

Discussion on the Practice of Design and Research Physics Experiment

Xin Jianying

School of electronics and electrical engineering, Zhaoqing University, Zhaoqing, Guangdong, China

Keywords: Design, Research, Physical experiment, Practice, Discussion

Abstract: In order to enhance students' practical and innovative abilities and improve their overall quality, colleges and universities offer design and research physics experiments on the basis of traditional physics experiments, which is conducive to satisfying students' learning status. Based on this, this paper analyzes the main problems existing in the current physics experiment teaching in colleges and universities, and based on the teaching points of design and research physics experiments, proposes the practical path of design and research physics experiments, and actively promotes the teaching level of colleges and universities. Promote.

1. Research Background

1.1 Literature review

Based on the "Basic Requirements for the Teaching of Physical Experiment Courses in Universities of Science and Engineering", Zhang Ying hui proposed a design and research university physics experiment for the current university physics experiment, which is conducive to the application of new instruments and methods, as well as the existing scientific and technological achievements. Conversion (Zhang, 2011).Zhang Zeng ming pointed out that physics experiments mainly rely on students' independent learning ability, and through the construction of scientific experimental platform, students' work style and scientific attitude are promoted and developed rapidly in practice (Zhang et al, 2011).Based on the current status of physics experiments in colleges and universities, Bai Anning combines different physics experiment cases to conduct comparative research on related teaching programs, and then proposes improved solutions for design and open physics experiments, which is conducive to improving the quality of teaching in colleges and universities (Bai et al, 2012).Zhou Zai jin and Li Zhi kun pointed out that university physics experiments in engineering colleges occupy an important position in higher education. In order to better improve the teaching effect of physics, combined with the actual learning situation of college students, reforming the university physics experiment model is conducive to improving students' initiative. Sex (Zhou and Li, 2015).Xu Mei hua et al. combined with the teaching experience of university physics experiments, and conducted in-depth discussion on the conditions and processes of open and design physics experiments, which is conducive to the reform of physics experiments (Xu et al, 2011).

1.2 Purpose of research

Experimental teaching is the main link in cultivating comprehensive talents. It plays an important role in training students' practical ability, improving students' innovative ability and improving school teaching quality (He et al, 2018).Traditional physics experiments are not very demanding for students. It is only for students to continue to imitate and repeat training, it is difficult to enhance students' ability of independent learning and innovation (Tang et al, 2015).Design and research physics experiments can effectively solve the shortcomings of traditional experiments, mainly focusing on the cultivation of students' creativity and personality (Li et al, 2012).In recent years, various colleges and universities have carried out a lot of research and exploration on the physics experiment teaching mode, which can make up for the deficiencies in the traditional teaching process to a certain extent. Moreover, the design and research physics experiment teaching methods adapt to the current educational industry development needs, and the

society's need for innovative and high-quality talents, gradually introduced into major universities, and gradually become the main direction of physics experiment teaching reform.

2. The main problems in the current physics experiment teaching

Along with the gradual implementation of the new curriculum reform method in the country, physics experiments gradually exposed many problems in the actual teaching process, which is not conducive to the effective implementation of relevant courses, and is not conducive to the improvement of school teaching quality.

First of all, the current school physics experiment is biased towards the theory, and the physics experiment using the instrument for teaching is not enough. In the existing teaching system, physics experiments pay too much attention to theoretical experiments, and ignore the students' correct and practicality for related instruments, which is not conducive to improving the quality of physics teaching from both theoretical and practical perspectives. Most of the schools still use traditional classical physics experiments when conducting physical experiments. These experiments are basically performed by hundreds of experiments or even thousands of experiments by the predecessors, and the corresponding research conclusions have been drawn. Under this circumstance, it is far from enough for the students to repeat the classical physics experiment. The test of the students' ability is not enough. Even if the students know the results, they will carry out relevant experiments, which lacks the opportunity to contact the reality. The use of physical instruments around to carry out the corresponding physical experiments, under the existing cost, in a low-cost way, allowing students to actively participate in physical experiments. This kind of practical physics experiment can not only bring the distance between students and life closer, but also play a formal experimental guiding role. Therefore, even if the school has sufficient experimental resources, it is necessary to emphasize the use of relevant experimental instruments by students, and encourage students to use existing physical experimental instruments to conduct innovative experiments, which is conducive to fully mobilize the enthusiasm of students.

Second, ignore the basic ability of experiments to cultivate students' cognitive world. In recent years, the focus of physics experiments in relevant schools is based on the knowledge of theoretical textbooks, allowing students to combine practical hands-on operations to deepen their understanding of theoretical knowledge. Most of the teaching focuses on cultivating students' standard use of related instruments. Through the correct guidance, the physics experiment can see whether the students can follow the theoretical knowledge and carry out the correct operation, and then draw the correct conclusion. From this point of view, most schools are still derived from theoretical courses when physics experiment teaching, ignoring students' cognitive ability to the outside world. Under this influence, after completing the physics experiment, the students still stay at the book level, and it is difficult to expand to other levels. The scope of teaching has certain limitations.

