

# Research on digital education teaching reform under the mode of "equal emphasis on teaching"

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**Abstract.** In response to the requirements of "accelerating the construction of an educational power and promoting the digitalization of education" pointed out by the 20th National Congress, this paper explores the teaching reform of teaching content, teaching resources, teaching strategies and teaching evaluation. Among them, the reform is supported by digital technology, with the teaching design of "equal emphasis on learning and teaching" as the core, and the purpose is to solve the problems existing in the course and talent training of "Electrical Control Technology". It has been proved that this teaching model can effectively improve the quality of the classroom, improve the skill level of students, and truly open up the last mile between the classroom and the enterprise.

## 1. Research background

As one of the core elements to improve the quality of the classroom, instructional design has been continuously explored and studied since the day it was proposed. At present, from the perspective of the world, the teaching system design is mainly divided into three modes<sup>[1]</sup>, one is the "teaching-oriented" teaching system design model represented by the theory of meaningful learning<sup>[2] [3]</sup>, which emphasizes students' learning needs and learning objectives, and focuses on independent learning strategies and learning environments, but the disadvantage is that it is too much emphasis on transmission-acceptance learning, and learners' initiative is difficult to give full play; The second is the "learning-oriented" teaching system design model represented by constructivist learning theory<sup>[4]</sup>, which is conducive to cultivating talents who can think independently and think actively, but ignores the leading role of teachers. As a result, the third model - the teaching system design model of "equal emphasis on learning and teaching" was born<sup>[5]</sup>. This model combines the advantages of "teaching-oriented" teaching system design and "learning-oriented" teaching system design, which is more suitable for classroom teaching.

In 2020, China's Ministry of Education launched the experimental area of "New Teaching and Learning Model Based on Teaching Reform and Integration of Information Technology" to promote the deep integration of technology and education<sup>[6] [7]</sup>. In 2022, Minister Huai Jinpeng made a comprehensive analysis in many aspects such as the digital transformation of education and the strategic action of education digitalization, and explained the transformation of education digitalization from the stages of vocational education, higher education, and basic education.

Therefore, this paper integrates digital technology with the teaching design model of "equal emphasis on learning and teaching", and conducts classroom teaching practice from four dimensions: teaching content, teaching resources, teaching strategies, and teaching evaluation, so as to comprehensively improve the quality of teaching.

## 2. Teaching status

### 2.1. There is more theoretical knowledge and less class time allocation

The course "Electrical Control Technology" covers a wide range of topics. In terms of content distribution, the previous chapters are mostly based on theoretical teaching, and the subsequent chapters learn practical operations. However, in the teaching, the integration of theory and reality is mostly adopted, and electrical knowledge and control circuits are taught at the same time.

### 2.2. Teaching resources are outdated, and there are potential safety hazards in practical operations

As a traditional equipment manufacturing professional course, "Electrical Control Technology" was developed very early, and most of the existing resources are pictures and videos. Secondly, in practice, students, as beginners, are very easy to cause damage to components. For example, the AC contactor wiring is wrong, resulting in a short circuit, which not only increases the cost, but also easily brings safety hazards.

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### 2.3. Learners have poor concentration and are not interested in traditional teaching methods

Most students' learning goals are to get good grades in the final exam, and if they fail to achieve the desired results, students' concentration will decrease. In addition, coupled with students' lack of self-control, it is easy to be attracted by mobile phones. Research shows that the average time students spend in class is 8 minutes, and only 18% of students are interested in the course, 57% are generally interested, and 25% are not interested in studying for exams.

## 3. Reform strategies

Combined with the academic situation of electrical students in higher vocational colleges, taking students as the teaching center, supported by digital technology, combined with the teaching design mode of "equal emphasis on learning and teaching", in view of the problems existing in teaching content, teaching resources, teaching strategies and teaching evaluation, a four-in-one classroom revolution of content reconstruction, resource upgrading, teaching design and teaching evaluation was carried out.

Firstly, the teaching content and objectives are analyzed, and the "learning-oriented" or "teaching-oriented" teaching mode is flexibly selected according to the learner's cognitive structure and the pre-class learning preview. In the "learning-oriented" teaching mode, give full play to students' subjective initiative, and use the reverse snowball model for discovery teaching; In the "teaching-oriented" teaching mode, the leading role of teachers is brought into play, and the ARCS model is used for transitive teaching, and the teaching design structure diagram is shown in Fig.1 below.

