

# Teaching Reform of Public Mathematics Basic Courses-- Taking Electronic Information Engineering Major as an Example

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**Abstract:** In order to meet the needs of the "new engineering" transformation of Yangtze University's electronic information engineering major, this project carried out a comprehensive teaching reform of the basic mathematics course in the electronic information engineering major, including completing the course system and teaching content, innovating teaching methods, changing the assessment method, realizing the open sharing of teaching resources, and creating a "golden subject" for the public basic mathematics course. The reform results show that it has improved students' learning interest, cultivated students' innovation and engineering application capabilities, realized the open sharing of teaching resources, and improved the teaching quality of basic mathematics courses and the quality of talent training.

**Keywords:** Emerging Engineering; teaching reform; public basic mathematics courses; Electronics Information Engineering;

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## 1. INTRODUCTION

"Emerging Engineering" is a new direction of my country's engineering education reform based on the new needs of national strategic development[1]. The talent training goals of the new engineering department put forward new requirements for classroom teaching in colleges and universities: pay more attention to the practicality, cross ability and comprehensiveness of the discipline, and break the traditional discipline gap; update the knowledge system of engineering talents, improve curriculum interests, academic challenges,, academic challenges,, academic challenges, academically challenges,, academically challenges, challenges, Eventually promote the comprehensive development of students. Basic public mathematics courses are one of the most important compulsory courses in engineering majors. They are the foundation of almost all subsequent professional courses and an important cornerstone of engineering[2].

Basic public mathematics courses include "Higher Mathematics", "Linear Algebra" and "Probability and Mathematical Statistics". So far, in China, there are not many researches on the basic reform of public mathematics in accordance with the requirements of "new engineering".

In 2018, Yangtze University was approved by the Ministry of Education's first batch of "Emerging Engineering" research and practice projects. Requirements. This research team has always focused on the study of the basic class of public mathematics and the research on online and offline hybrid teaching. In 2019, "Higher Mathematics Speech" was launched online. In 2020, "Higher Mathematics A" was announced as a national first -class undergraduate course (online and offline mixed). This project intends to conduct a comprehensive teaching reform of the basic courses of mathematics in electronic information engineering, open up mathematical foundation and professional curriculum barriers, reconstruct teaching content, innovate teaching methods[3], change the evaluation method, realize the opening and sharing of teaching resource platforms, and the teaching model Innovate, create a "gold class" for basic mathematics lessons.

## 2. RECONSTRUCTING THE CONTENT SYSTEM OF HIGHER MATHEMATICS

### 2.1 Research on Electronic Information Engineering Courses

The electronic information engineering major of Yangtze University is undergoing new engineering reform and practice, adding the direction of big data and artificial intelligence. By conducting construction and development seminars with the electronic information engineering major, strengthening extensive contact and communication between the School of Information and Mathematics and the electronic information engineering major, collecting which knowledge points in the basic mathematics courses are applied to which points in the professional courses, making questionnaires, listing the knowledge points and application paths of the basic mathematics courses one by one, and forming a research report.

### 2.2 Deconstruct the curriculum system and reorganize the teaching content

The one of main courses of electronic information majors are circuit courses, which are fundamentally related to higher mathematics. The demand for mathematical knowledge in circuit courses is mainly the application of basic mathematical concepts and methods. Therefore, in the construction of the curriculum system of electronic information majors, the higher mathematics content system must be established based on the actual situation of circuit courses. After sorting out, we list the higher mathematics knowledge points corresponding to the knowledge points of circuit courses, as shown in Table 1.

To build a higher mathematical content system, it is necessary to make higher mathematics and the corresponding "job grade certificate" corresponding to the majors.

Higher mathematics content should be matched with professional courses. To adapt to industrial transformation and upgrading and its development, professional courses need to

respond in a timely manner about the dynamic needs of the knowledge ability required for professional positions. The required high -counting knowledge modules, master the professional connotation of mathematics concepts combined with professional professional connotation, closely follow the work task selection carrier, preferably facilitate the use of mathematical ideological methods to solve professional problems, and familiarize the degree of mathematical analysis and engineering application capabilities.

Higher mathematics content should be connected to professional standards and curriculum standards. Higher mathematics curriculum standards should be considered from a professional perspective, grasping industry needs, occupational standards and their changes, gathered to refine the general general curriculum goals, and then determine the high -number curriculum module and their teaching goals according to the requirements of the specific curriculum and their teaching goals. , Effectively improve the achievement of higher mathematics to help professional goals.

