

# *Teaching design of secondary school courses based on LABVIEW virtual simulation*

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**Abstract:** With the rapid development of information technology, the electronic information industry, as an important pillar of the country's economic development, the demand for talents is becoming more and more urgent. The purpose of this paper is to analyse the current status quo of secondary electronic information professional courses, and put forward a reform plan based on LABVIEW virtual simulation, taking the basic course of secondary electronic technology as an example, and make a design and elaboration on the course as a whole.

## **1. Introduction**

The intermediate electronic technology basic course is an important basic course for electronic information technology majors, aiming to train students to master the basic theory and experimental skills of electronic technology [1]. However, there are some problems in the traditional teaching mode, such as insufficient experimental equipment, single experimental content, and limited practical opportunities for students. These problems limit the cultivation of students' practical ability and innovative spirit, therefore, it is imperative to reform the basic electronic technology course for secondary school [2].

LABVIEW is a virtual simulation software based on graphical programming language, with intuitive and easy to learn, powerful and flexible features [3]. Through LABVIEW virtual simulation technology, you can simulate the real experimental environment and operation process on the computer, so that students can carry out experimental operations and skills training without contacting the physical equipment, which not only makes up for the lack of experimental equipment, but also expands the experimental content and improves the students' practical ability and innovative spirit [4].

## **2. Analysis of the state of the art in the fundamentals of electronics**

Fundamentals of electronic technology in secondary vocational and technical schools is a basic course in the field of high technology, which is set up in order to cultivate highly skilled technical personnel to meet the needs of social development [5]. However, at present, the teaching of electronic information professional courses in secondary vocational colleges and universities is still mainly based on theoretical teaching, and there are problems in the curriculum.

## **2.1. Weaknesses in students' own capacities**

In our country, most of the students who choose to enter vocational colleges and universities have less than satisfactory results, which indicates that the students' basic knowledge is weaker and their ability is poorer, however, the electronic information professional courses have the characteristics of abstract principles, complicated knowledge and practicality, which puts forward certain requirements on the basic ability of the students, which requires that the students not only have the basic theoretical knowledge, but also have the ability to apply the knowledge to solve relatively simple practical ability to solve relatively simple practical problems [6]. However, most of the intermediate students have a weak knowledge base, weak spatial thinking ability, insufficient practical ability, and cannot accurately understand the content of the textbook and cases, which leads to unsatisfactory student performance and difficult to improve the quality of teaching.

## **2.2. A more uniform approach to teaching and learning**

Nowadays, some colleges and universities still adopt the traditional teaching mode, that is, the teacher dominates and students learn passively, which is not conducive to the development of teaching and cannot cultivate students' innovation ability [7]. Based on the traditional teaching mode, some colleges and universities have introduced a number of blended teaching modes, where teachers gradually add animation, micro-course and other teaching methods to enrich the teaching mode and improve the quality of teaching under the simple textbook-based teaching, but due to the long-term exposure of contemporary students to computers, mobile phones and other electronic devices, the simple images and videos can not inspire students to learn, which leads to the failure to improve the efficiency of teaching [8].

## **2.3. Less construction of curriculum resources**

The development of the field of electronic technology is very rapid, rapid technological updating, new equipment, new processes, new applications emerge one after another, which makes the content of the electronic information professional courses need to be constantly updated and adjusted to meet the needs of the industry's development [9]. This puts higher demands on the professionalism of teachers, who need to continuously improve their comprehensive quality to meet the high quality of teaching. At the same time, this also requires more teaching resources to support teaching. However, some EEI disciplines may not be able to provide sufficient teaching materials quickly, especially for emerging areas and technologies [10]. In addition, some students may be limited in the experimental sessions due to the high cost and limited number of experimental equipments, which may lead to the restriction of students' practical ability and affect their competitiveness in the professional field.

## **3. Curriculum reform programme based on virtual simulation**

Based on the problems raised above, for the current situation of the secondary electronic information professional courses, this paper proposes a reform programme based on LABVIEW virtual simulation. The specific content includes the following aspects:

### **3.1. Integration of course content and introduction of LABVIEW virtual simulation**

On the basis of the original course content, increase the virtual simulation experiment project based on LABVIEW. Through virtual simulation experiments, course knowledge and simulation

operations are combined, and students can operate the relevant theoretical knowledge in the virtual environment to deepen their understanding and application of theoretical knowledge.

