

## **Construction and Practice of Curriculum System of Mechanical and Electrical Specialty in Colleges and Universities**

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**ABSTRACT.** *At present, China is in the critical period of transformation from a big manufacturing country to a manufacturing power. The production and manufacturing of all kinds of high-tech products are inseparable from mechanical and electrical technology. The shortage of high-quality mechanical and electrical professionals is a prominent problem in the current industrial upgrading. As the main link of talent transportation, colleges and universities should timely reform and optimize the construction of the existing curriculum system. Therefore, this paper puts forward the construction and practice of curriculum system of mechanical and electrical specialty in Colleges and universities. This paper makes an in-depth study on the current curriculum system of mechanical and electrical majors in Colleges and universities. The analysis shows that in the current talent training mode, there are typical problems such as emphasizing theory and neglecting practice, backward curriculum setting and lack of practical application. In view of these problems, this paper puts forward the optimization and improvement measures, through the establishment of mechanical and electrical professional teaching system, dynamic adjustment according to the professional positioning changes, improving the degree of attention to the practice of the assessment of the curriculum system, as well as put forward the guarantee measures of the practice teaching curriculum system, to construct a complete set of mechanical and electrical professional curriculum system in Colleges and universities. The main purpose of the system is to cultivate practical ability, at the same time, it takes into account the study of theoretical knowledge, strengthens the professional quality of students, broadens the coverage of knowledge, and improves the ability to solve practical problems in production and manufacturing.*

**KEYWORDS:** *Mechanical and Electrical Major, Major in Mechatronics, Curriculum System, Reform in Education*

## 1. Introduction

Electromechanical technology is the core technology of modern manufacturing industry. At present, China is in the transition stage from a manufacturing country to a manufacturing power. The most significant sign of the improvement of manufacturing modernization level is that a large number of automated manufacturing systems have replaced the traditional low degree of automation production mode [1-3]. Modern mechanical and electrical technology is a high-tech organic combination of mechanical, electronic and information disciplines, which is widely used in machinery, electronics, automobile and other industries. It can be said that as long as any product is put into industrial production, automation production technology is indispensable. The core technology of automatic production and manufacturing is Electromechanical technology. Compared with the world advanced level, there is still a big gap in China's mechanical manufacturing industry [4-5].

Mechanical and electrical specialty is one of the largest professional groups in higher education. In order to cultivate high skilled talents, colleges and universities should innovate talent training mode and implement the concept of work study combination in the teaching implementation process [6-7]. Therefore, it is necessary to break the original basic curriculum system and establish a curriculum system in line with the cultivation of students' comprehensive quality and professional ability. The curriculum system of talent training mode is the result of continuous exploration, practice and improvement in Colleges and universities. In the process of teaching reform, colleges and universities should timely design and optimize the curriculum system according to the development of mechanical and electrical majors [8-10].

This paper deeply studies the construction mode of the curriculum system of mechanical and electrical majors in Colleges and universities in China, and understands that there are many problems and deficiencies in the setting of mechanical and electrical curriculum system in China's colleges and universities. The theory teaching is still too much, and the teaching method is single, and the teaching content is out of line with the needs of the times, which cannot achieve the ideal goal for the cultivation of students' practice and comprehensive ability, which seriously affects the training plan of high-quality talents of mechanical and electrical specialty in China. Therefore, this paper puts forward the construction and Practice Research on the curriculum system of mechanical and electrical specialty in Colleges and universities. It is hoped that through the optimization and improvement measures of this paper, the construction of the existing curriculum system of mechanical and electrical specialty in Colleges and universities will be helpful to improve the existing teaching system of mechanical and electrical engineering in Colleges and universities, and promote the overall development of China's modern manufacturing industry. In view of the existing problems, this paper gives the specific optimization and improvement scheme, including the construction of the mechanical and electrical professional curriculum system, the establishment of training objectives for mechanical and electrical talents in Colleges and universities, and the promotion of modern teaching methods, etc., and gives a comprehensive

optimization scheme for the training mode of mechanical and electrical professionals in Colleges and universities. In this paper, the relevant investigation and research, further verified that the practice-based College mechanical and electrical curriculum system for the comprehensive ability of mechanical and electrical professional students played a great help, and has been widely praised by students, high satisfaction.

