

# *Research and Practice on Teaching Methods of Heat Transfer Experimental Course*

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**Abstract:** In heat transfer experimental course, there is a common phenomenon that some students only record experimental data and copy others' experimental reports. They fail to preview before the class, and think during the experiment. However, as an important practical subject in experimental teaching, heat transfer experiment course will seriously affect the output quality of Chinese college graduates. This paper firstly analyzes the existing problems in the heat transfer experimental course. Then, this paper puts forward the teaching mode reforming of heat transfer experiment course. Finally, this paper puts forward the teaching mode suitable for colleges and universities at the present stage, which is combining with teaching, experiment and examination.

## **1. Introduction**

As one of practical teaching, heat transfer experimental course is an important link in the process of cultivating application-oriented undergraduate talents. Experimental teaching is a teaching form in which students learn by means of experiments under the teachers' guidance. Among them, the teaching method is a method that people use special instruments and equipment to actively intervene, control or simulate the research object, according to the tasks specified in the research subject. The aim is to observe the experiment under the most favourable conditions.

## **2. The Problem of Heat Transfer Experimental Teaching**

### **2.1 The monotonous experimental teaching method**

In terms of the experimental teaching method, the method generally is letting students operate, analyze and draw conclusions step by step in strict accordance with the experimental instruction book, according to the experimental instruction book. What's more, the experimental teacher will adjust the experimental equipment, the specific experimental conditions, and the experimental time for students before the beginning of the experimental class. At the same time, the teacher explained the experimental principle, experimental steps and specific operation to the students in detail before the experiment. Finally, the teacher asked the students to passively repeat the operation several times, and recording the corresponding experimental data. In this experimental mode, students do not need to preview before the class, and they do not need to think during the experiment. The whole experimental learning is completely passive. This kind of experimental teaching is

completely programmed. Although students have the opportunity to operate, they still feel boring and can't stimulate their interest in learning. Moreover, it is not able to cultivate students' innovative thinking and practical ability.

## 2.2 The inadequate experimental equipment

Many universities in China have problems with experimental equipment. First, there are few kinds of experimental equipment, so there are few experimental items for students to choose. Second, the number of experimental equipment is small, there are usually a few people or even a dozen people a group, which can not guarantee the students hands-on operation opportunities. Third, the operability of the experimental equipment itself is not strong. These problems affect students' practical ability and innovation ability, and weaken students' learning enthusiasm and effect.

## 2.3 The one-sided achievement assessment

One - sided achievement assessment is a very common manifestation. It is difficult to give an accurate quantitative assessment for experimental ability in heat transfer experiments as in the theory courses. Students' hands-on ability can only be scored by impression, and students' performance is more reflected in the experimental report. Heat transfer experiment credit is low, have 0.5 credit only, partial college does not count credit even. It has little effect on the grade point average, which causes many students pay little attention to the experimental class. So, some students only record experimental data and copy others' experimental reports. Such a lack of scientific assessment standards, can not truly reflect the students' basic experimental quality, comprehensive experimental ability and innovative consciousness.

