Experiment Teaching Reform of Electronic Measurement and Intelligent Instrument Based on Emerging Engineering Education

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Abstract. In view of the electronic measurement and intelligent instrument of experiment teaching problems, students' innovative practice ability is vigorously promoted through the establishment of the laboratory, development experimental projects, rich teaching methods, multiple experiment assessment system, practice course education, construction of double type on teachers based on Emerging Engineering Education. It can provide reference for electronic information class other professional courses of Emerging Engineering Education.

1 Introduction

In 2012, our university was upgraded from a vocational college to an ordinary undergraduate college. In 2017, we began to explore the transformation of technology universities, and in 2018, we gradually began to reform new engineering education certification for pilot majors. The electronic information engineering major of our college is one of the pilot majors of engineering education certification reform. Most of the courses set up in this major have experienced the development process of higher vocational college, new undergraduate course, applied technology transformation and the ongoing engineering education certification reform[1].

Take the course of "Electronic Measurement and Intelligent Instruments" as an example, these courses are important professional courses in telecommunications, measurement and control, and instruments in colleges and universities. They are closely combined with engineering practice and play an important role in cultivating students' innovative thinking ability and practical ability. However, there is still a distance between its reform and development process and the new engineering construction goal. In particular, the experimental teaching of the course has some problems, such as unreasonable setting of teaching content and backward teaching mode, so it only plays a preliminary role in auxiliary theory teaching, while the goal of higher level new engineering construction —— has little role in cultivating students' practical ability, practical ability to solve practical problems and innovation ability.

In view of the above reasons, the research group will take "Electronic Measurement and Intelligent Instrument" as the pilot course of the new engineering experimental teaching reform, which will provide a good reference for the new engineering construction of other professional courses of electronic information, and has good practical significance and promotion value.

2 The idea of experimental teaching reform

New engineering is put forward under the background of new scientific and technological revolution, industrial revolution and economy, and its direction of engineering education reform is in line with the major national strategy. Therefore, the research group focuses on the urgent requirements of the society for electronic information talents, and aims to cultivate outstanding engineering talents with practical ability, the ability to solve specific problems and innovate, and at the same time to meet the needs of social development. The experimental teaching system, teaching methods, and teaching means of electronic Measurement and Intelligent Instruments were explored and reformed, and the policy of “taking social needs as the guidance, taking practical engineering as the background, taking engineering technology as the main line, and focusing on improving students' engineering awareness, engineering quality, and engineering practice ability” was formulated[2-3].

Virtual instrument technology is the inevitable trend of the development of new electronic testing technology. It makes use of the powerful hardware platform of computer and emphasizes the concept that software is the instrument. Build soft and hard combination, the combination of the experiment teaching mode, including the development of virtual simulation teaching project, and the formation of "content enrichment, reality" experimental curriculum system, instructions, highlights the concept of "sharing software experiment, sharing hardware experiment, remote experiment", realize open sharing of high quality experimental teaching resources. This can not only enhance the teaching attraction, stimulate students 'learning enthusiasm and autonomy, but also strive to improve students' engineering awareness, engineering quality and engineering practice ability, fully

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meet the requirements of the reform of telecommunications professional engineering education certification[4].

3 Specific measures

3.1 Establishing a laboratory combining the virtual and real conditions

The experimental teaching of "electronic measurement and intelligent instrument" requires the electronic measuring equipment, such as multimeter, oscilloscope, signal generator, frequency scanner and so on. If students want to ensure sufficient experimental time, it may have to invest more than millions of funds, which is impossible for ordinary institutions of higher learning. Considering the college of electronic measurement and intelligent instrument course experiment and no dedicated laboratory this objective conditions, at the same time in the case of not increase laboratory investment, with the existing electronic technology laboratory (hardware laboratory), computer system laboratory (virtual instrument laboratory), establish the combination of electronic measurement and intelligent instrument laboratory, to open the course experiment to provide the necessary infrastructure. This is also in line with the current learning mode of the Internet+ era, which is conducive to improving the quality of teaching and is a powerful supplement to experimental teaching[5-6].

3.2 Developing experimental projects

The experiment of the course itself includes 8 credit hours and 4 experiments, including the use of signal generator; the use of multimeter; the use of double tracer oscilloscope, and the measurement of computer simulation circuit. These experimental projects are mainly confirmatory experiments, lacking comprehensive and designed experiments, and the experiments are too simple and not challenging; hardware electronic measuring instruments are basically used in experimental teaching, and lack the combination of virtual and real.

The research group compiled the experimental handout, reformed the confirmatory experimental projects, and added the comprehensive design experimental projects. After the reform, the experimental projects include: the measurement of signal parameters, the measurement of electronic component parameters, the design of intelligent frequency meter and the design of intelligent RLC measuring instrument. It covers the confirmatory, comprehensive, designed and innovative multi-level experiment types. The verification experiment is no longer completed step by step according to the experiment instructions, but transformed into designed and innovative experiments. The teacher gives the questions, requirements and conditions, and the students design the experiment scheme, and then use the virtual instrument simulation software to verify, and finally select the experimental instruments and equipment to complete the experiment. Each experimental project is a combination of hands-on practice and virtual simulation, to truly achieve the combination of virtual and real. So as to fully improve "the height of the innovation, challenges of the course and take into account the frontier" of the course, cultivate students' practical ability.