## **2. Mechanical and Electrical Specialty and Curriculum System Design**

### ***2.1 Connotation of Teaching Curriculum System Design***

The two concepts of curriculum system design and curriculum design are different and need to be distinguished. Curriculum design is a process of selecting, organizing and arranging the elements of curriculum, while curriculum design is a process of sorting out many elements of curriculum from a micro perspective. The design of the curriculum system is to combine the selected courses under the guidance of the corresponding training objectives, so that all kinds of subject elements can be organically integrated into the curriculum system, and finally realize the training process. Curriculum system design is a process of determining the training objectives of curriculum system, formulating and evaluating the curriculum system on the basis of comprehensive examination of relevant factors and interrelations in the curriculum system. Therefore, the design of curriculum system can be understood as the guideline of professional construction.

### ***2.2 Thoughts on the Reform of Curriculum System of Mechanical and Electrical Specialty***

Mechanical and electrical specialty is a comprehensive specialty, involving microelectronics technology, mechanical transmission technology and so on. In the learning process, we should learn practical technology from the basic theory. Teaching tasks should be reformed according to the actual situation and in accordance with the following principles:

- (1) The principle of foresight. Due to the rapid development of electromechanical technology, the most practical electromechanical knowledge and skills required by students should be brought into the teaching system.
- (2) Optimization principle. In order to meet the needs of mechanical and electrical technology application ability, the new curriculum should be reorganized according to the requirements of integration to form a curriculum system with professional characteristics.
- (3) Broad principles. In order to adapt to the characteristics of the rapid development of high-tech and help to form the ability of sustainable development, it is necessary to establish a wide range of professional basic theoretical framework.

(4) Ability based principle. Taking ability training as the core, highlighting the applicability of the curriculum system. According to the requirements of students' professional ability, we should break the disciplinary boundaries and optimize the combination of courses.

### 3. Theoretical Curriculum System and Practical Curriculum System Complement Each Other

According to the requirements of post knowledge, technology and quality of Electromechanical industry, corresponding theoretical and practical courses are set up. Theoretical teaching is based on necessity and sufficiency, including three courses: basic quality, mechanical basis and control of electric power. Basic quality courses: Ideological and moral, professional English, computer foundation, advanced mathematics; mechanical foundation courses: mechanical drawing, design, mechanical design, metal technology, mechanics; electromechanical control courses: single chip microcomputer principle, mechanical engineering detection, electrical control, mechatronics system design; improve the proportion of practical teaching, pay attention to basic operation skills, professional application ability and comprehensive Quality training. The main courses are equipped with practice links, which make the theory and practice courses deeply integrated, forming a systematic teaching process with theory courses as the main part and practice teaching as the auxiliary, as shown in Table 1.

*Table 1: professional quality and ability training list of mechanical and electrical specialty.*

vocational ability	Theoretical curriculum	Practice	certificate
basic quality	Ideology and morality	labor for public good	English proficiency certificate
	Professional English		
	Fundamentals of computer	military training	Computer grade certificate
	Advanced mathematics		
Mechanical Foundation	Mechanical drawing	curriculum design	Draftsman certificate
	machine design		
	Metal technology	Metalworking practice	Intermediate mechanical certificate
	engineering mechanics		
Electromechanical control	Principle of single chip microcomputer	Course design of single chip microcomputer	MCU Engineer
	Mechanical engineering inspection		
	electric control	Course design of electrical control	
	Design of Mechatronics System		

## 4. Discussion

### 4.1 Analysis on the Main Effect of the Practice Based Curriculum System of Mechanical and Electrical Specialty in Colleges and Universities

Since 2017, after five rounds of practice in a university in Suzhou, a total of 38 classes have systematically implemented the new curriculum system based on practice and achieved gratifying results. In this paper, eight indicators of satisfaction with the course content (A), satisfaction with the teaching methods (B), satisfaction with the overall curriculum (C), conducive to the cultivation of practical ability (D), conducive to the cultivation of comprehensive ability (E), conducive to the improvement of learning interest (F), conducive to students' autonomous learning (G), and the clarity of learning objectives (H) are adjusted in this paper Check the statistics, as shown in Figure 1 and Figure 2.

