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Research on the Curriculum Reform of Integrated Circuit Majors Based on 1+X

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Abstract: *With the rapid development of information technology and the continuous growth of the integrated circuit industry, the curriculum reform of integrated circuit majors in vocational colleges is urgently needed. This study is based on the "1+X" talent cultivation model, aiming to explore how to reform the integrated circuit curriculum in vocational colleges, improve students' comprehensive quality and practical operation ability, and meet the talent needs of the integrated circuit industry. This article first analyzes the implementation and future research directions of curriculum reform for integrated circuit majors in vocational colleges.*

Keywords: *1+X; Vocational School; Integrated Circuit; Curriculum Reform*

1. Introduction

In recent years, with the rapid development of information technology and the continuous growth of the integrated circuit industry, the demand for high-level and composite integrated circuit talents has been increasing. As an important way to cultivate practical professionals in this field, the integrated circuit major in vocational colleges faces the challenge of improving students' practical operation ability and comprehensive quality. In the reform of higher vocational education, the "1+X" talent cultivation model is advocated, which combines the learning of basic courses with practical teaching to cultivate students' practical operation ability and professional literacy, in line with the talent needs of the integrated circuit industry.

2. The concept and characteristics of the 1+X mode

2.1. Concepts

The 1+X model is a modern educational concept that emphasizes the organic combination of professional knowledge and interdisciplinary comprehensive literacy. Among them, the number "1" represents professional knowledge, which is the core course that students deeply learn and master in their professional field; "X" represents interdisciplinary comprehensive literacy, which means that students cultivate comprehensive literacy and interdisciplinary abilities by learning knowledge and skills from other disciplines outside of their majors.[1]

2.2. Characteristics

2.2.1. Organic integration of professional knowledge and interdisciplinary literacy

The 1+X model emphasizes the organic integration of professional knowledge and interdisciplinary literacy. Students not only delve into core courses in their professional fields, but also cultivate comprehensive literacy and interdisciplinary abilities by learning knowledge and skills from other disciplines.[2] This organically integrated teaching method helps students better understand and apply professional knowledge, and improve their comprehensive literacy.

2.2.2. Practice oriented and project driven

The 1+X model emphasizes practical oriented and project driven teaching methods. Students apply their knowledge to practical problems through practical projects, case studies, experimental training, and other methods to cultivate their ability to solve practical problems. This practical oriented and project driven teaching approach can help students better integrate theory with practice and enhance their problem-solving abilities.[3]

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2.2.3. Emphasizing innovation and teamwork abilities

The 1+X model focuses on cultivating students' innovation and teamwork abilities. Encourage students to collaborate, innovate, and solve problems in teams through interdisciplinary collaboration and practical project implementation. This way of cultivating innovation and teamwork skills helps students to have better comprehensive literacy in practical applications.

2.2.4. Emphasizing personalized development and career planning

The 1+X model encourages students to develop personalized skills based on their interests and strengths, and provides career planning and guidance. Students can choose different subjects and courses according to their own situation, cultivate personalized professional abilities and career development plans, and enhance their competitiveness in the job market.

2.2.5. Combining in-depth disciplines with extensive disciplines

The 1+X model not only emphasizes students' in-depth learning in their professional fields, but also emphasizes their learning in a wide range of subject areas. Students can not only delve into professional knowledge through professional courses, but also learn knowledge and skills from other fields across disciplines, cultivate interdisciplinary comprehensive literacy, and better adapt to the modern society and professional needs of interdisciplinary integration.

3. Teaching methods of traditional integrated circuit design course

3.1. Theoretical lecture

Teachers introduce the basic concepts, theoretical principles, design methods and skills of integrated circuit design to students through classroom teaching. At the same time, the teacher organically presents the course content to the students through slides, blackboard writing, teaching materials, etc., to help students establish an overall understanding of integrated circuit design.

3.2. Experimental operations

Students can carry out the actual operation of integrated circuit design in the laboratory, and master the actual design process and the use of tools.[4] The teacher arranges students to conduct practical operations such as circuit design, circuit simulation, and circuit testing, allowing them to personally design, in order to better understand and master the course content.

3.3. Design project

Teachers organize students to carry out integrated circuit design projects, such as designing a digital circuit, analog circuit or mixed signal circuit. Through the actual design process, students comprehensively apply the knowledge they have learned on the basis of thorough thinking, exercise their ability to solve practical problems, and cultivate practical operation and innovation abilities.

