Electronic Technology Curriculum Reform Based on Teaching Experiment Cloud Platform

Hua Yu[1], Wenquan Wu[2], Xuelian Gu[1], Min Yao[1], Yunfeng Zhou[3], Lan Liu[1], Jingjing Jiang[1]

[1]School of Electronic Information Engineering, Wuhan Donghu University, Wuhan, 430212, China

[2]Department of Electronic Engineering, Naval University of Engineering, Wuhan, 430000, China

[3]Policy and Regulation Department of Hubei Science and Technology Department, Wuhan, 430000, China

Abstract: Based on the netcircuit labs virtual real combination of electronic technology teaching experimental cloud platform, it provides a solid foundation for the implementation of online offline hybrid teaching new methods of electronic technology courses. The curriculum reform plan attempts to build a new teaching experimental cloud platform, design and realize a new, more effective online offline mutual penetration, mutual supplement and close combination We design and implement a new online theory experiment teaching management mode and method, effectively grasp the personalized knowledge background and learning habits of students, collect data online to form teaching big data, which is used to customize personalized teaching, training and experiment programs for each learner. The curriculum reform plan is in line with the transformation and upgrading needs of Application-oriented Universities in training application-oriented talents, and has achieved remarkable results in training high-quality and high-level application-oriented talents.

1. Introduction

Under the background of "China manufacturing 2025", "one belt and one road" and the "new engineering" strategy adapting to the social development of our country, how to adapt to the rapid change of the market demand of applied talents, solve the shortcoming of the shortage of high-quality educational resources, and improve the quality of applied talents, become the key problem to be solved urgently. Colleges and universities are lagging behind in personnel training mode, specialty setting, curriculum construction and faculty construction, especially in the teaching concept and teaching method of theoretical courses and experimental courses, which results in low quality and efficiency of application-oriented personnel training and disconnection from the talent demand of our province [1]~[3].

In 2013, China's Ministry of Education issued a notice calling for the establishment of a national virtual simulation experiment teaching center as soon as possible. The notice requires higher education institutions to explore new educational concepts and models, actively promote the technological innovation and information construction of teaching, and provide students with more high-quality and efficient teaching resources[4].

At present, although the Application-oriented Undergraduate Colleges and universities have gradually introduced the advanced cloud platform as the technical support, but the corresponding curriculum reform and implementation of colleges and universities is just starting, facing many technical difficulties and resource constraints. In this paper, we will try to carry out online offline curriculum reform based on netcircuit labs virtual reality combined with electronic technology teaching experimental cloud platform[5].

2. Construction of teaching cloud platform and design of curriculum reform scheme based on netcircuit Labs

Netcircuit labs virtual real combination electronic technology distance teaching experimental

cloud platform is an electronic technology teaching experimental cloud platform developed by Emona company. It is different from the general virtual simulation software. It is a brand new virtual real combination electronic technology teaching experimental cloud platform based on FPGA technology, which has the actual hardware circuit connection and operation, and high integration. It uses multimedia The interface reproduces the experimental environment which is highly consistent with the real hardware experimental conditions in the networked remote client, so that teachers and students can implement the theoretical function verification and experiment of the relevant classical electronic technology circuit in a new way of remote online experiment, and achieve the effect that is completely consistent with the actual work of the hardware and electrical circuit.

Netcircuit labs new virtual real combination electronic technology teaching experimental cloud platform has rich experimental case base and excellent remote online experimental user interface, and can be combined with provincial and school level excellent resource sharing course construction. Students can watch the teaching video of excellent courses, and at the same time, through netcircuit labs virtual real combination electronic technology teaching experimental cloud platform on hardware experimental equipment Verify and test the theoretical knowledge learned in the classroom, so as to obtain intuitive, image and real perceptual knowledge when contacting the theoretical knowledge for the first time, with totally different learning experience, so as to greatly deepen students' understanding of theoretical knowledge, enhance students' interest and efficiency in learning, and help students to understand "digital electronic technology foundation" more intuitively and profoundly "The theoretical knowledge of basic courses of electronic technology is an important improvement and supplement of offline theoretical teaching methods. As shown in Figure 1, the netcircuit labs server logs in to the web page remotely. Figure 2 shows the main board of "digital electronic technology foundation" course of netcircuit labs virtual real combination electronic technology teaching experimental cloud platform.

Through online remote access to the netcircuit labs of Emona on the computer of multimedia classroom, the new electronic technology teaching experiment cloud platform of virtual reality combination is demonstrated in real time, such as the classic circuit composition, logic and analog circuit function of "digital electronic technology foundation", "analog electronic technology foundation" and other courses, so that students can have an image and intuitive for the abstract theory and circuit function The knowledge and understanding of the course will help to strengthen the students' deep understanding and application of the theoretical knowledge they have learned, greatly improve the teaching effect and efficiency, and improve the students' engineering practice ability of learning and using the theoretical knowledge flexibly.