### **3.2. To Optimise the Teaching Mode and Implement Mixed Online and Offline Teaching**

Using LABVIEW virtual simulation software, combined with online teaching software, teachers can release teaching resources, assign experimental tasks and guide students' learning online, and students can conduct experimental operations, submit experimental reports and experimental summaries through virtual simulation software offline. At the same time, students can communicate with teachers and classmates through online communication to solve problems and consolidate knowledge. This online-offline hybrid teaching mode can improve the learning efficiency and learning effect of students.

### **3.3. Strengthening practical teaching and enhancing students' practical operation ability**

By introducing LABVIEW virtual simulation technology, students can perform various experimental operations in a virtual environment, such as circuit design, system construction, signal processing and so on. This kind of virtual simulation experiment is not only safe and low-cost, but also can be repeated until students fully understand and master. At the same time, through virtual simulation experiments, students can also carry out fault simulation and troubleshooting and other operations to improve the ability to solve practical problems.

### **3.4. Implementing project-based learning to develop students' creativity and teamwork spirit**

Based on LABVIEW virtual simulation technology, teachers can design a series of project tasks according to the actual situation, from easy to difficult, and constantly increase the difficulty of the tasks, so that students can practice and communicate in teams to complete these tasks. Through the implementation process of the project, students can learn how to apply their knowledge to solve practical problems, and at the same time, they can also develop teamwork and innovation.

## **4. Teaching process design**

Fundamentals of Electronics Technology is an important course in the field of electronic information engineering, aiming to provide students with core knowledge and practical skills in electronics technology. This study proposes a teaching method based on LABVIEW virtual simulation experimental teaching driven on the basis of virtual simulation experimental teaching, taking Fundamentals of Electronic Technology as an example. This teaching method is student-oriented, teacher-oriented, and adopts virtual simulation technology. Compared with traditional teaching methods, virtual simulation experiment teaching can not only strengthen students' understanding of theoretical knowledge, but also combine corresponding theoretical knowledge with specific practice, so as to achieve the effect of theory and practice complementing each other. At the same time, the use of experiments to complete the verification, as well as through the practice to test the theoretical knowledge learned, is conducive to the absorption of knowledge by students, and only in this way can we continue to improve professional skills, as shown in Figure 1.

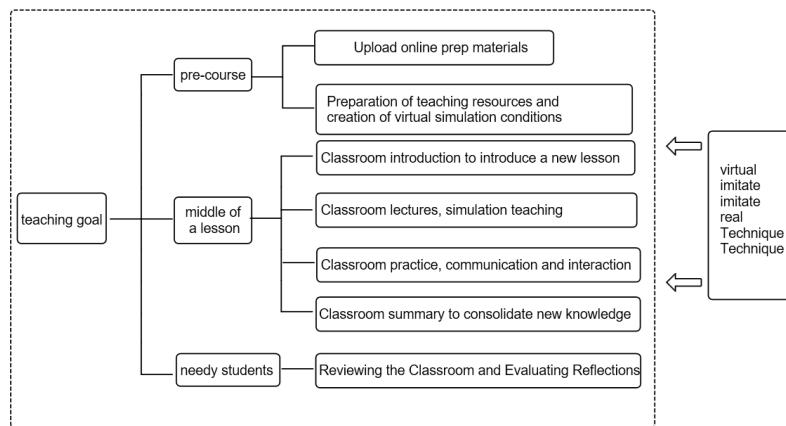


Figure 1: Flowchart of teaching methodology under virtual simulation teaching approach.

#### 4.1. Pre-course

Before the class, the teacher should firstly formulate the teaching objectives according to the teaching content, and then upload the online pre-study materials according to the teaching objectives. By collecting and organising online learning resources and guiding students to online preview, students will have a certain understanding of LABVIEW software and be able to use LABVIEW software in a basic way.

Prepare teaching resources and create a virtual environment. Teachers according to the teaching content, as well as the teaching objectives of the requirements of the use of LABVIEW software to complete the establishment of virtual models and other work, in order to create the offline virtual teaching environment integrated with the knowledge of the course to consolidate the foundation. At the same time, the integration of the production of teaching PPT, improve the teaching means, enrich the teaching mode, so that students are clear about the course arrangements, improve the quality of teaching.

#### 4.2. Middle of a lesson

Classroom introduction to introduce a new lesson. When teachers introduce new knowledge, they briefly introduce the background of the knowledge being learnt or relevant background knowledge to help students understand the source and background of the knowledge and stimulate their interest in learning. At the same time, you can ask questions related to the content of this lesson to guide students to think and stimulate their curiosity and desire for knowledge, in order to gradually guide students into the new lesson.

