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The Assessment Method of Basic Circuit Course

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Abstract: This article explores the assessment mechanism of the course "Fundamentals of Circuits", analyzes the teaching content, characteristics, and methods of the course, refines the process assessment, and quantifies the assessment items in detail. It mainly includes three major assessment items: classroom performance, simulation experiments, and homework after class. In the article, further quantitative assessments were conducted on classroom performance, simulation experiments, and after-school assignments, refining the assessment of students. Practice has shown that the assessment method proposed in this article is conducive to promoting deep learning among students, strengthening interaction and communication between teachers and students, and improving classroom learning outcomes.

The professional courses of Electronic Information Engineering Technology in vocational colleges have some commonalities: the course content is relatively dry, the theory is relatively abstract, and for vocational students, the difficulty of learning is relatively high. For such professional courses, it is necessary to start from three stages: the formulation of teaching plans, the selection of teaching methods, and the application of teaching methods. Each teaching stage requires teachers to conduct research and analysis. Setting up assessment methods[1][2] to evaluate students' final grades is an essential and important teaching process.

The traditional assessment method for professional courses mainly consists of two parts, namely the final exam scores and regular scores, but the proportion of final exam scores is relatively large. The drawback of this type of assessment is that the grades are almost determined by the test paper's score, neglecting regular performance. Because students often cram in the hope that passing an exam can determine whether a course is qualified or not. So such exams cannot achieve good educational results. In order to meet the requirements of the training objectives for applied talents, and to establish a scientific, fair, comprehensive, and effective assessment and evaluation system based on the learning foundation and characteristics of vocational college students, attention should be paid to the diversification of assessment methods, and the phenomenon of only emphasizing exams and neglecting daily learning should be changed. Strengthen the process of learning and emphasize the importance of the learning process. Conducting reasonable and comprehensive assessments is beneficial for students to master knowledge and skills, and is more conducive to improving teaching quality and effectiveness. Therefore, we must attach importance to the important link of assessment. Circuit Fundamentals [3][4][5][6]is a highly theoretical and practical professional foundation course that covers two parts: analog electronic technology and digital electronic technology. Because the Curriculum theory is abstract and not intuitive, the author proposes to reform the traditional teaching mode based on the Mulitisim virtual simulation platform. Practice has shown that the new teaching model based on Multisim is beneficial for improving students' learning enthusiasm and facilitating the implementation of teacher teaching organizations. However, it also faces the same problem: how to assess students' learning effectiveness? Should we continue to use the traditional assessment model of "one exam determines the world" or reform the traditional assessment methods? The answer is unquestionable, that is, under the premise of implementing teaching on the Mutlisim virtual simulation platform, it is necessary to reform the traditional focus on examining students' book knowledge, ignoring the evaluation method of students' overall learning effectiveness, and establish a new assessment mechanism corresponding to the reformed teaching mode. Below, this article will further elaborate and research on such an assessment mechanism.

1. Composition of assessment mechanism

The assessment method proposed in this article mainly consists of three parts: classroom performance, simulation experiments, and homework after class. This method is used to further enhance students' interest in learning, actively guide them to operate simulation experiment skills and consolidate classroom learning.

1.1 Classroom performance

Classroom performance, as the name suggests, refers to students' learning performance in the classroom, mainly including learning attitude, civilized operation, social behavior, and other situations. Among them, learning attitude refers to whether one listens attentively in class, takes notes in a timely manner, hands in homework on time, and previews. Civilized operation refers to whether the operation is standardized, whether the workstation is clean, whether electricity is saved, whether criticism and obedience to arrangements are accepted, whether speaking is civilized, whether changing positions and moving around frequently, etc. Social behavior refers to whether school supplies are complete, whether things are taken indiscriminately, affecting the collective, whether there are arguments, impoliteness, unfriendly interactions, and whether they are not doing things on duty. Classroom performance is important and crucial as it best reflects students' learning outcomes. So, classroom performance should be considered as one of the assessment items.

