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Teaching Reform of Communication Electronics Based on CDIO Model

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ABSTRACT

Communication electronics is an important foundational course for communication engineering majors. Traditional teaching methods primarily focus on knowledge transmission, neglecting the cultivation of students' engineering practice abilities. This fails to meet the demands of modern society for versatile talents. This paper proposes a teaching scheme guided by the CDIO model, aiming to cultivate students' ability to comprehensively utilize knowledge to address practical engineering problems, thereby further enhancing teaching quality and nurturing highly skilled communication engineering professionals.

KEYWORDS: *CDIO model, communication electronics, teaching reform*

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1. INTRODUCTION

"Communication Electronics" is a core professional course in communication engineering majors, covering fundamental knowledge of communication systems, small-signal amplifiers, sinusoidal oscillators, resonant power amplifiers, signal modulation and demodulation, and feedback control circuits. This course emphasizes the integration of theory and practice, focusing on cultivating students' practical circuit analysis and design skills. A key research issue in the course's teaching is how to effectively combine theoretical knowledge with practice, thereby nurturing graduates who meet the professional training objectives.

2. Challenges in Traditional Communication Electronics Teaching

With the rapid advancement of information technology, the communication engineering field has witnessed a shift in talent demands. Traditional teaching methods often prioritize classroom lectures, leaving students passively receiving information. Students frequently find the course content dull and difficult to grasp, lacking motivation and enthusiasm. This approach overlooks students' initiative and creativity in the learning process, leading to a disconnect between theory and practice. Students struggle to apply classroom knowledge to real-world situations, impacting their learning outcomes and interest. Additionally, due to constraints in class time and teaching resources, practical training in communication electronics courses is often limited. Students lack sufficient opportunities for hands-on experience, making it difficult to fully grasp circuit principles and hindering their ability to solve practical problems. With the rapid development of communication technology, the content and methods of teaching communication electronics need continuous updates and improvements to keep students abreast of technological advancements and meet their future career development needs.

3. CDIO Model

To address these challenges, the CDIO model has gained widespread adoption in engineering education in recent years. The CDIO model emphasizes the four key stages of "Conceive, Design, Implement, and Operate," aiming to foster students' ability to apply theoretical knowledge to practical scenarios and enhance their engineering skills and innovation[1,2].

4. Teaching Reform Based on the CDIO Model

To effectively integrate the CDIO model into communication electronics teaching, this paper proposes a teaching reform scheme that incorporates the following approaches.

4.1. Project-Driven Teaching

Traditional teaching methods in communication electronics lack real-world engineering problem connections. This reform scheme integrates project-driven teaching into classroom instruction. By designing a series of projects related to communication electronics, students are guided to learn relevant knowledge with a project-oriented approach, thereby strengthening their ability to address practical engineering problems.

Here are the steps for implementing project-driven teaching:

Project Selection: Choose engineering projects related to communication electronics, such as small-signal amplifier circuit design, power amplifier circuit design, oscillator circuit design, and amplitude modulation and demodulation, based on course content and student learning objectives.

Project Decomposition: Divide the project into multiple stages, each with clearly defined objectives and tasks, closely aligned with course content.

Project Implementation: Guide students to implement projects in teams. Teachers can provide technical guidance and regularly organize student project progress reports to assist them in overcoming challenges.

Project Evaluation: Evaluate student project completion through project presentations and defenses.

For example, in an AM circuit design project, students need to undertake tasks such as selecting circuit components, designing circuit schematics, conducting circuit simulations, PCB design, circuit soldering, and circuit debugging based on project requirements. During project implementation, students need to apply theoretical knowledge of communication electronics and leverage simulation software and experimental equipment for practical operations. Through project implementation, students can integrate theoretical knowledge with practical application and strengthen their ability to solve real-world engineering problems.

4.2. Case Study Teaching

By collecting real-world cases related to communication electronics and using these cases as teaching tools, students can be guided to learn and develop their ability to apply knowledge. Specific implementation steps are as follows:

Case Collection: **C**ollect real-world cases related to communication electronics, such as communication equipment failure analysis, design of new communication systems, and FM transmitter debugging. Cases can be sourced from real-world engineering projects, scientific literature, and news reports.

Case Analysis: Guide students to conduct in-depth analysis of cases, examining aspects such as circuit principles, device characteristics, and operating principles involved. Teachers can guide students to consider crucial issues within the case and encourage in-depth analysis and discussion.

Case Discussion: Teachers can act as facilitators, guiding students toward deeper reflection and discussion and encouraging them to express their views and solutions.

Case Summary: Teachers can guide students to summarize the lessons learned from the case and relate them to the course content, helping them deepen their understanding of theoretical knowledge.

5. Conclusion and Future Prospects:

The teaching reform based on the CDIO model in communication electronics has yielded positive results. However, continuous improvement and development are necessary. To further enhance the effectiveness of the course, future teaching should involve deeper collaboration with industry and businesses, integrating real-world engineering projects into classroom instruction, enabling students to better understand industry demands and enhance their engineering practice abilities.

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