The Digital Electronic Technology course is optimized to adapt to a variety of new majors

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Abstract. In view of the practical teaching problems encountered in the training process of a variety of new professionals in the course of the Digital Electronic Technology, this paper optimizes the content, teaching mode and assessment mechanism of the course, and proposes a tailorable and scalable curriculum system suitable for a variety of new majors. The optimization of the curriculum organically combines the discipline characteristics of different new majors, talent training programs, knowledge content systems, modern teaching resources, and new teaching models, completes the adaptation and optimization of course teaching, and designs the knowledge-ability-quality assessment mechanism. Practice has proved that curriculum optimization can better adapt to a variety of emerging majors. The course content setting and implementation are more reasonable, which fully mobilizes the enthusiasm of students to learn, improves the comprehensive quality of students from multiple dimensions, and achieves good teaching results.

1. INTRODUCTION

With the rapid development of emerging technologies such as artificial intelligence, unmanned intelligent systems, biological interdisciplinarity, and brain-like disciplines, a variety of new majors, new disciplines, and interdisciplinary majors are constantly emerging, which puts forward new requirements for the construction of basic courses and disciplines such as Digital Electronic Technology. In addition, the demand for talent training in a variety of new majors has also undergone profound changes.

To meet the demand for talent training in a variety of new majors, in recent years, our university has opened new majors such as artificial intelligence, unmanned systems, and big data in many colleges to accelerate the cultivation of new professional talents. The course of Digital Electronic Technology is an introductory professional basic compulsory course for traditional disciplines such as information engineering and communication engineering, as well as emerging interdisciplinary disciplines such as artificial intelligence, unmanned systems, and big data, mainly explaining the basics of logic algebra, gate circuits, combined sequential logic circuits, memory, FPGA and CPLD, waveform generation and shaping, digital-analogy-to-digital converters, etc. The course has the characteristics of theory, practice, operation, and a wide range of majors, which plays a role in the entire talent training system[1]. However, in the face of the training needs of a variety of new majors and new talents, the traditional curriculum design can no longer meet the needs. After several years of exploration and practice, it is found that there are the following main contradictions between traditional curriculum design and new discipline talent training.

1. The course of Digital Electronic Technology is often taught with the principal application of electronic devices and the operation-processing technology of signals as the core. However, different new majors pay more attention to the application of electronic devices and the cross-application with this discipline, which leads to the lack of adaptability between the traditional teaching content and the emerging majors, and the lack of theory and practice. Therefore, in the process of content explanation, it is necessary to tailor and expand different degrees for different emerging majors and carry out knowledge selection[2].

2. In recent years, many interdisciplinary courses have been arranged in various new majors of our university, which has led to the reduction of the class hours of the Digital Electronic Technology course from 60 to 50 hours. However, the course of Digital Electronic Technology has many knowledge points, and the knowledge is systematic and logical[3][4]. The compression of class time poses new challenges to the teaching of course knowledge and the cultivation of students' quality and ability. Therefore, it is necessary to design a dynamic menu-based, scalable, extensible theoretical and practical teaching content[5] based on the actual teaching situation of different new fields, new quality, and new majors to meet the new requirements of different new disciplines.

3. Oriented to traditional disciplines, the course assessment methods of Digital Electronic Technology course focus on the understanding and mastery of course knowledge. The course assessment includes 10% of the usual grades, 30% of the experimental results and 60% of the experimental results and 60%
of the final exam. And the final exam plays the role of a veto, and there is less examination of students' ability and quality. The lack of diversity and hierarchy of such assessment methods leads to the limitation and one-sidedness of the assessment results. The proportion of final exams is too large, which will lead students to despise the exercise and cultivation of personal qualities to a certain extent. Therefore, it is urgent to explore a comprehensive curriculum assessment scheme that adapts to multiple aspects and levels.

2. Optimal designs of the course

To solve the contradictions encountered in real teaching, the optimization design of the course of the Digital Electronic Technology for the cultivation of a variety of emerging professionals is mainly reformed from three aspects: overall optimization, teaching content optimization and course assessment mechanism optimization. And the innovative teaching method is cleverly integrated into the optimization design of theoretical and practical teaching content.

2.1. Overall optimized design

To meet the talent training needs of a variety of emerging majors, the course team of Digital Electronic Technology has formed a set of curriculum optimization scheme of tailoring and reconstructing according to needs, diverse teaching modes, and comprehensive quality assessment after several years of teaching practice and research, as shown in Fig. 1.

The comprehensive quality assessment mainly assesses the overall quality of students from three aspects: knowledge, ability, and quality. Knowledge is mainly reflected in the assessment of various knowledge such as mid-term, final, quiz, homework, etc. The ability is mainly reflected in experimental operation, independent learning, group cooperation and so on. The quality is mainly reflected in the responsibility and mission of strengthening the country, the scientific style of rigorous and truth-seeking, and the innovative spirit of courage to explore. Focusing on the goal of talent training, the course team has established a formative all-round three-dimensional training and assessment mechanism of knowledge-ability-quality.