3.4. Discussion and interaction

Teachers promote cooperation and communication among students by organizing group discussions, academic presentations, classroom interactions, and other forms. Students can engage in in-depth thinking and communication during discussions, stimulate academic interest, and improve their ability to analyze and solve problems.

4. The necessity of curriculum reform for integrated circuit majors based on 1+X

4.1. Improving students' comprehensive quality

Traditional integrated circuit courses focus on imparting theoretical knowledge, but in practical work, integrated circuit practitioners need to possess more practical operational skills and comprehensive qualities. The curriculum reform based on "1+X" can introduce more practical links, including experiments, project practice, enterprise cooperation, etc., so that students can accumulate practical operation experience, improve practical application ability, and enhance comprehensive

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quality in the course.

4.2. Meeting the needs of the integrated circuit industry

The demand for talent in the integrated circuit industry is becoming increasingly diverse, requiring not only technical expertise but also comprehensive qualities such as teamwork, innovation, and marketing. The traditional curriculum cannot meet these needs, and the curriculum reform based on "1+X" can introduce relevant courses and practical projects according to the actual needs of the industry to cultivate integrated circuit professionals who are more in line with the industry's needs.

4.3. Promoting the integration of industry and academia

The integrated circuit industry is a highly technology-intensive industry, and the integration of industry and academia is an important way to cultivate high-level integrated circuit talents. The curriculum reform based on "1+X" can introduce practical links such as enterprise cooperation projects and internships, promote close cooperation between schools and enterprises, and enable students to better understand the current situation of industrial development, in order to improve practical application abilities, and enhance the employment competitiveness of graduates in practice.

4.4. Strengthening the cultivation of practical abilities

In traditional curriculum settings, there are relatively few practical steps, which makes it difficult to meet students' needs for practical operational skills. The curriculum reform based on "1+X" can strengthen the cultivation of students' practical abilities by adding experimental courses, internships, practical projects, and other methods, so that students can learn and apply in real practical environments and better adapt to the actual work requirements of the integrated circuit industry.

4.5. Cultivating awareness of innovation and entrepreneurship

The integrated circuit industry requires talents with strong innovation and entrepreneurial awareness, and traditional curriculum settings are difficult to meet this demand. The curriculum reform based on "1+X" can introduce courses and practical projects related to innovation and entrepreneurship, cultivate students' innovative thinking and entrepreneurial ability, and stimulate their innovation and entrepreneurial awareness, so as to enable them to deeply learn and practice the field of integrated circuits, while possessing the ability to innovate and entrepreneurship.

5. Suggestions for curriculum reform of integrated circuit majors in higher vocational education under the background of 1+X

5.1. Optimizing course structure

Vocational colleges should re-examine their curriculum, pay attention to the cultivation of practical abilities, and make practical projects, experimental courses, and practical training courses important components of the curriculum, and integrate them into each semester of the curriculum. At the same time, appropriate practical links should be established, such as internships, practical training, project practice, etc., to collaborate with enterprises, provide practical application scenarios, and allow students to learn, exercise to apply the knowledge and skills learned in practice. In addition, attention should also be paid to the organization and management of courses to ensure that students can smoothly participate in practical activities, and timely feedback and evaluation of students' practical results should be provided to improve practical effectiveness and students' practical operational abilities.

5.2. Providing diverse practical opportunities for students

Vocational colleges can establish close cooperative relationships with enterprises and fully utilize their practical resources, including laboratory equipment, production lines, project practices, etc. Through collaborative projects, internships, and practical training, students can practice in a real work environment and improve their practical operational abilities. At the same time, the school can actively strive for the support of the government and the industry, strive for more funds and resources for the construction of practice links, and improve the speed of upgrading laboratory equipment to ensure the

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progressiveness and practicality of the practice environment. On this basis, we can also collaborate with other universities or research institutions to share practical resources and improve resource utilization efficiency. In addition, advanced teaching technologies such as simulation software and virtual laboratories can be introduced to provide a virtual practice environment and compensate for the shortage of practical resources. We should utilize various resources comprehensively to provide students with rich and diverse practical opportunities, cultivate their practical skills and experience, and enhance their overall quality.

