Exploration on the Reform of Analog Electronics Technology Course from the Perspective of "Position-Course-Competition-Certificate"

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Abstract: In response to the comprehensive education model of "Position-Course-Competition-Certificate" proposed at the Countrywide Vocational Education Conference, this paper explores the current teaching status of the "Analog Electronics Technology" course from the perspective of this model. The study reveals shortcomings in the alignment between course content and job skill requirements, the empowerment of competitions and certifications, and the course evaluation system. Based on these findings, the article proposes reforms that integrate theory and practice, optimize teaching content and methods through the convergence of post course competition certificate elements, and establish a diversified evaluation system. Through these reforms and practices, the article demonstrates how to modularize and optimize course content, innovate teaching models by combining project-driven pedagogy with vocational skill competitions, and implement a multifaceted course evaluation system. These measures have effectively enhanced students' vocational skills, practical abilities, and innovative thinking.

Keywords: "Position-Course-Competition-Certificate"; Curriculum Reform; Analog Electronic Technology

1. Introduction

In April 2021, the Countrywide Vocational Education Conference explicitly proposed the "Position-Course-Competition-Certificate" integrated education model for the first time. In October of the same year, the document "Opinions on Promoting the High-Quality Development of Modern Vocational Education" emphasized the need to improve the "Position-Course-Competition-Certificate" comprehensive education mechanism [1], designing and developing courses based on actual production and post requirements to enhance students' practical abilities. To align with the requirements of the vocational education conference and guided by the concept of "Position-Course-Competition-Certificate," this paper explores teaching reforms for the foundational course "Analog Electronics Technology" in electronic information majors. It examines the current teaching status of the course, the four-dimensional integrated teaching reform requirements of "Position-Course-Competition-Certificate," and the teaching reform and practice of "Analog Electronics Technology" oriented by "Position-Course-Competition-Certificate." Two years of teaching practice have demonstrated that the teaching model based on the "Position-Course-Competition-Certificate" perspective improves teaching effectiveness and enhances the quality of talent cultivation.

2. Current Teaching Status of the "Analog Electronics Technology" Course

2.1 Misalignment Between Course Content and Job Skill Requirements

"Analog Electronic Technology" is one of the core foundational courses for electronics-related majors, aiming to cultivate students' vocational skills and comprehensive qualities. Under the traditional teaching model, the textbook content excessively emphasizes formula derivations, resulting in teaching primarily focused on theoretical knowledge transmission. However, vocational college students generally have weak mathematical foundations and struggle with understanding abstract concepts. Furthermore, through in-depth enterprise visits and research, it has been found that actual job positions place greater demand on technical talents with skills in diagnosing and repairing common electronic

circuit faults. This indicates a certain disconnect between the current course teaching content and the skill requirements of job positions.

2.2 Insufficient Empowerment through Competitions and Certifications

In higher vocational education's "Analog Electronics Technology" course teaching, "insufficient empowerment through competitions and certifications" has become a key bottleneck restricting the improvement of course quality. This is specifically manifested in the disconnection between course content and professional skills competition requirements, inadequate alignment of teaching with vocational skill certification assessment standards, incomplete coverage of certification exam points in teaching, and students' insufficient attention to certification exams, which consequently affects the pass rate of vocational skill certificates. This current situation of "insufficient empowerment through competitions and certifications" not only limits the improvement of students' professional competence and comprehensive abilities but also directly impacts their career competitiveness and future development, reflecting significant room for improvement in the integration of competitions and certifications in current higher vocational "Analog Electronics Technology" courses.

2.3 Incomplete Course Evaluation System

From the perspective of "Position-Course-Competition-Certificate" integration, the imperfect course evaluation system has become an important factor constraining the improvement of teaching quality. First, the evaluation indicators are singular, primarily focusing on theoretical knowledge assessment, while insufficient attention is paid to the assessment of job-related practical skills, competition innovation abilities, and vocational certification-related competencies, making it impossible to comprehensively measure whether students meet the requirements of "Position-Course-Competition-Certificate" integration. Second, there is a lack of process evaluation, failing to adequately address the cultivation and enhancement of students' key abilities such as practical participation, teamwork, and problem-solving during the course learning process, which makes it difficult to effectively support the comprehensive competency requirements of students across all aspects of "Position-Course-Competition-Certificate" Furthermore, the evaluation subjects are singular, predominantly relying on teacher assessments, with insufficient participation from diverse stakeholders such as industry enterprises and competition experts, resulting in low alignment between evaluation outcomes and job requirements, competition standards and certification demands, and thus failing to provide precise guidance for teaching improvement. This imperfection in the course evaluation system makes it difficult to effectively implement the "Position-Course-Competition-Certificate" integration concept in teaching practice, urgently necessitating the construction of a scientific and reasonable course evaluation system to promote the comprehensive improvement of teaching quality in "Analog Electronics Technology" courses.

