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ORIGINAL ARTICLE

Give Full Play to the Role of Undergraduates in the Construction of Physics Demonstration Laboratory

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Abstract: To give full play to the role of Undergraduates in the construction of physics demonstration laboratory and let them participate in the maintenance and improvement of experimental equipment will not only improve the teaching effect of college physics and other related courses, but also provide work study opportunities to apply what they have learned and cultivate their innovative and practical ability.

Keywords: Physics Demonstration Experiment; Teaching Effect; Innovative Practice Ability

1. Introduction

There are many difficulties and key knowledge learning in physics teaching, which brings difficulties to students in understanding. The single teaching method of blackboard and chalk is not intuitive enough. Physics is an experimental science, but the knowledge that is difficult to understand has concrete and intuitive application in real life. We should give full play to the characteristics of the subject and make full use of the role of demonstration teaching. In order to stimulate students' interest in learning, cultivate students' ability to observe, analyze and solve physical problems. At present, many colleges and universities at home and abroad take the physical demonstration experiment as a very important teaching link in [1-4], and have established the demonstration experiment teaching base of the second classroom type (open type), and achieved good teaching effect. Physical demonstration laboratory can not only play an important role in college physics teaching, but also can be used to improve the scientific literacy of science and engineering students, and even can be used to carry out popular science work for primary and secondary school students. However, there are many kinds of demonstration experiments, many experimental items and various equipment, and the accessories of the equipment are easy to wear and tear. How to maintain and improve is a practical problem. In recent years, we have made some explorations, especially in the construction of physical demonstration laboratory, giving full play to the role of undergraduate students, not only training and training students, but also greatly improving the utilization rate of demonstration laboratory, and achieved good results.

2. Measures

In order to give full play to the role of Undergraduates in the construction of physics demonstration laboratory, we have made some attempts on the basis of the successful experience of other universities.

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(1) In the way of voluntary registration and assessment, some undergraduates are accepted to participate in the arrangement and maintenance of physical demonstration experiment equipment. They are responsible for each demonstration experiment project to make the experimental principle and step description label, easy for students to understand and operate. In this process, students not only review the relevant physical theory, but also have a deeper understanding of the experimental steps. After each demonstration, timely check the loss of demonstration experimental equipment after use, set up a special maintenance room, so that students can carry out maintenance and repair within their ability.

(2) In order to promote the application of physics demonstration experiment in the engineering of grade one, the post of work study assistant is set up to enable some senior students to assist teaching and become the right-hand assistant of the instructor; when the demonstration laboratory is open to primary and secondary school students in winter and summer vacation, these students can also act as the lecturers.

(3) It is very good for students to use the new physics club to design experiments.

(4) The undergraduates participate in the development of simulation software and the production of demonstration video, and participate in the improvement and independent research and development of physical demonstration experimental equipment. Good project results are also shown as part of the demonstration experiment.

(6) The demonstration laboratory provides a platform for undergraduates, and the maintenance and extracurricular scientific research provide them with exercise and inspiration, and encourage them to actively participate in the innovative design competition of College Students' physical experiment, and more importantly, it can be inherited and improved year by year.

Specific implementation. Take a semester as an example, mainly for science and Engineering Freshmen, 320 students. This project mainly through the physical demonstration series of devices to understand and learn the physical phenomena of force, heat, sound, light and electricity. The experiment was scheduled for two weeks, from Monday to Friday at 9—10 (18: 15—20: 55). Six senior students helped to organize and maintain the demonstration experimental instruments, as well as to guide the freshmen. At the beginning of each experiment, the students were divided into two groups, which were respectively explained and guided by two teachers. Then the students visited and operated the experiments they were interested in. The teacher was responsible for answering the students' questions. The students could write the experimental report according to the requirements of the teacher. During the period, six senior students assisted in guiding and maintaining the experiment.

3. Effect

In order to give full play to the role of Undergraduates in the construction of physics demonstration laboratory, preliminary results have been achieved through efforts and attempts in recent years.

(1) It is conducive to the smooth development of related courses, such as the freshmen's "first year project" to arrange science and Engineering Freshmen to visit the demonstration laboratory, and further study the corresponding demonstration experiments in college physics courses. This not only provides the opportunity of work study, but also improves the use efficiency of demonstration experimental equipment and improves the teaching effect of demonstration experiment.

(2) The construction and opening of the demonstration laboratory not only enhances the learning interest of the visiting students, but also deepens the students' learning and understanding of the relevant physical theory, improves the practical ability, and enhances the students' interest in learning scientific knowledge.

(3) It has cultivated the ability of innovation and practice, produced a number of ideas and design schemes to optimize and improve the existing instruments and equipment, and reflected in the form of papers or patents, laying the foundation for students to participate in scientific research work in the future, and produced a number of student research projects.

Research projects for students:

1) Research on magnetic resonance wireless charging technology based on electromagnetic induction principle and resonant circuit (Project No. 2018zd044).

2) An innovative resistor lock (Project No. 2018zd045).

3) Study on the hydrophobic properties of plant leaves in the SanJiao Lake (Project No. 2018zd046).

4) Design of contactless power and resistance measuring instrument based on voltage and current sensor (Project No. 2018yb143).

5) Variable temperature water cup (Project No. 2018yb145).

6) Cluster analysis of Wuhan City Circle Based on City gravity model (Project No. 2018yb150).

7) Energy saving fan with automatic wind speed regulation based on electronic technology and thermistor (Project No. 2018yb160).

8) Photoresistance based light-emitting pen that will not affect the rest of roommates (Project No. 2018yb161).

9) Automatic dimming portable mirror based on electronic technology and photoresistor (Project No. 2018yb162).

10) Automatic identification of cash register using GMR effect (Project No. 2018yb163).

(4) While giving full play to the role of Undergraduates in the construction of physics demonstration laboratory, many teams have been trained and trained to participate in the innovative design competition of College Students' physical experiment, and many awards have been obtained.

(5) Students get exercise, and it extends to other aspects, such as a student who won the "President's scholarship" and another student who was admitted to the graduate student of China University of science and technology.

4. Existing problems and improvement suggestions

There are also some problems to be noted:

(1) Safety and management regulations.

(2) Reasonable distribution and balance of work study time and study time.

(3) Some students don't pay enough attention to it, they are not active enough, and their levels are different.

(4) There are also conflicts between the open use of the laboratory and conventional teaching, as well as the arrangement of college students (such as students' self-study in the evening), as well as conflicts with students' own elective courses.

(5) Laboratory space is indeed limited, and the number of people to accommodate is limited. Try to adopt the form of grouping and increase the time period.

(6) Some experiments cannot be carried out normally due to the vulnerability and consumption of experimental equipment and supplies. Therefore, it is necessary to strengthen the storage and management of experimental equipment and supplies, and strengthen the maintenance and improvement of experimental equipment.

5. Conclusion

In order to give full play to the role of undergraduate students in the construction of physics demonstration laboratory, some measures we have taken are still effective, and students have also made some concrete achievements: the fifth Hubei College Students' physics experiment innovation design competition won one first prize, two second prizes, three third prizes, and won the excellent organization award; the 14th National University Students "EnZhiPu Cup" intelligent automobile The first prize of the four round group in the national automobile competition finals; one SCI paper published by the students as the first author; one invention patent, one utility model patent, one computer software copyright; and ten scientific research projects of the students.

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