5.3. Strengthening the construction of teaching staff

Vocational colleges should strengthen the training and improvement of teachers, including providing practical experience training courses, opportunities to participate in enterprise practical projects, and participating in industry university research exchange activities, to enhance teachers' practical teaching ability and experience. At the same time, it is necessary to introduce professionals with rich practical experience to serve as teachers or part-time professors of practical courses. The practical experience of practitioners can provide students with practical cases and practical operation guidance to improve the quality of practical teaching. On the basis of the above, it is necessary to actively guide and support teachers to participate in practical projects, industry university research cooperation and other practical activities, encourage teachers to cooperate with enterprises to carry out practical courses, and improve their practical experience and teaching level. Finally, schools should also attach importance to incentive mechanisms for teachers, including providing competitive compensation, professional title evaluation, and career development channels, in order to attract and retain excellent teachers with practical experience and teaching abilities.

5.4. Guiding students to actively participate in practice

Schools can optimize the design of practical courses to better align with students' interests and practical needs, provide challenging and attractive practical projects, and stimulate students' interest and enthusiasm in learning. It is necessary to reasonably arrange students' curriculum burden and schedule, avoid conflicts between practical courses and theoretical courses, and leave enough time for students to participate in practical activities. At the same time, vocational colleges should encourage students to participate in practical competitions, innovative projects, and other activities to stimulate their practical interest and motivation. In addition, schools should also set weights for practical credits or grades, using practice as an important indicator to evaluate students' overall quality, in order to encourage students to participate more actively in practical activities.

5.5. Innovative teaching mode

Schools should optimize their teaching management system, establish flexible and efficient management models, such as introducing enterprise management models and experiences, establishing scientific and standardized teaching management systems, and improving the organization and management level of practical courses. At the same time, it is necessary to strengthen the training and evaluation of teachers, encourage them to actively participate in the design and implementation of practical courses, and enhance their practical teaching abilities. In addition, schools should establish a comprehensive evaluation system for practical courses, incorporate practical aspects into important indicators for teaching quality evaluation, and encourage students and teachers to conduct self-evaluation and mutual evaluation in practical activities, so as to promote continuous improvement and enhancement of practical aspects.

5.6. Adjusting teaching focus based on industry development

Vocational colleges can invite professional and technical personnel from enterprises to serve as part-time teachers to participate in course design and teaching implementation, ensuring that the course content closely matches actual needs. We should pay attention to the professional development and training of teachers, and improve their subject literacy and teaching level. For example, organizing teachers to participate in industry training, academic seminars, and other activities can increase their industry insight and foresight, enabling them to timely understand the latest trends in the industry and integrate them into curriculum teaching. At the same time, the school should also encourage teachers to participate in production, teaching and research projects, carry out cooperative research in enterprises, and improve their ability to respond to rapid changes in industrial demand. In addition, advanced

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teaching resources such as online education platforms and virtual laboratories should be introduced into the school to provide the latest industry information and teaching resources through information technology to help students understand the latest trends in industry development.

5.7. Establishing a practical achievement evaluation system

Vocational colleges should establish a comprehensive practical achievement evaluation system to evaluate and provide feedback on students' practical achievements. Evaluation can include practical reports, demonstration of practical achievements, and demonstration of practical projects. By evaluating students' practical achievements, it is possible to understand their practical level and operational ability, and provide timely guidance and feedback to help them continuously improve their practical abilities. Meanwhile, the evaluation results can also serve as a part of the comprehensive quality evaluation of students, provide a comprehensive evaluation of their practical experience and achievements as well as a reference basis for their employment and further education.

5.8. Providing practical support services

Vocational colleges should provide students with comprehensive practical support services, including practical guidance, acquisition of practical resources, and organization of practical activities. Schools can establish practical guidance centers or practical service centers to provide students with teaching guidance for practical courses and organizational management of practical projects. At the same time, schools should also establish good cooperative relationships with enterprises, providing students with practical resources, including internships, practical training, project cooperation and other opportunities, in order to help students gain real practical experience.

6. Conclusion

In summary, the curriculum reform of integrated circuit majors based on "1+X" emphasizes the cultivation of practical abilities to a certain extent, but also faces a series of problems. Therefore, in the curriculum reform of the integrated circuit major, comprehensive consideration should be given to the actual needs of students, the development trend of the industry, and the cooperation mechanism between schools and enterprises. The curriculum and teaching methods should be continuously optimized to enhance students' practical and application abilities, in order to meet the demand for high-quality talents in the integrated circuit industry and provide strong support for students' career development and employment competitiveness.

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