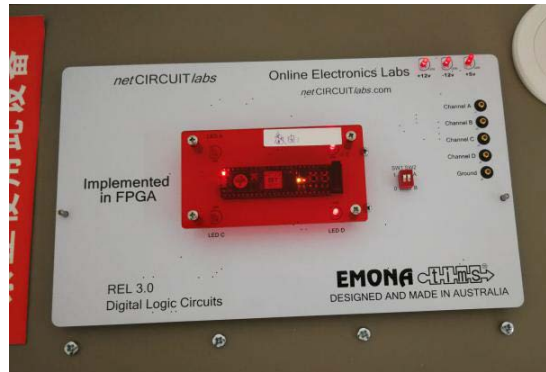Fig.1 Remote Login Web Page of Netcircuit Labs Server

Fig. 2 Main board of "digital electronic technology foundation" course of netcircuit labs virtual real combination electronic technology teaching experimental cloud platform

Netcircuit labs virtual real combination of new electronic technology teaching experimental cloud platform related "digital electronic technology foundation" and "analog electronic technology foundation" courses online theoretical teaching experimental case base includes: full adder, full subtracter, medium scale integrated circuit, data distributor, decoder and other classic combinational logic circuits; latch, trigger, edge trigger, state diagram and State table, finite state machine application design and other sequential logic functional circuits.

As shown in Figure 3 below, it is the logic functional circuit wiring diagram of "digital electronic technology foundation" and "analog electronic technology foundation" of netcircuit labs teaching experiment cloud platform. Figure 4 shows the output results of logic functional circuits of "digital electronic technology foundation" and "analog electronic technology foundation" of netcircuit labs teaching experiment cloud platform, which are used to demonstrate the working principle and operation results of combinational logic functional circuits.

Fig. 3 "Digital electronic technology foundation" logic function circuit wiring diagram of netcircuit labs teaching experiment cloud platform
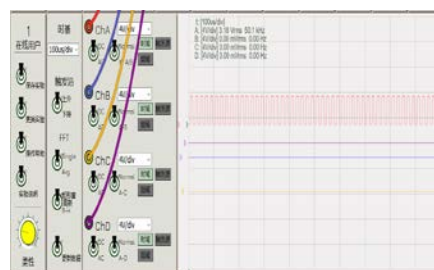

Fig. 4 Output results of "digital electronic technology foundation" logic function circuit of netcircuit labs teaching experiment cloud platform

Netcircuit labs virtual real combination of new electronic technology teaching experiment cloud platform related "simulation electronic technology foundation" course online theoretical teaching experiment case base includes: the AC performance of the partial voltage bias co injection amplifier circuit, the no-load voltage gain of the partial voltage bias co injection amplifier circuit, the load voltage gain of the common emitter transistor amplifier circuit, the multi-stage amplifier circuit, and the output voltage Peak to peak, emitter resistance plus bypass capacitance, negative feedback,

differential amplifier, thyristor operation, thyristor dimming circuit, OTL power amplifier, dynamic range and conversion rate, open loop, input compensation voltage and current, common mode, reverse amplifier, non reverse amplifier, voltage follower, add amplifier, differential amplifier, integral circuit, differential circuit, integral circuit- Differential combination circuit, square wave generator, duty cycle, triangle wave generator, sawtooth wave generator, etc.

As shown in Figure 7 below, it is the physical figure of netcircuit labs virtual real distance education experiment cloud platform loaded with the "analog electronic technology" experiment main board.

Netcircuit labs virtual real combination of electronic technology teaching experimental cloud platform conforms to the development direction of laboratory teaching innovation reform, combines with today's developed computer network, virtual instrument and multimedia technology, adopts a new long-distance online experiment and practical teaching mode, truly realizes the sharing of high-quality teaching and experimental resources, greatly reduces the number of students brought to experimental teaching Under the great pressure of learning resources, students are no longer limited to the time and place of experiment and practical teaching, and can complete the experiment independently in a more open environment. It is conducive to the realization of education equity and targeted education poverty alleviation.

With the development of information technology and the continuous upgrading of software, in order to better meet the needs of teaching and scientific research, electronic technology laboratories often need to upgrade and update the hardware and software experimental circuit equipment, so as to improve the construction and maintenance costs of the software and hardware of the experimental center, reduce the efficiency of the laboratory software and hardware, and based on the netcircuit labs virtual real combination of new electronic The technology teaching experiment cloud platform system overcomes the above shortcomings, completes the upgrade and optimization of the hardware equipment of the experiment and practice teaching with the improvement, optimization and upgrading of the software module, keeps the consistency and continuity of the experiment and practice conditions, greatly reduces the hardware maintenance cost and labor cost, improves the experiment and practice teaching effect, and improves the teaching efficiency It also provides an excellent teaching experiment cloud platform for teachers and students to carry out theoretical teaching and scientific research activities.