3. The Four-Dimensional Integrated Curriculum Reform Requirements of "Position-Course-Competition-Certificate"

3.1 Optimizing Teaching Content Based on Job Requirements

The "Position-Course-Competition-Certificate" four-dimensional talent cultivation model emphasizes job demand orientation, requiring course content to be designed and optimized closely around the needs of actual job positions. In the "Analog Electronic Technology" course, it is essential to analyze the professional knowledge and skills required for positions in electronic enterprises, such as electronic equipment maintenance engineers and electronic product design engineers. The course content should be modularized, highlighting key and challenging aspects while incorporating practical teaching elements relevant to actual job roles, such as smart terminal product debugging and maintenance, as well as the assembly and debugging of electronic products. Through the "learning by doing" integrated theory-practice teaching approach, theoretical knowledge points can be embedded into practical sessions, allowing students to derive theoretical insights from hands-on activities. This transforms the monotony of theoretical classes into engaging and dynamic practical sessions.

3.2 Competition as the Guide, Integrating

Competition, Certificate, and Course

Vocational skills competitions serve as a crucial pathway to enhance students' practical abilities and innovative thinking, as well as an integral component of the "Position-Course-Competition-Certificate" four-dimensional talent cultivation model. In the teaching of the "Analog Electronics Technology" course, "insufficient empowerment through competitions and certificates" has become a key bottleneck hindering the improvement of course quality. To address this challenge, the following measures can be taken: First, incorporate the advanced concepts, cutting-edge technologies, and industry standards from professional electronic skills competitions, exposing students to new industry technologies. Second, align the course content with the assessment criteria of vocational skill certificates, integrating certification requirements into daily teaching to achieve precise alignment between course content and certification standards. Third, innovate teaching methods by adopting project-driven pedagogy, combining real job projects, competition projects, and certification practice projects. Using projects as the medium, students can master practical operational skills in analog electronic technology while completing these projects. Additionally, leverage online teaching resources and virtual simulation technology for specialized training in competition and certification-related content, enhancing students' practical abilities and their capacity to compete and obtain certifications. Furthermore, instructors can guide students to participate in various vocational skills competitions, using these platforms to stimulate their enthusiasm and motivation while fostering teamwork and innovative thinking.

3.3 Certification as the Standard, Refining the Course Evaluation System

Vocational skill certificates serve as crucial credentials for student employment and form a fundamental pillar of the four-dimensional talent cultivation model integrating "Position-Course-Competition-Certificate." In the Analog Electronics Technology course, teaching should align with vocational skill certification standards to refine the course evaluation system. Instructors can establish assessment criteria based on certification requirements, incorporating theoretical knowledge evaluation, practical operation assessment, and vocational certification examination into a comprehensive and objective course evaluation framework. Simultaneously, teachers can adjust teaching content and strategies based on student feedback to enhance instructional quality.

4. Curriculum Reform Practice Guided by the "Position-Course-Competition-Certificate" Framework

4.1 Optimizing Teaching Content

Addressing the actual job requirements of electronics enterprises and competition-certification standards, the "Analog Electronic Technology" curriculum has been modularized into three components: foundational modules, core modules, and extension modules [2].

The foundational module covers essential basic knowledge and skills in analog electronics technology, including semiconductor devices and amplifier circuits. As the cornerstone of electronic circuits, semiconductor devices require students to thoroughly understand their structures, characteristics, and working principles, laying the groundwork for subsequent learning. Amplifier circuits represent the core component of analog electronics technology, where students must master circuit composition, analysis methods, and performance parameter calculations. These fundamental knowledge areas and skills form a solid starting point for students' study of analog electronics technology.

The core modules focus on key competencies required for practical job positions, vocational skill level certificates, and 1+X certifications, including the diagnosis and repair of electronic circuit faults, as well as the assembly and debugging of electronic products. In the fault diagnosis section, students learn to utilize various testing tools and methods to accurately locate circuit faults and perform effective repairs. The assembly and debugging component provides hands-on experience in full-process production from component installation to final product testing, familiarizing students with manufacturing standards and quality control to develop genuine problem-solving capabilities for real-world production scenarios. Developing "course-certification integrated" micro-projects, such as incorporating heat dissipation design specification tests required by certifications into the "Power Amplifier Circuits" chapter, achieves

synchronous cultivation of teaching-assessment competencies.

The expansion module focuses on broadening students' knowledge base and innovative capabilities, encompassing content such as electronic circuit design and electronic innovation practices. It covers the skill requirements of professional competitions like electronic design contests and vocational skill competitions. The electronic circuit design segment encourages students to apply their acquired knowledge to innovate circuit designs based on practical needs, fostering engineering design thinking and innovation skills. Electronic innovation practices provide students with ample opportunities to participate in various electronic innovation projects, stimulating their creative potential and teamwork spirit.

4.2 Project-Driven Teaching Methodology to achieve Integration of Competition, Certification, and Course

Project-driven teaching methodology, with its strong practicality and interactivity, has become a key approach in promoting teaching reform. Based on course content and competition requirements, teachers design a series of challenging and engaging project tasks. Taking amplifier circuit explanation as an example, the teacher introduces the project task of "Design and Production of an Audio Amplifier". During project implementation, a blended online-offline teaching approach is adopted.