The results show that students' learning enthusiasm has been significantly improved. Compared with the non-pilot class, the overall satisfaction of students to the course has been greatly improved, and the comprehensive ability of students has been significantly improved. Since the implementation of the curriculum reform, the "double certificate" acquisition rate and employment rate of the pilot class graduates have reached 100%. Students majoring in mechanical and electrical engineering have achieved excellent results in all kinds of competitions at all levels, successfully solving the contradiction between the original curriculum system and the goal of cultivating high-quality talents, reflecting the characteristics of higher education, highlighting the characteristics of higher education, in line with the goal of cultivating mechanical and electrical talents in Colleges and universities.

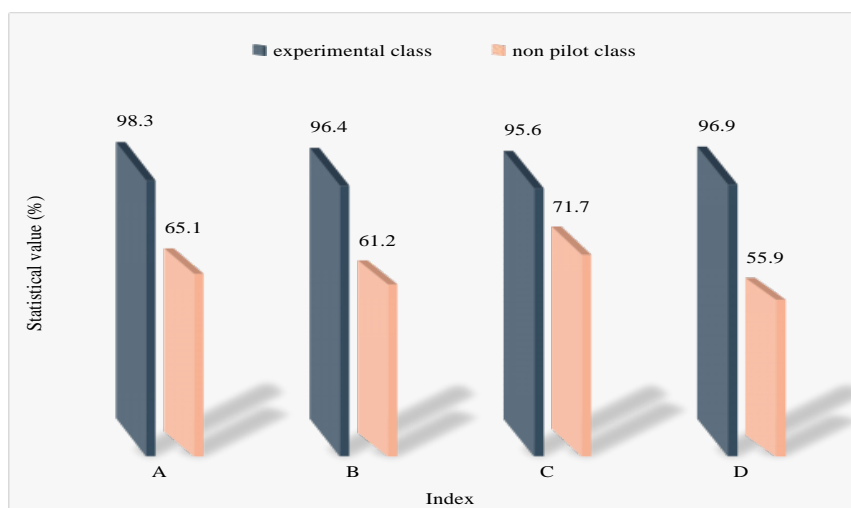


Figure 1. The result of students' survey on the overall difficulty of the course 1

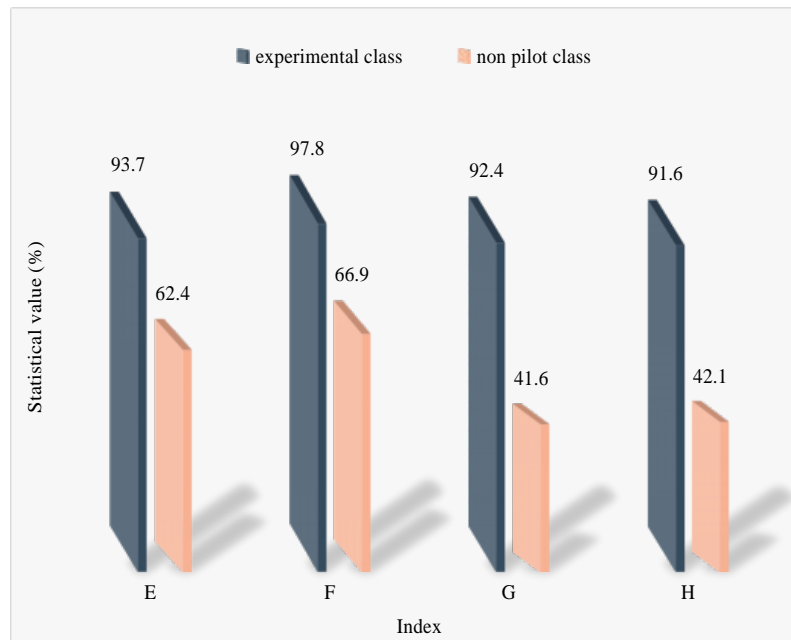


Figure 2. The result of students' survey on the overall difficulty of the course 2

#### 4.2 Construction of Teaching System for Mechanical and Electrical Specialty

According to the requirements of the position, knowledge and ability structure, the principle of application as the main line, ability as the center, and the principle of sufficiency and necessity are adopted to cultivate students' practical operation skills and reflect the characteristics of innovative higher vocational education.