The new electronic technology teaching experiment cloud platform based on netcircuit labs virtual reality combination technology has changed the traditional management mode of current experiment teaching, trying to put forward requirements for courses and learning objectives in a certain period of time, and then the students can learn independently, arrange theoretical knowledge learning and experiment time independently, and submit experiment reports through the network independently. Teachers can also carry out theoretical and experimental teaching through the network, arrange the progress of theoretical and experimental courses, monitor the completion of students' theoretical and experimental courses, manage and grade relevant theoretical assignments and experimental reports, and reflect a more flexible, efficient and standardized management mode.

The new electronic technology teaching experiment cloud platform based on net circuit labs virtual reality combination technology can make use of big data and cloud technology, explore the way to customize personalized teaching and training programs, improve the training ability of high-level engineering technology talents and graduate employment rate of application-oriented undergraduate universities, improve the full-time teacher training system of application-oriented undergraduate universities, design and To realize a set of personalized sharing theoretical teaching platform, experiment and practice platform based on big data and cloud technology for Application-oriented Undergraduate Colleges and universities.

3. Implementation effect of curriculum reform based on netcircuit labs teaching experimental cloud platform

In May 2018, the school of electronic information engineering of Wuhan East Lake University introduced netcircuit labs virtual real combination electronic technology teaching experimental

cloud platform of Emona Corporation of Australia, which provided solid hardware conditions for the teaching reform and new experimental scheme design of electronic technology courses such as "digital electronic technology foundation", "Analog Electronic Technology foundation", etc The need of transformation and upgrading to application-oriented universities is of great importance to the cultivation of high-level application-oriented talents with strong ability of engineering practice and innovation and entrepreneurship. With the help of the cloud platform, the network operation of multimedia classrooms can vividly and intuitively display the classic theories and circuits of electronic technology courses such as "digital electronic technology foundation" and "analog electronic technology foundation". In the first semester of 2018-2019 academic year, the teaching reform of relevant theoretical courses is mainly aimed at the students of class 1 of 2017 electronic information engineering and class 1 of 2017 communication engineering The reform of experiment teaching, the reform of online and offline experiment methods and so on have achieved good teaching results. The effectiveness of online offline Hybrid Teaching Based on netcircuit labs virtual reality combined with electronic technology teaching experimental cloud platform is further verified.

With the help of netcircuitlabs virtual real combination of electronic technology teaching experimental cloud platform of Emona company in Australia, we can operate online in multimedia classroom, vividly and intuitively display the classic theories and circuits of electronic technology courses such as "digital electronic technology foundation". In the first semester of 2018-2019, we will try to use the brand new technology in class 1 of 2017 electronic information engineering and class 1 of communication engineering The combination of online and offline theoretical teaching and experimental teaching mode verifies its advantages, disadvantages and effectiveness. The teaching effect of this course is excellent. In the course of "digital electronic technology foundation", the overall teaching information of teachers is full, and the students' arrival rate is close to 100%. Among them, 3 / 5 of students can sit in the front row and listen carefully and take notes, actively ask questions through QQ, telephone and other channels, and communicate with teachers. This part of students has achieved good results in the final course assessment, which shows that for this batch of undergraduates The learning ability should be sufficient. From the final score of the exam, it shows that most of the students in 2017 electronic information engineering class have met the requirements of the syllabus, reaching 93.18%; the exam scores of 44 students are basically normal distribution, which is more reasonable. The second, the fourth and the function analysis of the real-time sequence logic circuits, which are concentrated in the sixth problem "analysis and design problems", show that the time sequence logic circuits are the key and difficult points in teaching, and the students still don't have enough in-depth understanding. In the process of completing the test questions, the students are not proficient enough, spend more time doing the questions, and reflect that the students usually have less training and time sequence logic The teaching, training and experiment of the circuit part need to be further strengthened. The test results are summarized as follows: 1 student with more than 90 points, accounting for 2.27%; 15 students with 80-89 points, accounting for 34.09%; 19 students with 70-79 points, accounting for 43.18%; 6 students with 60-69 points, accounting for 13.64%; 3 students with failed papers, accounting for 6.82%, with an average score of 74.91 and a standard deviation of 9.4. It reflects that the learning and knowledge mastery level of "digital electronic technology foundation" course in this class is relatively average, and most of them reach a good level or above. Only three students are not serious in learning attitude and lack of learning motivation, so they fail to pass.

4. Conclusion

Based on the netcircuit labs virtual real combination of electronic technology teaching experimental cloud platform, it provides a solid foundation for the implementation of the online offline hybrid teaching new method of electronic technology courses, designs and realizes a new, more effective online offline hybrid theory experimental teaching method which infiltrates, complements and closely combines with each other. At the same time, design and implement a new online theory experiment teaching management mode and method, effectively grasp the

personalized knowledge background and learning habits of students, collect data online to form teaching big data, which is used to customize personalized teaching, training and practical programs for each learner.

The curriculum reform plan meets the needs of the transformation and upgrading from Wuhan Donghu university to the Application-oriented Undergraduate University, and has a significant effect on the cultivation of high-quality and high-level application-oriented talents.

In the future, we will further refine, improve and optimize the design of the electronic technology curriculum reform plan based on the netcircuit labs virtual real combination electronic technology teaching experimental cloud platform.

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