Finally, the teaching process is too rigid. The physics experiment teaching process is too rigid. In the process of practical teaching, the basic principles of the experiment are not fully reflected, and all teaching methods are relatively rigid. From the perspective of teaching content, physics experiment teaching does not leave enough room for students to develop, just to let the students practice the mechanics according to the textbook. As far as the group experiment is concerned, the experimental purpose, experimental principle, related instruments and operation parts of the textbook are all reflected. However, whenever physics experiment teaching is carried out, students need to spend a lot of time to understand the purpose of the experiment, the experimental principle and related instruments, and then under the guidance of the teacher, follow the teacher to perform a few simple operations, that is, complete the whole Teaching experiment process. In this experimental process, the students' income is not large, which is not conducive to cultivating students' ability to find problems and solve problems, and is not conducive to guiding students to break through existing thinking obstacles. Under this environment, students are difficult to change in a short period of time, unable to form innovative thinking methods, and is not conducive to their own intelligent development.

3. Teaching points of design and research physics experiments

The design and research physics experiment is to let the students get basic ability training in the scientific experimental process through the rationalized experimental process. According to the long-term teaching experience analysis, it is found that the design and research physics experiment is a teaching mode that constantly reflects innovative thinking in the basic experimental process. Under this teaching mode, students are able to discover different problems at different time periods, and then carry out a process of continuous thinking and learning. In the school teaching system, design and research physics experiments are the best way to improve students' learning ability, and also the main way to expand students' personal cognition system. In general, design and research physics experiments mainly include three teaching requirements.

One is feasibility. In the process of design and research physics experiments, teachers set aside some creative space for students in specific experimental design by formulating experimental tasks with certain difficulty. At the same time, in the specific experimental process, students only need to operate according to the general teaching process, and the specific teaching links have certain controllability. In the process of design and research physics experiments, teachers provide students with sufficient independent learning opportunities, so that students can obtain a large amount of data in the reference technical data of the system, which is conducive to solving the corresponding problems. At the same time, the teacher also prepares a variety of physical equipment for the students in the process of experimental design, allowing students to make their own choices according to the actual situation, which can stimulate students' diverse learning interests and create design and research physics experiments. A diversified teaching system that mobilizes students' enthusiasm for learning.

The second is rationality. According to the current experimental situation, the design and research physics experiments comprehensively analyze the problems existing in the relevant experimental processes and processes, and analyze the related problems to design the existing experimental processes to form a new teaching method. In the process of design and research physics experiments, the students will conduct a comprehensive analysis of the specific experimental process, as well as after-school guidance and pre-class preparation, and improve and optimize the different teaching links to determine the rationality of the teaching process. The student performs the corresponding operation, that is, enters the normal experimental verification phase. After the design and research physics experiments, the relevant personnel will analyze and reconfirm the experimental results, confirm whether the experiment is successful, and optimize the corresponding process to guide students to carry out rationalized teaching experiment design, and students and teaching. The combination of content is conducive to the overall improvement of teaching quality.

The third is design. The main body of design and research physics experiments is still students. In the specific experimental process, the teacher only needs to explain the overall design and research physics experiment teaching ideas and methods to inspire students' experimental thinking and realize the purpose of students' independent participation in experiments. However, the teacher's explanation will not give the final design result of the whole experiment. In the course of the experiment, the students must obtain the experimental results through continuous practice, data search and innovative thinking. In this way, through the reform of physical experiments, the passive learning process of students is transformed into an active exploration process, allowing students to actively participate in the entire teaching process, and it is easy to achieve better teaching results.

4. Fourth, the practical path of design and research physics experiments

Based on the current status of physics experiments, in order to effectively solve the problems existing in current physical experiments, try to reform and explore the physical experiment mode, integrate design and research physics experiments into physical experiments, and decompose the whole experimental target into independent learning. Synchronous experiment, independent experiment and summary and consolidation of four links, through specific teaching practices, get

good teaching results.

Self-learning. Relevant schools should make full use of the resources of the school and the advantages of the campus network information platform to publish various physical experiment materials on the information platform for students to download and prepare before class. Moreover, teachers should base on the basic needs of students, issue clear preview reports and requirements, provide basic essays when necessary, and solve problems that students do not pre-study before class, so that students have a clear preview goal before class. At the same time, in the process of design and research physics experiment, teachers should propose the basic requirements and scoring standards of the experiment, and adopt the teaching methods of pre-school examination, supervision in class and after-school review to confirm the learning objectives of the students. It not only solves the problems in the experimental class, but also trains students' ability to collect and obtain information.

Synchronous practice. In the process of design and research physics experiments, we should use a way to explain and operate simultaneously, so that students and teachers can achieve synchronous connection. Teachers can timely provide corresponding guidance according to the actual operation of the students to solve the corresponding problems in the students' experimental process. In this session, teachers can not only effectively grasp the students' operation, but also test the students' practical ability and achieve the goal of doing more with less.

Independent experiment. According to the experimental process designed by the teacher, the students perform the corresponding experimental operations with the proposed experimental steps, and then perform data analysis based on the specific experimental results. By recording the student's practice process and data, the teacher completes the quality test according to the corresponding teaching process and gives corresponding evaluation. In this session, students' ability to think independently can be greatly improved, and the overall experimental program can be continuously improved to ensure that students can complete experiments with high quality.

Summarize the consolidation link. Induction and summarization are the most prone to mistakes. This session requires students to highly summarize the entire experimental process and the central idea, and put forward some precautions. The design of this link can not only achieve the purpose of consolidating the students' learning effect, but also eliminate the students' vague cognition of some knowledge, and encourage students to establish their own conceptual models for the whole experiment to achieve the same effect.

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