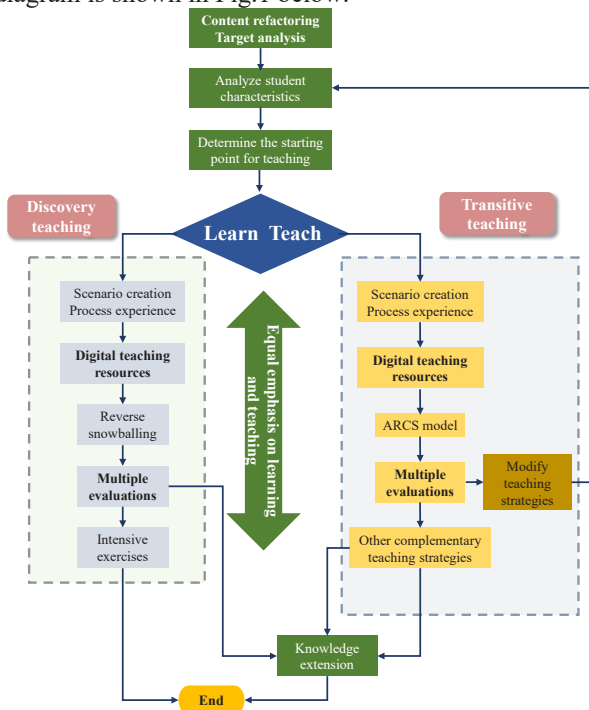


Fig. 1. Teaching program design structure diagram.

### 3.1. Content reconstruction "from shallow to deep"

Based on the students' vocational ability training system, in order to strengthen the internal connection of course content, the structured reorganization of course teaching content was carried out. The "Electrical Control Technology" course is aligned with the position of electrical maintenance worker and electrical technician. Therefore, disrupt the course structure and adjust it into three modules, which are divided into DC motors, transformers, and AC motors. At the same time, each module is composed of "simple to difficult, from shallow to deep" projects, according to the knowledge and skill objectives of each module.

In the process of curriculum reconstruction, develop ideological and political resources, implement the fundamental task of cultivating morality and cultivating people, and drive the "classroom revolution". The analysis process of the project is the process of discovering problems and solving problems, which can exercise students' ability to think independently; The practical process of the project can strengthen the foundation, train skills, and cultivate the craftsman spirit of standardized operation and excellence; In addition, when reconstructing the project, we should pay attention to cultivating students' sense of innovation and establishing the concept of "independent innovation and strengthening the country with science and technology". Taking Project 5 as an example, Figure 2 below introduces the sub-projects and ideological and political education elements, and realizes the docking with the national vocational skills standards.

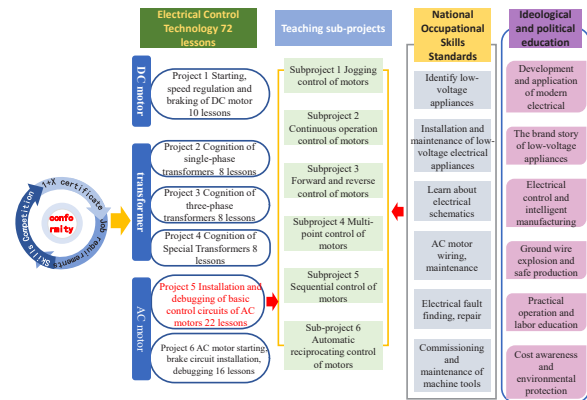


Fig. 2. Course modules and project division diagrams.

### 3.2. Teaching resources "from fiction to reality"

In the digital era, relationships need to be connected, such as inside and outside the classroom, online and offline, local and off-site, physical space and virtual space.

First of all, combine the Internet with classroom teaching, and complete pre-class learning tasks through smart platforms such as the National Smart Education Platform, Smart Vocational Education, and Smart Classroom. In this way, "smart teaching, smart management, smart service, and smart learning" can be integrated; Second, develop specific digital resources to

realize the cross-integration of traditional courses and emerging technologies through VR technology. Related course teachers lead electronic information students to develop component simulation programs, teachers can make the classroom more vivid with the help of three-dimensional animation, students can scan and identify components into the virtual space at any time through the mobile phone, observe the structure composition and working process of electrical equipment, the entire training process will be automatically tracked by the system, the teacher is very convenient for teaching analysis, and the classroom atmosphere is good. The specific process of integrating teaching resources into the teaching process is shown in Fig.3 below.

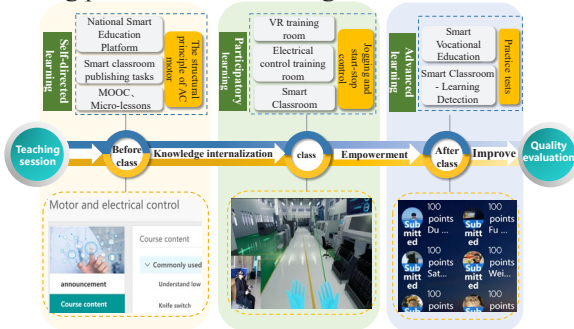


Fig. 3. Digital teaching processes.

### 3.3. Project teaching "from the surface to the inside"

When teaching, teachers adopt the "from the surface to the inside" teaching method. First, teachers and students watch the real enterprise equipment work process, experience the operation process of the motor, lead to the main work tasks of the course, and the teaching design adopts the "reverse snowball" or ARCS model.

In the "learning-oriented" teaching mode, the "reverse snowball" method is first adopted to guide students to think independently, analyze the knowledge and skills required for the task, and explore and learn the theoretical knowledge from the surface to the inside. Then forward analysis, teachers guide students to wire operation and troubleshoot electrical faults, and cultivate students' ability to analyze circuits and solve problems.