Machine oriented: emphasize the main role of mechanical part in the mechanical and electrical system, that is, the work of mechanical and electrical equipment ultimately depends on the movement of machinery. In this process, sensing and control should serve for it. Therefore, in the arrangement of teaching links, the proportion of electromechanical class hours is about 6:4, and the mechanical class hours are slightly higher.

Taking electricity as the center: the key point of the course system is the electronic and electrical control of mechanical and electrical equipment, so we should deal with the relationship between electromechanical courses. In the arrangement of teaching links, the idea of running a school mainly by electricity is adopted, and the time ratio of Electromechanical is about 4:6. In the course content, the mode can ensure that students have enough basic knowledge of computer application, electrical control, programming and so on.

#### ***4.3 Dynamic Adjustment According to the Change of Professional Orientation***

Specialty orientation is the basis of constructing curriculum system. We should set up professional courses according to the specialty characteristics, and dynamically adjust the specialty direction according to the needs of economic and social development such as regions, industries and technical fields. For example, with the transformation and upgrading of equipment manufacturing industry, the society needs a large number of intelligent equipment transportation and scheduling personnel. Therefore, colleges and universities should timely adjust the core professional orientation of the specialty group and actively construct the curriculum system of intelligent equipment. Colleges and universities should analyze the similarities and differences between core majors and related professional teams, further improve the curriculum module, and actively build professional curriculum platform. According to the characteristics of the major, taking the work flow as the main line, we can form a professional shared course and effectively improve the students' professional knowledge and skills.

#### ***4.4 Pay More Attention to the Assessment of Practice Teaching of Mechanical and Electrical Courses***

Assessment is an important means to stimulate students to complete teaching tasks. Therefore, colleges and universities should take students' performance in various experiments as one of the evaluations. The traditional practice course assessment of mechanical and electrical specialty mainly takes the examination, the experimental report and the final experimental result as the assessment standard. This evaluation method cannot evaluate students' practical ability and mechanical and electrical skills, but can only evaluate students' practical ability according to students' experimental reports. Therefore, this evaluation method is not perfect and unreasonable. At present, colleges and universities need to reform the traditional practice assessment methods. Combined with the characteristics of the examination itself, the traditional standard examination mode should be cancelled, the examination methods should be set flexibly, and the quantitative and qualitative examination methods should be combined to carry out practical teaching assessment. The key point of evaluation is not the evaluation of students' theoretical knowledge, but the mastery of students' application ability and practical skills.

#### ***4.5 Safeguard Measures of Practice Teaching Curriculum System***

##### **(1) Provide sufficient funds and policy support for curriculum construction**

Provide sufficient construction funds and relevant policy support, organize the corresponding human and material resources, and construct and design the curriculum system. Set up a research group and submit the first draft of the reform plan to the school for review and approval.

(2) Combine online and offline courses organically to create a strong atmosphere of innovation

Using virtual reality devices such as mobile network video to develop online teaching can promote the diversity of classroom teaching methods and stimulate students' interest. Select innovation and entrepreneurship projects, provide training and financial support, pay attention to its later development, and give care and help at any time.

## 5. Conclusions

In this paper, in the construction and Practice Research of the curriculum system of mechanical and electrical specialty in Colleges and universities, the main problems existing in the construction of the curriculum system of mechanical and electrical specialty in Colleges and universities are deeply studied. At present, there is no improvement in the traditional teaching mode of mechanical and electrical specialty in Colleges and universities. As a result, the training of mechanical and electrical professionals' practical ability is weak, unable to meet the actual production and manufacturing of high-quality personnel demand. The construction mode of curriculum system of mechanical and electrical specialty in Colleges and Universities Based on practical purpose proposed in this paper, to a certain extent, makes up for the typical deficiencies in the construction of mechanical and electrical specialty curriculum system in Colleges and universities, and plays a positive role in promoting the teaching reform of mechanical and electrical specialty in Colleges and universities. Based on the investigation, the advantages of the system are verified by the investigation. In the survey, the students in the experimental class have significantly improved their practical ability and comprehensive ability compared with the students in the non-pilot class. Moreover, students generally believe that the new curriculum system to their own learning help, for their ability to improve plays an important role.

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