1.2 Simulation experiments

Simulation experiments have virtual characteristics and do not have actual experimental equipment. Instead, they use simulation software on a computer to simulate real circuits. The teaching reform of circuit basic courses based on Multisim is proposed by taking advantage of the intuitive and convenient advantages of Multisim virtual simulation. Therefore, the assessment of circuit basic courses based on Multisim is inevitably related to simulation experiments, and simulation experiments should have a large proportion in the entire assessment system. The assessment of simulation experiments mainly includes circuit design, circuit simulation testing, and circuit troubleshooting. Among them, circuit design refers to whether electronic components are used correctly and whether the layout and planning of the circuit are reasonable on the Multisim virtual simulation platform. Circuit simulation testing refers to conducting simulation tests on relevant circuits to determine whether the test results are correct. Circuit troubleshooting refers to whether the problem can be accurately identified, dealt with, and eliminated in a timely manner when a fault occurs during circuit simulation testing.

1.3 After class assignments

The ancient Chinese educational literature "Xue Ji" advocates that "when teaching, there must be a proper career, and when retiring, there must be a place to study. Among them, "regular work" refers to formal courses, and "residential study" refers to homework after class. It can be seen that homework after class should occupy a certain proportion in the entire teaching process, and it has become an indispensable organic component of teaching work. Through various types of homework, students can consolidate and improve their acquired knowledge and skills during class. Due to the fact that homework is independently completed by students, it is of great significance in cultivating students' ability to think and work independently, as well as their learning habits.

2. Quantitative assessment methods

The assessment items for the circuit foundation course based on Multisim mainly include three parts: classroom performance, simulation experiments, and homework after class. The total assessment score is P , $P=\sum_{i=1}^{3} K_i P_i$, which P_i is the assessment score for each item, such as classroom performance. K_i is the proportion coefficient of each item, K_1 represents classroom performance, with a value of 0.3, K_2 represents simulation experiments, with a value of 0.6, K_3 represents homework after class, with a value of 0.1. It can be seen that the proportion of simulation experiments is relatively large because it best reflects students' learning situation and shows their level of mastery of the knowledge learned. Therefore, the proportion of simulation experiments is higher than the other two items. Below, we will conduct a quantitative assessment of classroom performance, simulation experiments, and homework assignments.

2.1 Quantitative assessment of classroom performance

The score for classroom performance is P_1, $P_1=\sum_{i=1}^{3} a_i x_i$.The values of a_1, a_2 and a_3 are 0.4, 0.4, and 0.2 respectively, x_1, x_2 and x_3 represent learning attitude, civilized operation, and social behavior respectively. $x_1=\frac{m_1+m_2+\ldots+m_N}{N}=\frac{\sum_{i=1}^{N} m_i}{N}$, Among them, m_i represents the score of each learning attitude. Similarly, $x_2=\frac{n_1+n_2+\ldots+n_N}{N}=\frac{\sum_{i=1}^{N} n_i}{N}$, Among them, n_i represents the score of each civilized operation, $x_3=\frac{o_1+o_2+\ldots+o_N}{N}=\frac{\sum_{i=1}^{N} o_i}{N}$, o_i represents the score for each social behavior. Through this assessment method, students' performance can be reflected to a certain extent, making them pay attention to their learning attitude, knowing that attitude is the primary factor in learning any knowledge. A good learning attitude can promote students' further learning, while a negative learning attitude can have a negative impact on learning. Secondly, civilized operation is also another important consideration for classroom performance. Standardized and civilized operation is conducive to promoting students' mastery of skills, as well as their memory of knowledge and skills. Conversely, it can have a negative impact on the entire learning process. Social behavior is also an inspection point of classroom performance, which means that students can complete a task together through division of work and cooperation. During this period, the inspection is to see whether students can carry out appropriate and reasonable communication, that is, whether students can communicate with others normally. As is well known, good social behavior ability is beneficial for students to engage in in-depth learning. Conversely, students will fall into communication traps, learning isolation, and thus hinder their further learning.