Classroom explanation, simulation teaching. Based on the teaching content, it integrates teaching resources, uses LABVIEW software to demonstrate the basic theoretical knowledge in the teaching content, and explains the theoretical knowledge in combination with PPT. Through the creation of virtual situations, the abstract and complex knowledge in the course is transformed into an intuitive and operable virtual simulation effect, which promotes the organic combination of theory and knowledge and improves the teaching quality. Students in this process, on the one hand, through the teacher's explanation, consolidate theoretical knowledge, at the same time can be virtual practice of theoretical knowledge, further test theoretical knowledge, deepen students' understanding of the course content.

Classroom practice, communication and interaction. At the end of the teacher's explanation and virtual simulation demonstration, students are free to team up, virtual simulation of classroom

knowledge, through the operation of the practice, to further observe the actual mastery of the students, monitor the students' learning progress, and at the same time for the student's errors in a timely manner, communication and guidance, to ensure that students can successfully master the content of the teaching and complete the teaching objectives.

Classroom summary, consolidate new knowledge. After the end of classroom teaching, teachers and students summarise the content of the class, grasp the key points, and summarise the problems that occur during the operation of the virtual simulation, to deepen students' understanding of the weak links in the classroom. At the same time, the teacher assigns post-class assignments, including virtual simulation practice assignments, the teacher by arranging the topics related to classroom content, the students carry out virtual simulation, to further deepen the understanding of the simulation teaching, and lay a good foundation for the further development of virtual simulation teaching.

### 4.3. Needy students

Review the classroom and evaluate and reflect. After the class, the teacher evaluates the students' learning results by making an evaluation of the completion of the class, combining process evaluation and summative evaluation. Process evaluation includes evaluation of students' classroom performance, mastery of the key points of the course and completion of students' homework; summative evaluation includes students' final exam. At the same time, in addition to the evaluation of students' learning, teachers also included the evaluation of teachers' teaching work. By integrating students' final grades, teachers summarized and analyzed the final comments, and further explained the positive effects of virtual simulation on course teaching, as shown in Table 1

Table 1: Quality Evaluation System for Blended Teaching of Electronic Information Courses.

Type of evaluation	Evaluation methodology	Evaluation content	Evaluation body	Purpose of evaluation
Process evaluation	Classroom performance	Teachers regularly assess student performance in the classroom participation, questioning and responding in the classroom	Principals	Monitoring of students' academic performance and engagement
	Course focus	Assess students' mastery of key teaching and learning points, including mastery of virtual simulation software		Ensure that students acquire the necessary knowledge and skills
	Operate	Evaluate assignments completed by students, including quality and timeliness		Measurement of students' competence and co-operation in practical projects
Concluding evaluation	Final	A comprehensive examination at the end of a semester to test students' academic knowledge	Principals	Measuring student mastery of subject matter
	Student Feedback	Student feedback on courses and training, including course satisfaction and recommendations	schoolchildren	Provide student perspectives and suggestions for improvement

### 5. Reach a verdict

The reform of virtual simulation of secondary electronic information professional courses is an important initiative to adapt to the development of the times and educational reform. Through the application of virtual simulation technology, it can enhance students' practical operation ability,

reduce the cost of experiments, and improve the quality and effect of teaching. In the process of implementing the curriculum reform, it is necessary to continuously develop a suitable virtual simulation platform, further strengthen the construction of the teaching staff, optimise the teaching content and methods and establish a perfect evaluation system. Only in this way can we cultivate high-quality talents with innovation and practical ability, and contribute to the development of China's electronic and electrical industries.

At the same time, the reform of secondary electronic information professional curriculum based on LABVIEW virtual simulation is a necessary initiative to meet the development needs of the times. Through the introduction of LABVIEW virtual simulation technology, it can optimise the course content and teaching mode, strengthen practical teaching and project-based learning, and improve students' practical operation ability and innovation ability. At the same time, this reform can also make up for the shortcomings of the traditional experimental teaching mode and reduce the experimental costs and safety risks.

In conclusion, the reform of secondary electronic information professional curriculum based on LABVIEW virtual simulation is an important way to improve teaching quality and cultivate students' practical ability. In the future, with the continuous development of technology and application, this reform will achieve more significant results.

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