## 3. The Teaching Mode Reform of Heat Transfer Experiment Course

### 3.1 Experimental teaching process

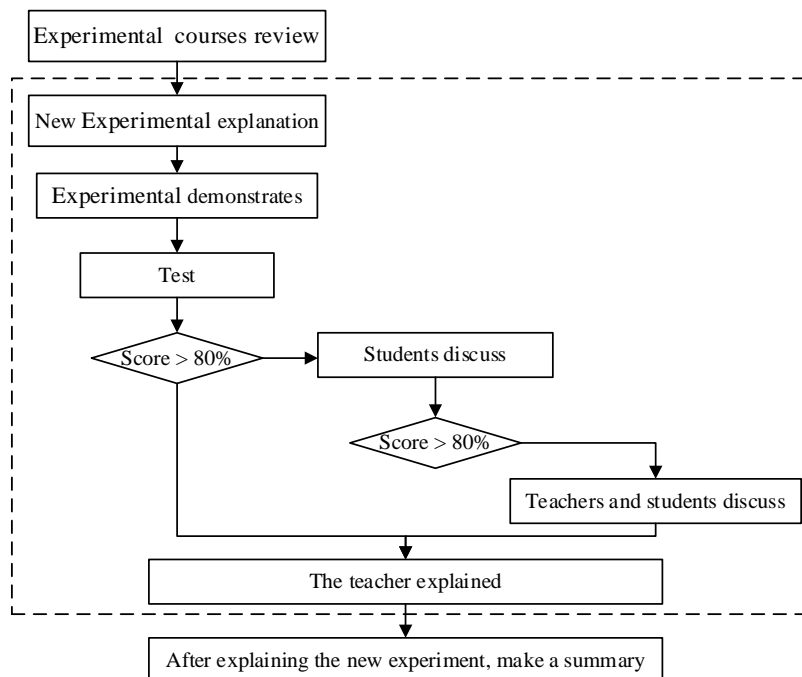


Figure 1: The Experimental teaching process diagram

The teaching process mainly consists of three parts: teaching review, classroom teaching and summary. The last experiment review can help students deepen the impression of their own knowledge. Which enables students to learn the new course content under a familiar and relaxed condition. In classroom teaching activities, the teacher can divide the experimental content into small units, and the teacher focuses on the key and difficult points for teaching. After the unit content elaborates, the teacher may enter the experiment demonstration link. Students can operate the experiment independently or analyze the images and data of the simulation experiment. After the classroom teaching, we should enter the induction and summary link. The teacher helps the students review what they have learned. The Experimental teaching process diagram is shown as the Figure 1.

### 3.2 The teaching implementation mode diagram

The teaching purpose of practical courses should focus on improving students' hands-on ability. This paper constructs the implementation pattern diagram combining teaching methods, experimental methods and examination methods. In the classroom teaching, the teacher mainly integrates the teaching content into the example, mainly through the example elaboration and the scene demonstration operation. In the experimental class, the basic and verification-type experiments can be completed independently by students in their own way. However, for the exploration experiment, design experiment and comprehensive experiment, students are required to complete the experiment in groups. The examination method is divided into two parts. The first part is the experimental basic examination. The second part requires students to complete a comprehensive experimental work and complete the work defense. The teaching implementation mode diagram is shown as the Figure 2.

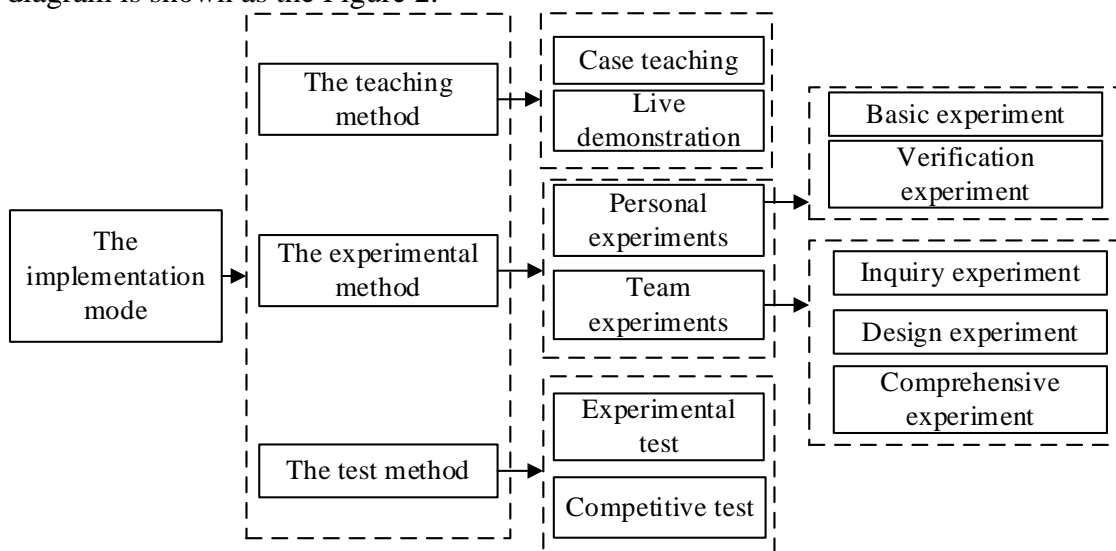


Figure 2: The teaching implementation mode diagram

### 4. Conclusion

Heat transfer is a subject developed on the basis of experiments, and scientific experiments are an indispensable part of heat transfer. The purpose of experimental teaching is training students in basic scientific experiments. Which is an effective means of training pioneering talents. The Experimental teaching process and the teaching implementation mode can effectively exercise students' independent ability, cooperative learning ability and so on. In the practice, we should pay

attention to students' ability to put forward problems, solve problems, observe and cooperate. In this way, heat transfer experiments can better serve heat transfer and become a more characteristic course.

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