

The Reconstruction and Practice Path of The "Integration of Morality and Technology" Curriculum System of Integrated Circuit Specialty in Higher Vocational Colleges

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Abstract

This paper takes the integrated circuit specialty of higher vocational education as the research object, focusing on the reconstruction and practice of the curriculum system of "integration of morality and technology". Based on the analysis of the characteristics of the current demand for talents in the integrated circuit industry and the current situation of the curriculum system of integrated circuit specialty in higher vocational colleges, by starting from the concept of " integration of morality and technology", this paper puts forward the general idea and implementation path of the reconstruction of the curriculum system of integrated circuit specialty, constructs the curriculum system of "four modules, three links and multiple platforms", and explores the systematic implementation strategies and safeguard measures. In practice, the reconstructed curriculum system should be able to effectively improve students' professional quality and professional skills, and provide reference for the integrated circuit industry to cultivate high-quality technical and skilled talents.

Keywords

Higher vocational education, integrated circuit professional, integration of morality and technology, curriculum system, reconstruction and Practice.

1. Introduction

With the acceleration of a new round of scientific and technological revolution and industrial transformation, the integrated circuit industry as a strategic and basic industry related to national security and development has ushered in unprecedented development opportunities. The introduction of a series of policies such as 'Made in China 2025' National Integrated Circuit Industry Development Promotion Program' further clarified the strategic position and development direction of the integrated circuit industry [1]. In this context, the cultivation of high-quality integrated circuit professional and technical talents has become an important task for higher vocational colleges.

The integrated circuit industry has the characteristics of technology-intensive and talent-intensive. It not only requires professionals to provide solid technical skills, but also requires them to have good professional ethics and professionalism. The report of the 20th National Congress of the Communist Party of China emphasizes that "education, science and technology, and talents are the basic and strategic support for building a modern socialist country in an all-round way", and calls for "accelerating the construction of a strong country in education, science and technology, and talents"[2]. This requires that higher vocational colleges must adhere to the fundamental task of "cultivating morality and cultivating people" when cultivating integrated circuit professionals, organically integrate moral education and skill

training, and achieve equal emphasis on morality and technology and comprehensive development.

However, at present, there are some problems in the curriculum system design of integrated circuit specialty in higher vocational colleges, such as the separation of moral education and skill training, the disconnection between curriculum content and industrial demand, and the separation of theoretical teaching and practical teaching, which are difficult to meet the needs of industrial development for high-quality technical and skilled talents. Therefore, based on the concept of 'integration of morality and technology', the reconstruction of the curriculum system of integrated circuit specialty in higher vocational colleges has become a key measure to improve the quality of personnel training.

2. Theoretical Basis for The Reconstruction of The " Integration of Morality and Technology " Curriculum System of Integrated Circuit Specialty in Higher Vocational Colleges

2.1. The connotation and value of 'integration of morality and technology'

'Moral and technical integration' refers to the organic integration of moral education and skill training in vocational education, and the educational concept and practice of realizing the mutual promotion and coordinated development of moral education and skill education. Its core is to take moral education as the foundation, serve development as the purpose, promote employment as the guidance, integrate ideological and political education, professional ethics training and professional spirit shaping into the whole process of professional knowledge learning and skill training, and realize the integrated cultivation of knowledge, ability and quality. The value of 'integration of morality and technology' lies in: first, it conforms to the essential requirements of vocational education and promotes the all-round development of students; the second is to meet the needs of industrial development for high-quality technical and skilled talents; thirdly, it is conducive to improving the pertinence and effectiveness of vocational education, enhancing students' vocational adaptability and sustainable development ability [4].

2.2. Theoretical basis of curriculum system reconstruction

Constructivist learning theory emphasizes that learners build a knowledge system through independent exploration, collaborative communication in real situations, and provides guidance on learning methods for the reconstruction of the curriculum system[5].

The theory of curriculum integration advocates breaking the boundaries of disciplines and realizing the organic integration of curriculum content, which provides theoretical support for the integration of moral education and professional education [6].

The theory of vocational ability development pays attention to the structure and development law of vocational ability, and provides the basis for the coordinated cultivation of technical skills and professional quality[7].

The theory of integration of industry and education emphasizes the close combination of vocational education and industrial development, which provides a theoretical basis for the docking of curriculum system and industrial demand[8].

3. Analysis of the Current Situation of Integrated Circuit Curriculum System in Higher Vocational Colleges

3.1. Characteristics of talent demand in integrated circuit industry

High technical skills: The integrated circuit industry involves design, manufacturing, packaging and testing, and requires practitioners to have solid professional knowledge and superb technical skills.

Comprehensive quality requirements are strong: the rapid iterative update of the industry requires talents to have good professional ethics, innovative spirit, teamwork ability and lifelong learning awareness.

The division of labor in the industrial chain is clear : different links have different requirements for the knowledge structure and skills of talents, and it is necessary to cultivate professional talents with clear direction.

