concepts, establish a diversified characteristic teaching model that pays equal attention to theory and practice. we should implement the dual main body of school and enterprise, make full use of the high-quality resources of the enterprise, conduct systematic practical training with clear themes and reasonable content, and adopt the combination of centralized practice and segmented practice.

Build an innovative practice platform of "hardware-software-comprehensive application", and students can participate in the school-enterprise cooperation project between the mentor of the training unit and the enterprise [19]. After the practice is over, the assessment will be carried out in the form of a practice report, practice experience, or practice summary, and the corresponding credits will be awarded after passing the assessment.

4.1.3. Project-based Dissertation

Relying on the actual needs of the enterprise, we will control the whole process from thesis topic selection, topic opening, mid-term inspection, thesis defense, and so on. Especially from the topic selection, the professional master's thesis is more required to be based on the enterprise and emphasize engineering and practicality.

4.2. Industry Demand-oriented Training Method Reform

Relying on the scientific and technological innovation project of the school-enterprise alliance, combined with the professional qualification certification, under the new requirements of cultivating diversified and innovative outstanding engineering talents, we have carried out practical education and research. Relying on the existing scientific research and teaching platforms of each school at the provincial and ministerial level and above, we have continuously integrated scientific research resources and teaching resources [20, 21], opened up teaching and scientific research platforms and developed a batch of postgraduate science and technology innovation training projects. At the same time, in accordance with the characteristics of high-tech, small-scale, asset-light, and other high-tech enterprises, we have reformed the school-enterprise joint education mechanism, explored the establishment of innovative projects with enterprises as the main body, and provided practical education for graduate students. we have appointed senior technical personnel or senior managers of enterprises as corporate instructors, assisted by instructors in colleges and universities, and be responsible for the guidance of students' innovative projects throughout the process. we have improved the engineering ability, practical ability, and

application ability of professional graduate students through practical links to meet the needs of the society and industry for professional degree graduate students.

Guided by vocational qualification certification, through the credit conversion mechanism of vocational qualification certificates, we have established a scientific and feasible vocational qualification certification connection training system, and improved the practice ability training system for masters in electronic information.

4.3. Improve Cross-training Process

Take the crossover approach of "course learning + engineering practice + dissertation". Strengthen skill training and improve the professional level. Classroom teaching is the main position, and enterprises are the main battlefield. Attach importance to the cultivation of students' engineering skills and build a composite knowledge structure. Implement the teaching mode of combining work with study, encourage students to go to the enterprise, to go to the engineering. In the engineering practice of the enterprise, the students gradually establish correct professional values, master the industry norms and basic ethics of the corresponding industry.

4.4. Building a Curriculum System Chongqing and Industry Characteristics Under the Needs of the New Economy

Chongqing has the largest electronic information industry cluster in the world, and Chongqing Science City is the cluster area of Chongqing's electronic information industry. Traditional industries such as automobiles, energy, and metallurgy are facing industrial transformation and upgrading, and vigorously promote automation, intelligence, and green development. Take advantage of the favorable location advantages of the core area of Chongqing Science City and the advantages of Chongqing's industrial clusters and industries. Through investigations of related enterprises, according to the demand for graduate students of electronic information majors in the new engineering department, we have combined with the school-running characteristics of each school, followed up with big data and artificial intelligence, edge computing, machine vision, and other new technologies, updated professional theoretical courses, and selectively build modular courses suitable for various fields, such as "Artificial Intelligence and its Application", "Intelligent Detection and Diagnosis", "Industrial Internet of Things", etc. we have built a master's program of electronic information into a curriculum system with Chongqing and industry characteristics.

4.5. Construct Innovative Practice Projects That Meet the New Requirements and Highlight the Leading Role of Enterprises

With the enterprise as the main body, according to the actual needs of the enterprise, we have established innovative projects suitable for postgraduates. Through the way of recruitment, two-way selection, to provide graduate students

with practical education. Appoint senior technical personnel or senior management personnel of the enterprise as corporate instructors, assisted by instructors of colleges and universities, and be responsible for the guidance of students' innovative projects throughout the process. Improve the engineering ability, practical ability, and application ability of professional graduate students through practical links to meet the needs of the society and industry for professional degree graduate students.

5. Conclusion

From the perspective of *Made in China 2025* strategy of manufacturing a strong country, this article analyzes the current situation of the cultivation of electronic information majors, puts forward some suggestions on the construction of the curriculum system, and creatively explores new strategies for the training of electronic information majors under the new situation, to improve the traditional training model of universities, truly applying the connotation of new engineering to the reform of training model, and effectively improving the quality of postgraduate training for electronic information majors.

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