

Raising Open Experiment Elective Course to Cultivate Students' Innovation Ability

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ABSTRACT: This paper discusses how to improve the experiment center open to cultivate students' innovative spirit and practical ability. And it introduces the main content, teaching materials, classroom instruction, and the report writing of improving experiment course in detail. And reasonable system of experiment teaching is the key issue in experiment course. In order to exert initiative and cultivate innovation ability of students, optional courses of improving-experiment are opened, which is benefit to the training practice and innovation ability of students, development of interdisciplinary, and cultivation of the application talent.

KEYWORD: Improving Experiment; Teaching System; Content Courses

1 INTRODUCTION

At the university level, we should be focused mainly on training students' creative mind and ability to develop their abilities, which is one of the teaching assignment of physical experiment. Compared with the classroom teaching, experiment teaching is more advantageous to train students' innovative spirit and practice ability[1]. Laboratory is an important place, where students can find and solve problems from practice and apply knowledge to practice. In addition, Laboratory is also a practice base, where research and applied talent of high quality and creativity are cultivated. However, for a long time, physics experiment teaching is bound by a fixed teaching mode, teaching pattern is unitary, and content is outmoded. Students complete the same experiment in accordance with the same content besides. Moreover, equipments are extensively tested and debugged by the teacher beforehand, so the students just conduct the experiment according to the steps of teaching material, and then they can obtain experimental data. This kind of rigid teaching mode, to some extent, limits the initiative enthusiasm of students, hardly stimulates interest in independent thinking, and suppresses the personality development[2]. This is obviously adverse for students' creative ability.

In order to exert initiative and cultivate innovation ability of students, optional courses of improving-experiment are opened, which is benefit to the training practice and innovation ability of students, development of interdisciplinary, and

cultivation of the application talent.

Therefore, Chinese universities commonly offer improving-experiments in physics experiment course in recent years[3]. We have made trials in this respect and already achieved certain outcomes which are as follows:

2 A REASONABLE SYSTEM OF EXPERIMENT TEACHING IS THE KEY ISSUE IN EXPERIMENT COURSE.

Physical experiment courses include the experiment required courses and two experiment elective courses. The required courses have 60 class hours and 20 experiments divided into two semesters, each completing 10 experiments. These experiments contain mechanics, electromagnetism, optics and modern physics.

Two experiment elective courses are basic experiment course and improving experiment course. Both have 18 class hours and 8-12 experiments. Basic experiments are offered for the students who have great interest in learning physics experiment but poor basic experiment skills. Improving experiments are offered for the students who have learning capacity. They can choose 4-5 experiments to do at any time[4], as long as they finish no fewer than four experiments in a semester, and they complete this course.

Improving experiment course can be follow-up courses of basic experiment course or required courses.

3 CONTENT OF IMPROVING EXPERIMENT COURSE

The students' horizon and thinking way are widened[5]. , the comprehensive use of technology of experimental method and experimental ability are developed, and their study achievement at basic experimental stage are consolidated through the learning improving experiment course. The improving experiments such as holographic gratings, the measurement of Rydberg constant, the measurement of air specific heat ratio, temperature sensor, sound localization, and GPS RF-signal simulation involve optics, electromagnetism, thermodynamics, sensor technology, optoelectronics, modern physics, etc. Students can not only learn new technologies but also review the old knowledge through these experiments. For example, students have used these experiment instruments in the first semester, and this will lay the foundation for complete holographic gratings and the measurement of Rydberg constant.

4 THE TEACHING MATERIALS WRITING OF IMPROVING EXPERIMENT COURSE

The teaching materials of improving experiment similar to ordinary experimental teaching materials, highlight some key questions that make the student thinking. For example, when students conduct the experiments of sound localization and GPS RF-signal simulation, they should discuss the differences and similarities between two experiments above from principle of measurement, device composition and characteristics of information. In addition, students have to discuss the essential of the inner-electric field at the study of silicon photocell experiment.

5 CLASSROOM INSTRUCTION OF IMPROVING EXPERIMENT COURSE

Classroom instruction of improving experiment course is different from other experiments. There are no explanations, only some necessary tips in the process of experimental steps are provided in order to inspire students' thinking[6].. For example, in the measurement of Rydberg constant, after the necessary adjustment of the spectrometer, the most important thing is how to accurately measure minimum deviation angle of one line of the mercury lamp in experiment. Most students don't know how to judge the minimum deviation Angle in the experiment, when the teacher can give questions to inspire the student to change the angle of incidence and observe the changing rule of the deviation angle by themselves. They should find the minimum

deviation angle independently. And that is precisely the meaning of improving experiment.

6 REPORTING REQUIREMENTS OF IMPROVING EXPERIMENT

The improving experiment report does not have explicit format like other experiment reports. Students need to summarize ideas and issues which happened during the experiment. In the experimental teaching, Students must understand the construction and functions of individual parts of the equipments. In instrument regulation, students record them and summarize the problem in report by themselves. When students do the experiments, they should be prompted to observe and record the experiment phenomenon, and then summed up the problem by themselves.

The above must be reflected in the experiment report. Because these records and problems summarized by students have different the depth and breadth, thus the experiment reports can not be the same. This is a way to avoid experiment report identicalness and plagiarism, and naturally ensure the quality of physics experiment teaching. So the improving experiment report would be the equivalent of a short paper. About how to instruct students to write a good improve experiment report, we are still exploring.

7 CONCLUSION

The pedagogical practice in recent years makes us to realize fully that it's very necessary to open improving experiment elective course. It can not only stimulate students' interest in learning, but also promote the students' creative ability, which provide a solid base for achievement in scientific research for students.

REFERENCES

- [1] L. Zhu.. 2003. Teaching Reform in Physics Experiment and the Development of the Ability of Creativity. *Experimental Technology and Management*.(1), 70-71.
- [2] R.X.Liu et al., 2001, Teaching Reform in Physics Experiment and the Development of the Ability of Creativity. *Journal of Gansu Education College*(1).
- [3] Guilford J P. 1956,The structure of intellect in *Psychological Bulletin*.(4):21.
- [4] S. R. Qian et al., 1999, Physics experiment teaching practice and experience of fully open, *Experimental Technology and Management*(2).
- [5] Y. P. Jiang.2001. Experimental Teaching and the Training of Creative Talents. *Laboratory Research*.(10).
- [6] Z. H. Zhang et al.,2009, Construction on integrated and study-innovation-featured physics experiments. *College Physics* 28(11):49-50.