The spiritual needs of the craftsman are prominent: the precision of the integrated circuit manufacturing process requires the employees to have the spirit of excellence and meticulous craftsmanship.

3.2. The main problems of the curriculum system

Through the investigation of the curriculum system of 20 higher vocational colleges offering integrated circuit specialty in China, the following problems are found:

(1)Moral education and skill training are separated: Ideological and political courses and professional courses are independent of each other, and the elements of moral education in professional courses are insufficient, so it is difficult to realize the integration of morality and technology.

(2)The curriculum content is out of touch with the industrial demand: the curriculum setting of some colleges and universities lags behind the industrial development, and the integration of new technologies, new processes and new standards is not timely.

(3)Separation of theoretical teaching and practical teaching: theoretical courses and practical courses are fragmented, lack of organic connection, and students' ability to 'integrate knowledge and practice' is insufficient.

(4)Curriculum evaluation emphasizes skills over literacy: the evaluation system pays too much attention to skills assessment, and pays insufficient attention to professional quality and professional ethics.

4. The Reconstruction of The " Integration of Morality and Technology " Curriculum System of Integrated Circuit Specialty in Higher Vocational Colleges

4.1. Guiding ideology

Guided by Chairman Xi 's thought of socialism with Chinese characteristics in the new era, we should implement the fundamental task of cultivating people with morality, adhere to the vocational education policy of "equal emphasis on morality and technology, combination of work and study", connect with the national integrated circuit industry development strategy and talent demand, build a curriculum system of integration of morality and technology, and unity of knowledge and practice, and cultivate high-quality integrated circuit professional and technical talents with all-round development of morality, intelligence, physique, beauty and labor.

4.2. Basic principles

- (1)The principle of moral education: adhere to the moral first, the socialist core values and professional ethics education into all aspects of the curriculum system.
- (2)The principle of integration of production and education: closely connect the integrated circuit industry chain, and timely transform new industrial technologies, new processes, and new standards into teaching content.
- (3)The principle of moral and technical integration: break the barriers between moral education and skill training, and realize the organic integration of moral education elements and professional knowledge and skills.
- (4)The principle of progressive ability: according to the law of professional ability development, the spiral curriculum structure is designed to realize the progressive cultivation of basic ability, professional ability and comprehensive ability.
- (5)The principle of multiple evaluation: establish a multi-dimensional and whole-process evaluation system, and pay attention to the effectiveness of students' moral and technical integration development.

4.3. Overall framework

Build a ' four-module, three-through, multi-platform ' moral and technical integration curriculum system:

'Four modules' : It refers to the ideological and political education module, professional basic module, professional core module and comprehensive expansion module, forming a comprehensive coverage and hierarchical curriculum structure.

'Three links' refers to the whole process of value guidance, ability training and evaluation feedback, so as to realize the whole process of moral and technical integration.

'Multi-platform': building classroom teaching platform, practical teaching platform, innovation and entrepreneurship platform and cultural education platform to provide diversified support for the integration of morality and technology.

4.4. Concrete construction of the curriculum system of 'integration of morality and technology' for integrated circuit specialty in higher vocational colleges

4.4.1. Ideological and political education module: consolidate the foundation of value guidance

Ideological and political compulsory courses: set up ideological and moral and the rule of law, Mao Zedong Thought and the theoretical system of socialism with Chinese characteristics and other courses, strengthen the education of ideals and beliefs.

Professional ideological and political construction: excavate the ideological and political elements of professional courses, compile the 'ideological and political guide for integrated circuit professional courses', and clarify the ideological and political education objectives and key contents of each professional course.

Professional quality course: set up professional ethics, career planning, craftsman spirit and other courses to cultivate students' good professional quality and professional spirit.

Introduction to Integrated Circuit Culture: Set up professional characteristic courses, introduce the development history, industry status and development trend of integrated circuits, and guide students to establish a sense of industry responsibility and mission.

4.4.2. Professional basic module: building the foundation of moral and technical integration

Basic circuit courses: In the courses of circuit analysis, analog electronic technology, digital electronic technology, etc., the craftsman spirit education of rigorous realism and excellence is integrated.

Computer basic courses: In the courses of C language programming and computer composition principle, professional ethics education such as integrity programming and intellectual property protection is infiltrated.

Introduction to professional courses: offering courses such as introduction to integrated circuits, EDA technology foundation, introducing typical industry figures and enterprise cases, stimulating students' professional identity and learning motivation.

Basic training courses: set up electronic process training, PCB design and production and other training courses to cultivate students' practical ability and teamwork spirit.

4.4.3. Professional core module : deepening the integration of moral and technical training

According to the division of labor in the integrated circuit industry chain, set up professional core curriculum groups in different directions:

(1)IC design direction course group:

Technology courses: CMOS integrated circuit design, digital IC design, analog IC design, SOC system design, etc.