**Table 1. Correspondence table between knowledge points of circuit courses and required advanced mathematics related knowledge points**

Circuit course knowledge points	Required advanced mathematics knowledge points
Basic circuit concepts, laws and basic analysis methods	Functions, limits, derivatives, calculus, linear algebra
Sinusoidal alternating current, three-phase alternating current	Trigonometric functions, derivatives, definite integrals
Mutual inductance coupling, resonant circuit, magnetic circuit and transformer	Derivatives, definite integrals
Non-sinusoidal periodic current analysis, linear dynamic circuit analysis	Calculus, Fourier series, differential equations
Transistor characteristics and basic applications	Functions, derivatives and differential calculations, derivative applications
Basic signal amplification, feedback amplification, power amplification, integrated operational amplifier	Application of derivatives, integration and differentiation
Signal generation and processing, DC regulated power supply	Derivatives and differentials, definite integrals, functions
High frequency small signal amplification, high frequency power amplification	Definite integral, Fourier series
Amplitude modulation and demodulation, angle modulation and demodulation	Functions (trigonometric, nonlinear), derivatives, definite integrals, power series, Fourier series, limits
Feedback control circuit	Differential and integral operations, differential equations

### 3. CROSS APPLICATION OF MULTIPLE TEACHING MODES

Explore the teaching mode of transforming the main "learning" of "teaching" and "learning". Explore the cross application of teaching modes such as "centralized lectures", "small seminars", "counseling courses"; continue to cooperate with high -quality platforms such as "Good University Online" to explore hybrid teaching models: make full use of modern information technology and other results. New media environments such as mobile phones and iPads, develop mobile Internet teaching methods, promote open teaching, organically integrate online and offline high -quality educational resources and learning resources to organize the autonomy and participation of students 'learning, and improve students' innovative ability.

#### 3.1 Lecture in large class, small class discussion

"Higher Mathematics" is a basic course for non -mathematics majors in colleges and universities. Our school's "Higher Mathematics" uses multi -professional public selection methods. The number of teaching teams is more than 90 or more, and the teaching effect is poor. The teaching class of the "Large Class Teaching and Small Class Research" adopted by this article is selected as a pilot. Based on the "big class teaching", the "small class research" link is added. The "big class teaching" is centered on teachers, teachers dominate the classroom, and realize the function of "teaching". The "big class teaching" mainly explains the basic knowledge points and completes the basic tasks of the outline; the "small class discussion" is aimed

at key difficulties, and students conduct in -depth discussions and exchanges.

The "Small Class Research" was carried out in the smart classroom. The large teaching classes were divided into 2-3 small classes. Each small class was divided into several groups. The number of groups was set at about 5. Two days before the "Small Class Research", the teacher released the topic and discussions on the Internet, and students prepared the theme of the discussion. During the "Small Class Research" process, the group members spoke freely on the topic of the seminar. Other members could express different views and even fierce debate. After the discussion was completed, the group submitted the seminar report to the usual results assessment.

#### 3.2 Online and offline hybrid teaching mode

In recent years, with the rise of online classrooms such as micro -classes and mood classes, teachers "teaching" and students' "learning" have changed. Data show that although online teaching has certain advantages, it still needs to be supplemented by offline teaching to improve the learning effect. Trying the organic integration of modern information technology and traditional teaching model is a trend of reform and development of curriculum teaching in colleges and universities[3-4].

The structure of online and offline hybrid teaching cannot be cut online and offline, and should cooperate with each other. This section uses the "Trinity" online and offline hybrid teaching mode, which mainly includes the "pre -class" of

teachers and students, "in the class" and "post -class". The specific organizations are as follows[5].

Theoretical part. It is mainly reflected in Mu class, micro -class, classroom teaching and expansion. The learning content should be divided into three types: basic level, challenge and excellent level. The foundation level is the basic theory in the course. Through the presentation of mood and micro -class, it lays the foundation for the development of the curriculum design. The challenge level has a higher comprehensiveness and greater difficulty. Students need to "jump and jump to get". The teachers need to teach the principles and methods in the offline class to inspire students to complete higher requirements. In the excellent level, students need to play their autonomy, consider the learning materials independently, communicate with teachers through group collaboration, and rely on group strategies to achieve their goals.

Practice part. It mainly relies on the hybrid teaching mode of "online-offline-online" as its main line. The first stage is "before class": online resources are launched. That is, students are required to preview before class. Published a learning task form before class, mainly based on basic learning content and professional case learning; videos in self -study online resources, courseware materials, and completing online self -test exercises; thinking about the problems in the task form, sorting and uploading self -study notes. The second stage is "class in class": offline classroom teaching. Teachers use a variety of teaching methods to teach and answer questions in the task form. The third stage is the "post -class": online testing and expansion of the content learned again. The Mixed -class classroom teaching mode design schematic diagram is shown in Figure 2.

