

Exploration of Experimental Teaching Methods of Mechanical and Electrical Specialty under the Background of New Engineering

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Abstract

Experimental teaching is an important part of teaching, which can deepen students' understanding of theoretical teaching and improve students' application of knowledge. Inspired by the current new engineering talent training model, by analyzing the actual situation of students, the characteristics of electromechanical experiments, and the teaching process of teachers, starting from experimental teaching, according to the requirements of engineering education certification, explore the establishment of "student-centered, results-based" The experimental teaching concept of "oriented and continuous improvement" enhances the effect of experimental teaching.

Keywords

Experimental teaching, new engineering, talent training, electromechanical.

1. Introduction

In order to improve the level of manufacturing and realize the transformation from a big manufacturing country to a strong manufacturing country, China proposed the "Made in China 2025" program [1-3]. In this context, in order to proactively respond to the new round of industrial reforms and technological reforms, the Ministry of Education actively promotes the construction of new engineering sciences, and has issued the "Notice on Carrying out New Engineering Research and Practice" and "About Promoting New Engineering Research and Practice Projects" Notice". Electromechanical experiment is a basic course of science and engineering generally offered by colleges and universities. It is a bridge linking classroom theory teaching and an important way to cultivate students' scientific experiment ability, scientific research ability and innovation ability. Based on the professional characteristics of our school, this article explores and establishes the experimental teaching concept of "student-centered, result-oriented, continuous improvement" from experimental teaching.

2. Focus on Students and Adjust Teaching Methods

2.1. Analyze and Understand the Characteristics of Students and Grasp Their Experimental Psychology

Understanding the characteristics of students, grasping their psychology, treating students differently, and understanding students are the basis for a good experiment class. In the process of guiding the experiment, understanding and mastering the characteristics of students and treating students with different psychological activities differently is of great significance to improving the quality of teaching. When students are doing experiments, they are eager to learn, but also cautious and lack confidence. Through observations over the years, it is found that during the experimental training process, the students who complete the same experiment content within the same time show great differences. The difference is manifested in two aspects, one is the data processing status, and the other is the experimental operation status. The differences in data processing are mainly related to the requirements of experiment

teachers, students' understanding of experiments and the degree of emphasis on experimental classes; the difference in the ability of vivid hands during the experiment operation is related to factors such as students' experimental literacy, personal habits, interests, and social environment.

2.2. Encourage Students to Learn Independently

Compared with the teaching of theoretical courses, the teaching of experimental courses has greater independence, freedom and exploration. Classroom teaching mainly relies on teachers to teach, and the teaching is carried out by listening. For experimental teaching, after the experimental teacher determines the experimental items, the experiment is mainly controlled by the students themselves, such as the installation and debugging of equipment and equipment, the measurement and collection of experimental data , The analysis of results, the compilation of experimental reports, etc., must be completed by each student independently, so students are the real main body in the activities of experimental teaching. In recent years, the laboratory has added design, synthesis, and exploratory experimental projects, and opened the laboratory to students, which further enhances the independence, freedom, and exploratory nature of students in experimental teaching activities. Therefore, it is particularly important to stimulate students to learn independently in experimental teaching. The use of limited experimental class hours to mobilize students' learning enthusiasm, so that students' practical ability can be fully trained, is a subject that experimental teachers should study carefully. Students' subjective initiative should be brought into full play, and students should be allowed to independently complete the operation process of the entire experiment and obtain data.

2.3. Grasp the Experimental Foundation of Students and Carry Out Dialogue-Based Targeted Teaching

The teaching and guidance of experimental courses is different from the guidance of other courses and has its own characteristics. After the experiment began, due to the different majors and personal abilities of each student, the understanding and cognition of the experimental problems were also different, and the problems were often numerous and trivial. The depth of the various questions is different, and the angle of asking the question is also different. In this regard, the teaching process should also be treated separately, and the teaching adopts face-to-face dialogue teaching, which is highly targeted. When answering questions, teachers should be quick, concise, and accurate. It is not advisable to ask for information from others, seek insights, and tell students the results directly. Through brief dialogues, we should find out the reasons for the problems, clarify the students' thinking, and then use accurate language to inspire and guide. In addition to requiring instructors to have high experimental quality and language skills, they must also have a clear understanding of the students' basics and status. When students ask questions, they can prescribe the right medicine, talk in a few words, and make the most of the key points, so that they can bludgeon them quickly. Solve the difficulties encountered in the experiment. When dealing with technical problems or making necessary demonstrations, the requirements should be clear and step-by-step. Not only should the procedures be strictly followed to standardize operations, but also the ideas when dealing with problems should be introduced to students, so that the guidance work is accurate, timely and enlightening .