Online, teachers release abundant teaching resources through the learning platform, breaking down key knowledge points such as the design principles of amplifier circuits. This includes determining parameters like gain and bandwidth based on practical requirements, as well as selecting appropriate components to meet design specifications. Students no longer passively receive knowledge but actively participate in project completion, gaining a deeper understanding of theoretical concepts through self-directed learning and exploration.

In offline teaching sessions, we incorporate Multisim virtual simulation software for circuit debugging and analysis. Students construct and test circuits in a virtual environment, familiarizing themselves with circuit performance and debugging techniques. Subsequently, they proceed with hands-on assembly and debugging of physical "audio amplifier" prototypes. Through this process, students not only master circuit debugging methods but also continuously optimize circuit performance through iterative adjustments, ensuring the designed audio amplifiers achieve desired outcomes.

The entire teaching process not only enables students to master the relevant knowledge and skills of amplifier circuits but also cultivates their problem-solving abilities and innovative thinking. Through completing project tasks, students experience the integration of theory and practice, significantly enhancing their learning motivation and self-confidence. This innovative teaching approach successfully incorporates practical job-related projects, competition projects, and certification practice projects into" Simulated Electronic Technology "course instruction, achieving deep integration of competition, certification, and coursework. This not only improves students' practical skills and innovative thinking but also lays a solid foundation for their career development and future employment.

Additionally, teachers actively guide students to participate in various vocational skill competitions, including electronic design contests and circuit welding competitions held during the school's science and technology cultural festival. These competitions provide students with a platform to showcase their talents and challenge themselves. The intense atmosphere and rigorous standards significantly enhance students' learning enthusiasm and initiative. During preparation, students must thoroughly explore competition topics and continuously improve their professional knowledge and skills. Simultaneously, competitions cultivate students' teamwork abilities, as many projects require close collaboration among team members to achieve goals. Students take on different roles within teams, collectively solving problems, thereby strengthening team spirit and communication skills.

4.3 Improving the Course Evaluation System

Based on the assessment standards of vocational skill certificates, establish "Analog Electronic Technology" course evaluation indicators, incorporating students' theoretical knowledge assessment, practical operation assessment, and vocational skill certificate assessment into the course evaluation system.

This evaluation system comprehensively covers

multiple assessment dimensions including theoretical knowledge, practical operations, and vocational skill certificates. Among them, the theoretical knowledge assessment focuses on evaluating students' depth of understanding of "Analog Electronic Technology" fundamental knowledge and principles, covering semiconductor device characteristics, amplifier circuit working principles, and various electronic circuit analysis methods. The examination formats are diversified, including not only traditional written tests but also online assessments and case analyses, to comprehensively examine students' understanding and application abilities of theoretical knowledge.

The practical skills assessment focuses on evaluating students' mastery of hands-on operational skills such as electronic circuit fault diagnosis and repair, as well as the assembly and debugging of electronic products. During the assessment process, students are required to complete designated practical tasks within a specified time frame, with instructors evaluating their operational standardization, accuracy, and task completion efficiency. This assessment method accurately reflects students' actual operational capabilities and proficiency levels.

Vocational skill certification assessment is an essential component of this evaluation system. Guided by the assessment standards of vocational skill certificates, it examines whether students possess the corresponding vocational skill levels and whether they can meet industry standards and enterprise requirements. By incorporating vocational skill certification assessment into the course evaluation system, the teaching of the course is closely integrated with vocational skill certification, providing strong support for students' future career development.

5. Conclusion

In the practice of curriculum reform for "Analog Electronics Technology" under the "Position-Course-Competition-Certificate" framework, significant teaching outcomes have been achieved. Students' learning engagement and academic performance have markedly improved, with a substantial increase in the proportion of high-achieving students. Through participation in various vocational skills competitions, students' practical abilities and innovation skills have continuously strengthened, resulting in repeated outstanding achievements. This success stems from the course's alignment with occupational standards and requirements, optimizing course content by integrating competition assessment points and the "1+X" certification system into daily teaching. By developing digital teaching resources that integrate "Position-Course-Competition-Certificate," innovating teaching organizational forms and methods [3], and establishing a comprehensive, diversified teaching evaluation system [4], the teaching focus has shifted toward students, enhancing the course's technical depth while creating flexible and diverse teaching models that effectively improve teaching quality and outcomes. In the future, we will continue to refine teaching methods, strengthen collaboration with enterprises, and introduce more cutting-edge industry technologies and practical project cases to provide students with learning experiences closer to real work environments, further enhancing their employ ability and cultivating more high-quality electronic technology professionals for society. Under the "Position-Course-Competition-Certificate" framework, "Analog Electronics Technology" course reforms have achieved initial success but still require continuous exploration and improvement. Future teaching should further optimize content, innovate methods, refine evaluation systems, and enhance teaching quality to cultivate more high-quality technical talents that meet societal needs.

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