2.2. Optimized design of teaching content

The course team first studied the knowledge system architecture of the Digital Electronic Technology course. Then, by studying the pre-requisites and follow-up courses of different emerging majors, and skilfully integrating various teaching methods according to the course content, a menu-based, extensible, and tailororable flexible theoretical knowledge framework was designed, as shown in Table 1.
3. Teaching Models

Taking the new mode of training and teaching of artificial intelligence professionals in our school as an example, this paper expounds the optimization design and reform of the course of Digital Electronic Technology adapted to the new major.

In terms of teaching content optimization, the learning of basic knowledge such as numeric, code taught online, supplemented by tutoring, to concentrate and improve the quality of teaching. In the process of theoretical teaching, we pay attention to cultivating students' scientific style of seeking truth from facts, the attitude of facing problems directly, the engineering literacy of collaborative inquiry, and the sense of mission of serving the motherland.

### 2.3 Optimization of the course assessment mechanism

The course assessment mechanism is supplemented and optimized based on the assessment mechanism of the usual-practice-final period. And a formative all-round three-dimensional training assessment mechanism is established from the three aspects of knowledge, ability, and quality, as shown in Table 2.

<table>
<thead>
<tr>
<th>Assessment elements</th>
<th>Evaluation session</th>
<th>Assessment basis</th>
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<tbody>
<tr>
<td>Knowledge</td>
<td>Closed-book exams</td>
<td>Exam scores, rain classroom statistics, homework completion, etc.</td>
</tr>
<tr>
<td></td>
<td>Homework</td>
<td>Group discussions, experiment completion, classroom performance, questionnaires</td>
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<td></td>
<td>Take a quiz in the classroom</td>
<td></td>
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<tr>
<td>Ability</td>
<td>Hands-on experiments</td>
<td></td>
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<tr>
<td></td>
<td>Explore independently</td>
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<tr>
<td></td>
<td>Group collaboration</td>
<td></td>
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<tr>
<td>Diathesis</td>
<td>Innovative research experiments</td>
<td>The spirit of innovation and breakthrough in the experiment, and the sense of responsibility and mission in the team</td>
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<td>Role in curriculum</td>
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</table>

The knowledge level in Table 2 mainly examines the student's mastery of curriculum knowledge, accounting for 50%. At the ability level, the student's ability to find and solve problems is mainly examined, accounting for 30%. At the quality level, it mainly examines the student's rigorous and truth-seeking scientific literacy, the innovative spirit of courage to explore, and the sense of responsibility and mission of strengthening the country in me, accounting for 20%.
knowledge. At the level of quality, the all-round ability of the student is mainly checked through theoretical classroom performance, experimental practical operation, etc. At the level of ability, the comprehensive quality of the student in all directions is mainly examined through the role played by students in the theoretical and practical team learning, and through questionnaires and other methods.

4. Teaching Outcomes

In recent years, the digital electronic technology course group of our school has optimized, reformed, and practiced in terms of teaching content, teaching mode, assessment mechanism and other aspects according to the different needs of a variety of new majors. It has built a rich teaching case library, practice case library, online resources, new professional question paper library and other teaching resources. Fruitful results have been achieved. The course team undertook the teaching tasks of more than 10 majors in digital electronics in 5 colleges of our university and trained nearly 2,000 outstanding students. Nearly 10 education and teaching projects have been applied. He has won nearly 30 national, district-level, provincial and ministerial level in the National College Young Teachers Electronic Technology Foundation and Electronic Circuit Lecture Competition, and the National University Electrical and Electronic Experimental Case Competition. Fruitful results have been achieved. The course team undertook the teaching tasks of more than 10 majors in digital electronics in 5 colleges of our university and trained nearly 2,000 outstanding students. Nearly 10 education and teaching projects have been applied. He has won nearly 30 national, district-level, provincial and ministerial level in the National College Young Teachers Electronic Technology Foundation and Electronic Circuit Lecture Competition, and the National University Electrical and Electronic Experimental Case Competition. After nearly two years of hard work by the digital electronics technology teaching team, we have built a scalable, reconfigurable, and flexible teaching platform suitable for a variety of emerging majors in our school, which greatly contributes to the high-quality training of new talents in the new era.

5. Conclusion

To meet the new requirements of the training of various new professionals for the course of digital electronic technology in recent years, this paper optimizes the design of the course, which mainly includes four aspects: theoretical teaching content, practical teaching content, new teaching mode and comprehensive assessment mechanism, and solves the more prominent practical teaching problems. The curriculum optimization is mainly combined with the talent training plan of different emerging majors, the characteristics of students, and the new mode of modern teaching and assessment. The teaching content, teaching methods, and assessment mechanism are reconstructed, forming a set of new flexible curriculum designs that can be tailored, reconfigurable, and scalable for a variety of different majors. Finally, combined with the artificial intelligence major of our school, the content and focus of the course optimization design are further explained. The teaching results of the past two years show that the optimization of the digital electronic technology course in this paper is more suitable for the cultivation of a variety of new professionals and has high flexibility and advantages.

References