3. Cleverly Arrange Training Content

According to the requirements of the market, within the framework of the teaching syllabus, the training topics are selected, and the students are targeted for intensive training.

3.1. Take the Experimental Preview as A Breakthrough to Change Students' Blind Reliance on Thinking Into Conscious Active Thinking

Experimental teaching is a process in which students are the main body, through the hands-on operation of students, to cultivate their experimental ability. In order to improve the effect of this process, grasping the experimental preview is a breakthrough. Most of the comprehensive and design experiments in experimental projects have the characteristics of wide coverage, high difficulty, and strong comprehensiveness. It is necessary to fully organize the preview, and use the experimental preview as the first link to stimulate students to actively acquire experimental skills for intensive training. First of all, put forward a heuristic guidance outline to students before the experiment, allowing students to analyze, synthesize, and discover the questions raised by the outline, and find the key to the success of the experiment. Secondly, students are required to do through the preview: read through and carefully analyze the content of the textbook, master the principles and internal knowledge connections of each step of the experiment; discover the key to the success or failure of the experiment and corresponding measures; plan the experimental steps and cross-use time and instruments to write the best Experiment implementation plan; seize the main parameters of the main instruments and mechanical power; draw the main experimental device diagram; write the preview report. Before the experiment, each student must present a preview report to the teacher, and the experiment can be carried out after passing the inspection, otherwise the experiment will be rejected.

3.2. Standardize the Basic Operations of Students

Experimental operation is the core link of electromechanical experiment. Whether the operation is standardized and accurate, the pros and cons of the experimental results, the orderliness and safety of the experimental process are all reflected in this link. For basic experimental projects, the lecture usually tells students the topic, principle, instrument used, experimental procedure, and even the details and points of attention are clearly explained one by one. This kind of experimental teaching method is called a process method, which is more suitable for bringing students into the hall of electromechanical experiments, and it is also very effective for cultivating students' meticulous style and serious scientific attitude. In the later stage of experimental teaching, increase the amount of information in electromechanical experimental teaching and encourage students to choose different ideas and methods for experimentation.

3.3. Strictly Check the Experimental Records

The experimental record is the true record of the experimental phenomena of the students in the experiment process. This link is an important process of cultivating students' scientific attitude of seeking truth from facts, developing good experimental habits, and finding and solving problems in time. Grasping this link can prevent students from passively coping in class and copying experimental data after class. Students are required to conduct experiments and record carefully on the basis of experimental preview, and no changes to the original data are allowed. At the end of the experiment, the teacher should carefully check the experiment record of each student, sign for approval and give an evaluation.

4. Strengthen Experimental Assessment

4.1. Experimental Skills Assessment During the Teaching Process, Individual Skills Must Be Passed for Key Teaching Content

In the assessment process, the assessment should be based on the assessment situation of most students, focusing on common problems; the students who fail the assessment should be

encouraged and guided; the creative methods and skills used by the students in practical activities should be encouraged and guided. Teachers should give praise and encouragement. The purpose is to give students a sense of urgency, mobilize their enthusiasm and initiative in training, broaden their horizons, enlighten their thinking, and arouse the desire for further learning.

4.2. Experiment Report

The evaluation experiment report is a summary of the experiments done by the students. It can reflect the whole process of the students' experiments. It is an important step for the sublimation of various experimental phenomena and experimental results to a theoretical level. The assessment of the experimental report mainly includes whether the report is clean and standard, whether the device diagram is accurate and beautiful, whether the experimental procedures and experimental phenomenon records are complete, whether the experimental phenomenon can be explained correctly, whether the experimental results are correct, and whether the problems found can be addressed. Make more in-depth discussions and so on.

5. Conclusion

According to the concept of the new engineering subject and in accordance with the requirements of engineering education certification, the existing experimental teaching activities are improved, and the experimental teaching concept of "student-centered, result-oriented, continuous improvement" is explored and established, which reflects the innovative design ability and practice. The comprehensive requirements of operational ability to adapt to the new goals of new engineering courses for curriculum construction and to enhance the effect of experimental teaching.

References

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