In the "teaching-oriented" teaching mode, the ARCS model is used for teaching, first, teachers play pre-class videos to attract learners' attention (Attention), teachers and students jointly find the relevance (Relevance) with the previous course, solve new problems through existing knowledge, teachers should pay attention to assigning different difficult and easy problems to learners of different levels when asking questions in the classroom, so that everyone can participate in problem discussions and enhance learners' self-confidence (Confidence), Learners are able to derive satisfaction from success(Satisfaction). The teaching process of different teaching modes is shown in Fig.4 below.

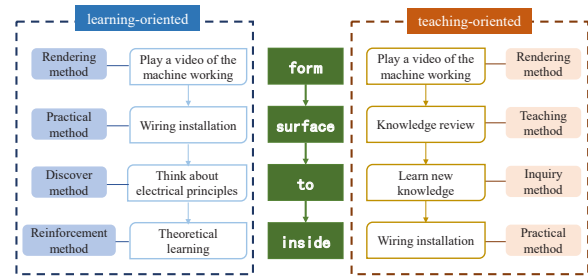


Fig. 4. Teaching strategy diagram.

### 3.4. Teaching evaluation "from start to finish"

Course evaluation adopts a combination of process assessment and final assessment. Process assessment accounts for 60%, including online learning assessment and offline project training, which focuses on assessing students' professionalism, group cooperation, 6S management, task completion and other aspects; The final assessment accounts for 40%, including theoretical assessment and comprehensive project practical operation assessment, theoretical assessment focuses on assessing students' mastery of basic theoretical knowledge of the course, comprehensive project practical operation assessment focuses on assessing students' electrical control system analysis task requirements, design circuits, and ability to complete work tasks, the specific assessment proportion is shown in the Fig.5 below.

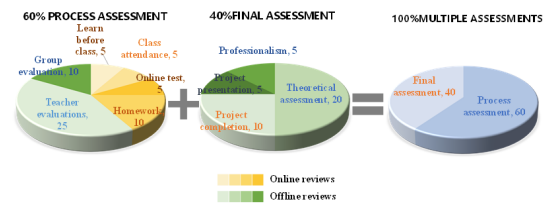


Fig. 5. Assessment method diagram.

## 4. Teaching effectiveness

### 4.1. It realizes the unity of students' theoretical knowledge and practical skills

Based on students' vocational ability and the development of enterprises, we deepen the "integration of positions, courses, competitions and certificates", focus more on strengthening basic and training skills in terms of knowledge structure, and realize the unity of students' theoretical knowledge and practical skills.

Taking the 22nd grade electrical class 1 as an example, students achieved good results in the skills competition and the innovation and entrepreneurship competition. At present, students have won the second prize once in the Shandong College Students Science and Technology Innovation Competition, the second prize twice and the third prize in the Shandong "Internet +" College Students Innovation and Entrepreneurship Competition, and the third prize once in the "Challenge Cup" College Students Innovation and Entrepreneurship Competition.

#### **4.2. It realizes the unity of the virtual space and the physical world**

Teachers and students use the Internet and virtual reality technology to develop virtual simulation resources to achieve the cross-integration of traditional courses and emerging technologies, which also provides practical opportunities for electronic information students, and students have cooperated in applying for 3 innovation and entrepreneurship projects "Safe School - Smart Campus Safety Devices and Systems Based on VR and Digital Twins" and "Full Life Cycle Intelligent Production Line Construction Scheme Based on Digital Twins", etc., and students also actively participated in Challenge Cup, "Internet +" and other competitions.

#### **4.3. It realizes the unity of teacher-led and student-subjective**

Through the analysis of the project "from the surface to the inside", teachers and students cooperate to find the knowledge and skills required for the project, and explore together under the guidance of problems, which can not only enliven the classroom atmosphere, but also enhance the cooperation between teachers and students, and finally realize the unity of teacher-led and student-subjective. Taking student evaluation as an example, since the implementation of the new curriculum model, the average score of student evaluation has increased by 2 points, of which in the second semester of the 2022-2023 academic year, the evaluation score is 99.87 points, and the teacher listening evaluation score has increased by about 4.5 points, which has won unanimous praise from teachers and students. In addition, teachers participated in the school teaching ability competition and won the second prize of the teacher teaching ability competition, and the teaching reform project applied for was also successfully approved.

### **5. Conclusion**

After the teaching practice of "Electrical Control Technology", teachers use the teaching mode of "equal emphasis on teaching", integrate digital technology, and reform teaching content, teaching resources, teaching strategies and teaching evaluation, the classroom effect and teaching quality are significantly improved, students' autonomy is fully utilized, the operation is more standardized, the practical ability is enhanced, the habit of independent thinking is gradually developed, and good results have been achieved in various skill competitions. In addition, teachers have also enhanced their practical ability and exercised their teaching level through the reform of teaching mode.

### **Fund projects**

Smart Education Research Project of Shandong Province; Yantai Vocational College Teaching Reform Research Project.

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