3.3 Enrich teaching methods

At present, the theoretical teaching in undergraduate education has gradually introduced and adopted new teaching methods, such as micro-courses, MOOCs and flipped classroom, etc., which have also achieved corresponding teaching effects. In experimental teaching, on the basis of retaining some traditional experimental teaching methods, the micro-class and small video are used to assist teaching. In the specific experimental teaching practice, different from the micro-course which tells the principle in the theory course, the experimental effect is selectively presented, and the middle "black box" (experimental process and its principle) part lets the students dig and learn by themselves.

The comprehensive and designed experimental projects adopt the project method to decompose the teaching links, and combine with the diversified teaching methods to achieve the teaching objectives. First of comprehensive, design experimental project use scenario experience method for project function, demand analysis, and then inspire the students discussion, ask the students to consult relevant information, prepare accordingly, flip classroom, please the students explain the specific working principle of intelligent instrument system, the system design scheme, at the same time using virtual instrument design specific circuit, complete simulation, analysis, and then according to the performance of the system parameters of component selection, layout, welding and debugging, complete the physical production. Using interactive method for on-site report defense, teachers, students, students have questions and answers. After the defense, the students will use their extracurricular time to write the experimental report and summarize the whole process. Finally, the mutual evaluation results between teachers, students and students will become an essential part of the experimental results.

3.4 Multiple experimental assessment system

The experimental part of the assessment aims to examine the students' knowledge, attitude, quality, ability and quality. According to the category of the experimental items, the results of the experiment are evaluated respectively. Among them, the results of comprehensive and design experiments are composed of formative, phased and final evaluation modules, as shown in Table 1. And the general experiment teaching setting preview problem, requires the students to do the corresponding preview work before the experiment class. During the experiment, check the preview report and ask questions. According to the actual operation, data accuracy and experimental speed, increase the proportion of the result in the total score. Strictly comparing the original

experimental data correction report, effectively eliminate the phenomenon of copying the experimental report after class. The performance evaluation is as shown in Table 2.

Table 1. Evaluation table of comprehensive and design experiments.

projects	proportion（%）	requirements
Formal assessment	20	Student attendance is graded on a 100-point scale.
Stage assessment	40	The theoretical knowledge, simulation design, physical production and comprehensive debugging of the two specific experimental projects were comprehensively evaluated.
Termination assessment	40	The assessment is carried out in the way of defense, comprehensively investigating the completion of the design, defense performance, experiment report writing, etc.

Table 2. table of General experiment performance evaluation.

projects	proportion（%）	requirements
Attendance and discipline	10	Each experiment was scored separately for attendance, discipline, and experimental performance.
experimental duties execution	60	It mainly examines the correctness of students' experimental results, the completion speed of experimental task and the standardization of operation process; each assessment is scored separately according to the percentage system, and the average value of each grade is taken as the final result of this link.
Preparation and experimental report quality	30	It mainly examines the students' analysis of experimental data and experimental results, as well as the mastery of practical knowledge and the standardization of report writing; each report is scored separately according to the percentage system, and the average value of each score is taken as the final result of this link.

3.5 Practice the ideological and political course

Through the course experiment, students can understand the development of electronic measurement technology and instruments in China, guide students to persevere, innovation and dedication, unity and cooperation spirit, further stimulate students' learning motivation, establish national pride and self-confidence, and strive for the construction of a world science and technology power. Learning the design method of intelligent instruments, so that students keep up with the cutting-edge technology of intelligent instruments, cultivate students to explore and enterprising, rigorous and realistic, climb the excellent quality and down-to-earth, unity and cooperation responsibility and responsibility.

3.6 Build a team of double-qualified teachers

Electronic Measurement and Intelligent Instrument is a very practical course, so the course experiment needs a "double-qualified" teacher team with theoretical teaching ability, engineering practice teaching ability, teaching organization and management ability. Guided by optimizing the structure of teachers, improving the quality of teachers and improving the engineering practice ability, the course group actively introduces and stabilizes the high-level urgently needed talents, and improves the professional and technical quality of teachers and the engineering practice ability. Through the training, introduction and extension of employment, strengthen the proportion of part-time teachers and expand the construction of dual-teacher teachers.

4 Conclusions

Through the unremitting efforts of the course team in experimental projects, teaching methods, experimental assessment system, curriculum ideological and political affairs, the teaching team and other aspects, the course experiment has been continuously constructed and practiced. Through the practical teaching test, the reform of the experimental teaching has aroused the enthusiasm and creativity of the students in learning, and improved the students' practical ability, innovation ability and thinking ability.

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