2.2 Quantitative assessment of simulation experiments

The score for the simulation experiment is P_2, $P_2 = \sum_{i=1}^{3} b_i y_i$, Among them, the values of b_1,$b_2$andb_3 are 0.2, 0.5, and 0.3 respectively, y_1,$y_2$and $y_3$represent the scores of circuit design, simulation testing, and troubleshooting. $y_1 = \frac{d_1+d_2+\ldots+d_N}{N} = \frac{\sum_{i=1}^{N} d_i}{N}$, (d_i representing the score of each circuit design), $y_2 = \frac{t_1+t_2+\ldots+t_N}{N} = \frac{\sum_{i=1}^{N} t_i}{N}$, (t_i represents the score of each circuit simulation test), $y_3 = \frac{g_1+g_2+\ldots+g_N}{N} = \frac{\sum_{i=1}^{N} g_i}{N}$, ($g_i$represents the score of each circuit troubleshooting). The assessment of simulation experiments is divided into three parts: circuit design, simulation testing, and troubleshooting. Among them, simulation testing accounts for the highest proportion, as this part of the content best considers students' mastery of knowledge points. For example, in a certain circuit, if it is necessary to test the voltage at a certain point, students must learn how to use simulation software Multisim, know what virtual devices are used to measure voltage, and know how to use this device. Therefore, simulation testing is an important examination point in simulation experiments. Secondly, troubleshooting is also an important inspection point. In the process of simulation testing, it is inevitable that errors will occur. At this point, we need to learn to troubleshoot errors and identify the root cause, which is precisely the focus of our investigation, namely the ability to troubleshoot. Of course, the ability to design circuits is also what we need to examine. In this section, we can see whether students have a reasonable layout and design of circuits. Good design not only makes people happy, but also reduces the occurrence of errors to a certain extent.

2.3 Quantitative assessment of homework after class

The score for homework after class is P_3, $P_3 = \frac{z_1+z_2+\ldots+z_N}{N} = \frac{\sum_{i=1}^{N} z_i}{N}$, Among them, $z_i$represents the score of each homework assignment after class. Why is homework also one of the key points of assessment? Because homework after class can reflect students' mastery of the knowledge points learned in class and their learning attitude. Standardized, clear, and correct homework is what we hope for, so we consider homework as one of our inspection points.

3. Conclusion

Our school's basic circuit courses rely on the simulation software Multisim for teaching, so how can students be evaluated based on such a teaching platform? This article proposes an assessment mechanism based on the Multisim simulation platform, which is based on the current learning patterns of vocational college students. It mainly includes three parts: classroom performance, simulation experiments, and after-school assignments. Among them, simulation experiments account for the largest proportion, highlighting the importance of cultivating students' ability to conduct simulation experiments. Next is the assessment of classroom performance, with the aim of recording students' learning attitudes, civilized operations, and social behavior. Finally, the assessment of homework after class is used to observe students' mastery of the knowledge they have learned.

This detailed and quantitative assessment method puts forward high requirements for students' learning. Students no longer simply remember some knowledge points or can do some exercises to pass the exam, but need to pay attention to their performance and accumulation in daily life.

References

[1] Zhang Fengchen, Zhang Yajiang, Qian Bingyu etc. A study on the reform of curriculum assessment methods with the aim of evaluating students' 'learning effectiveness [J]. Economist, 2013 (2): 133-135.
[2] Li Jianxing. Reform and Practice of Project Curriculum Assessment Methods in Higher Vocational Colleges [J]. Education and Career, 2013 (5): 145-146.
[3] Li Peng Discussion on the Assessment of Digital Electronic Technology Course [J]. Computer Knowledge and Technology, 2012, 8 (34): 8202-8204.
[4] Shi Minghui Analysis on the Assessment of Electronic Circuit Experiment Course [J] .Journal of Northwest Adult Education, 2000, (3): 57-51.
[5] Hu Yan Exploration of Assessment and Evaluation Methods in the Teaching of Science and Engineering Courses in Universities - Taking Communication Electronic Circuits as an Example [J]. Fujian Computer, 2018, (4): 164 to 167.
[6] Fang Erxi. Exploration and practice of goal driven curriculum process assessment [J]. Experimental Science and Technology, 2016, 14 (4): 136-138.