Integration of morality and technology: integration of innovative thinking training, awareness of intellectual property protection, design safety and ethics education

IC manufacturing direction course group:

Technical courses: semiconductor process principle, integrated circuit manufacturing process, lithography technology, thin film technology, etc.

Integration of morality and technology: integration of process specification consciousness, safety production responsibility, environmental protection consciousness, and craftsman spirit of excellence

(2)IC test direction course group:

Technical courses: integrated circuit test principle, test system application, fault analysis and diagnosis, etc.

Integration of morality and technology: integration of data authenticity, implementation of test standards, quality awareness and responsibility

Comprehensive training project:

Set up through project training, such as 'chip full process training from design to test'.

The integration of morality and technology: cultivating global awareness, teamwork, division of responsibility and engineering ethics

4.4.4. Comprehensive expansion module: improve the effect of moral and technical integration

Innovation and entrepreneurship courses: set up courses such as innovative thinking, entrepreneurial foundation, intellectual property rights, etc., to cultivate students' innovative spirit and entrepreneurial ability.

Topics on cutting-edge technologies: Regular lectures on cutting-edge technologies related to integrated circuits, such as artificial intelligence, Internet of Things, 5G, etc., are held to broaden students' horizons.

Humanistic quality course: set up humanities courses such as literature, art and history to improve students' comprehensive quality.

Social practice activities: organize students to participate in social services, volunteer activities, science and technology competitions, etc., and cultivate social responsibility in practice.

4.4.5. Construction of diversified practice teaching platform

On-campus training base: build integrated circuit design training room, process simulation training room, test analysis training room, etc., and create a simulation professional environment.

Off-campus practice base: co-build practice base with leading enterprises, so that students can receive exercise in the real working environment.

Industrial college: build integrated circuit industrial college with well-known enterprises, realize the deep integration of school and enterprise, and jointly cultivate high-quality talents.

Innovation and entrepreneurship platform: build maker space, business incubation base, support students to carry out innovation and entrepreneurship practice.

5. The Implementation Strategy of 'Moral and Technical Integration' Curriculum System

5.1. Teaching content reform

Develop moral and technical integration textbooks: write professional textbooks that integrate ideological and political elements, and integrate professional ethics, craftsman spirit and other contents into professional knowledge.

Construction of project-based teaching content: based on real work tasks, design project-based teaching content, and train students to pay equal attention to morality and skills in project implementation.

Develop digital teaching resources: build online and offline hybrid teaching resources to achieve full space-time coverage of moral and technical integration education.

Introduce enterprise standards and cases: introduce enterprise technical standards, production norms and typical cases into teaching content to improve the pertinence of teaching.

5.2. Teaching method innovation

Situational teaching method: create professional real situation, let students feel professional requirements in solving practical problems, and internalize professional spirit.

Case teaching method: select the typical cases of the integrated circuit industry, analyze the successful experience and failure lessons, and cultivate students' judgment and decision-making ability.

Project teaching method: through the implementation of a complete project, cultivate students' ability of teamwork, responsibility and problem solving.

Discussion teaching method: organize students to discuss issues such as technical ethics and industrial development, and cultivate critical thinking and communication skills.

5.3. Reconstruction of evaluation system

Establish a multi-evaluation subject: introduce a multi-evaluation mechanism combining teacher evaluation, student self-evaluation, enterprise evaluation, and social evaluation.

Improve the process evaluation: pay attention to the assessment of the learning process, pay attention to the performance and growth of students in the process of project implementation.

Construct the evaluation index of paying equal attention to morality and technology: design a comprehensive evaluation index system including professional ability, method ability and social ability.

Implementing outcome-based evaluation: Based on the learning outcome orientation, evaluate whether students have achieved the expected knowledge, ability and quality goals.

5.4. Construction of teaching staff

Improve teachers' ability of moral and technical integration: organize teachers to participate in moral education, professional skills improvement training, and enhance the ability of moral and technical integration teaching.

Create a 'double-qualified' teacher team: introduce industry and enterprise experts as part-time teachers to cultivate the practical ability of professional teachers.

Establish a teacher enterprise practice system: regularly arrange teachers to practice in enterprises to understand industrial development and enterprise needs.

Establish a curriculum ideological and political teaching team: a teaching team composed of ideological and political teachers, professional teachers, and enterprise experts to jointly promote the construction of curriculum ideological and political education.

6. Conclusions and Prospects

Based on the concept of "integration of morality and technology", this study reconstructs the curriculum system of integrated circuit specialty in higher vocational colleges, and forms a moral and technical integration education mode of "four modules, three links and multiple platforms". In practice, this model can effectively improve students' professional ability and professional quality, and meet the needs of the integrated circuit industry for high-quality technical and skilled talents. In the future, we will further deepen the reform of the curriculum system, strengthen the construction of digital teaching resources, promote the exploration of modern apprenticeship talent training mode, improve the school-enterprise collaborative education mechanism, and provide more solid talent support for the development of China's integrated circuit industry.

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