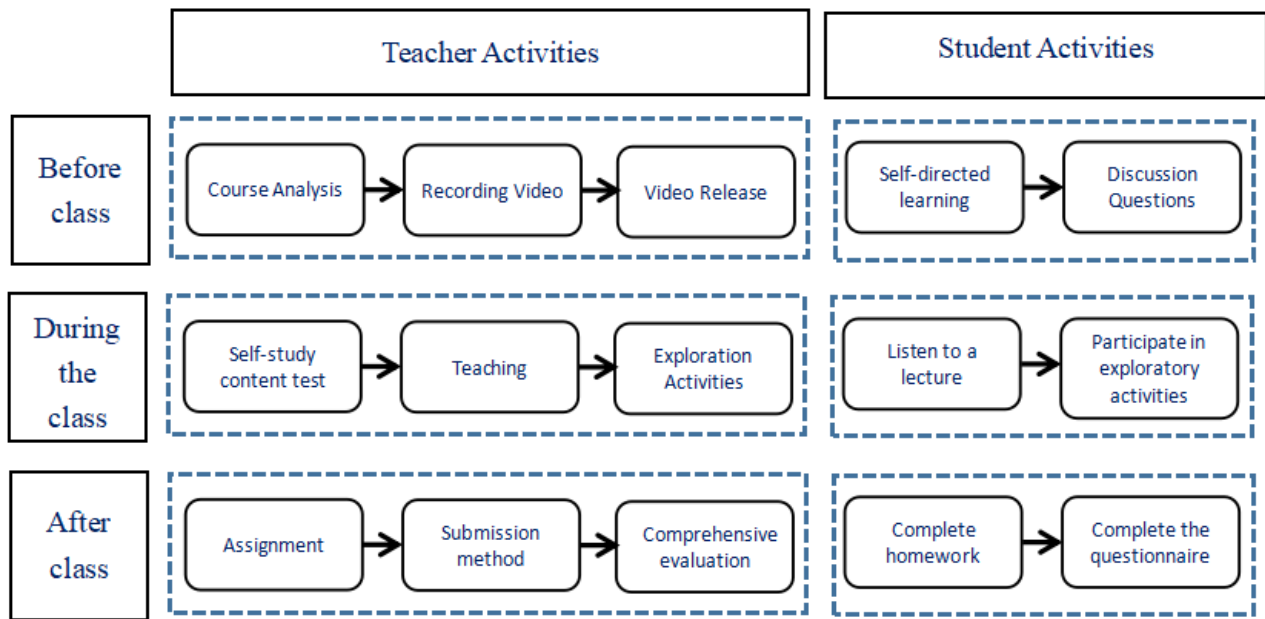


Figure 2. The Mixed -class classroom teaching mode design schematic diagram.

#### 4. DIVERSIFIED COMPREHENSIVE ASSESSMENT SYSTEM

The traditional assessment method, which mainly depends on the final exam, is harmful to assess students' engineering ability. To ensure the effectiveness of teaching, we designed a diversified assessment method, referring to CDIO standards, to assess the students' basic personal ability, interpersonal skills, software development capabilities, and their theoretical knowledge. By utilizing unit tests, classroom performance and extracurricular practical assignments, combined with the comprehensive evaluation of the online open course platform's graduation examinations and final examinations, we have developed an all-round comprehensive assessment model that emphasizes both theory and practice; based on teaching elements and student characteristics, we have comprehensively considered teacher evaluation, peer evaluation and self-evaluation, combined with process evaluation, to establish a diversified comprehensive assessment system.

The assessment method is described as following: (1) Dially work, accounting for 10%, including attendance, homework; (2) Assessment for the learning process, accounting for 60%, which consists of the project self-assessment and teacher evaluation. The project self-assessment for each team member is conducted by the team leader according to the teamwork ability, practical engineering ability, innovation ability, assessment from other members. The teacher's assessment is based on the team's completion of the project, the effect of the project statement, and project report. (3) Final examination result, accounting for 30%, using the traditional examination methods, assessment of students' theoretical knowledge, ability of algorithm design and programming.

Through strengthening the teaching process assessment, we could control each teaching links, guide students to improve the autonomy of learning, and train their abilities of teamwork, engineering practice, and innovation. The new assessment method could improve the teaching effectiveness by avoiding

the students not study usually but drive a night car just before the final exam.

## 5. CONCLUSION

Strengthen the extensive contact and communication between students and teachers of the electronic information engineering major and the School of Information and Mathematics, break the situation of separate training of students from different departments, jointly formulate the training objectives and content of basic mathematics courses, and deeply discuss a series of issues such as the construction and curriculum development of the electronic information engineering major and mathematics major. Strive to form a consensus and gather strength to complete the construction of the "golden course" of basic mathematics courses, further deepen the comprehensive reform of undergraduate teaching in the electronic information engineering major, and promote the construction and development of new engineering disciplines.

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## 7. REFERENCES

- [1] Zhong Denghua, 2017, Connotation and Actions for Establishing the Emerging Engineering Education, Research in Higher Education of Engineering, 2017(3):1-6.
- [2] Ye Min, Kong Hanbing, Zhang Wei, Emerging Engineering Education: From Idea to Action, Research in Higher Education of Engineering, 2018(1):24-31.
- [3] Wang Yueheng, Liu Wenjun, 2018, Modern information technology "Higher Mathematics" course teaching practice, Education and Teaching Forum, 4(17):268-269.
- [4] Cao Yan, Zhang Jian, Meng Guizhi, 2024, Higher mathematics teaching based on online and offline hybrid teaching models- Take the concept of guide numbers as an example, 2024(27):110-113.
- [5] Wang Huiyin, Wang Hongqing, 2024, Study on the integration of mixed -type classroom application cases in curriculum ideology and politics -Take the Teaching of Mathematics Professional Mathematics Course as an example, Higher Mathematics Research, 27(4):39-42.