

# Research on the Integration of Information Technology into Inquiry-Based Physical Teaching<sup>\*</sup>

Wanquan Zou

<sup>1</sup>Neijiang Normal University, Neijiang Sichuan China

## Abstract

The integration of information technology into inquiry-based physical teaching can arouse students' interest in learning, stimulate students' desire to learning, mobilize students' learning initiative and enthusiasm, form a reasonable teaching process, and realize the best teaching efficiency. Combined the instance of physics teaching, four aspects, the creation of inquiry-based teaching situation, breakthrough the difficult points of the teaching, simulation of the inquiry-based experimentation, and processing the inquiry data, of information technology application in the inquiry-based physical teaching are discussed.

**Keywords:** Information Technology; Inquiry-based Physical Teaching; Integration; Approach

## 1. Introduction

Basic Education Curriculum Reform (Trial) says: *the universal application of information technology should be vigorously promotes in the teaching process for promotion of information technology and curriculum integration, to realize the gradual innovation about the presentation of the teaching content, the way of*

*learning, and the way of teachers teaching.*<sup>[1]</sup>

Teaching practice experience has shown that the integration of information technology into physical teaching gives full play to the leading role of teacher, and inspires the students to use figurative teaching media actively to vividly perceive and understand teaching materials. Also the integration can, for students, promote the formation of physical concepts and establishment the laws of physics, and cultivate information literacy and scientific inquiry ability to achieve overall optimization of the process of physical teaching.

This paper studies how to give full play to the advantages of information technology in the process of the inquiry-based physical teaching, and discusses the ways of the integration.

## 2. Overview of inquiry-based teaching

Guiding ideology of inquiry-based teaching is that students consciously and initia- tively explore, under the guidance of teachers, to master the methods and steps of problem-solving and research objective attributes of things, and find the cause of the development of things and internal contact of the things each other. From the exploring, students establish their own physical concepts and laws.

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Inquiry-based teaching can effectively improve the students' ability to do by hands and think by brains, and develop the students' thinking skills and innovation ability. So it has some advantages: it can effectively improve the students' interests of learning, also it is of strong autonomy, flexibility and diversity.<sup>[2]</sup>

### **3. Approach of the Integration of information technology into Inquiry-Based Physical Teaching**

#### **3.1. Using information technology for creation of inquiry-based teaching situation**

Students, in the process of the physical inquiry teaching activities, at first, pay attention to the phenomenon that can directly observed and always be perceived. And then students ask questions, and use information resources, design feasible experiments, analyse and deal with the raw data, and finally draw conclusions<sup>[3]</sup>. Therefore, using the power of information technology at processing multimedia information, such as maps, text, audio, and video, it can realize voiced, visual and vivid presentation effects. And thus it could be easy to create physical inquiry-based teaching situations to help students to discover the problems, and to stimulate their exploring desire.

For example, in lesson overweight and weightlessness, images can be the first show, in order to let the students know the phenomenon of life in overweight and weightlessness in advance, and initially understand the interesting phenomenon of weightlessness in the process of development of the universe. Also a video should be played to show the number changes of scales on which a person stand in the operating elevator, for the students to observe, compare, reading and recording, and to arouse students' learning interest and exploring desire.

But it is worth noting that in the process of using information technology to create teaching situations, teachers should pay attention to guiding students to observe the phenomenon. Teaching could not be merely the surface of the multimedia information presentation, but should mine the hidden essence behind the phenomenon, and should put forward valuable inquiry problems.

In addition, in the teaching process, teachers can use multimedia integrating tools, web developing tools, teaching CD-ROM or network retrieval tools to obtain a lot of information related to the teaching content. It can take advantage of digital learning resources for self-learning, web collaboration and web interaction between teachers and students.

#### **3.2. Using information technology for breakthrough the difficulty points of the teaching**

Because of the limited cognition and thinking level, the abstract concept of physics, and the complexity of the process, they cause students' cognitive disorder and the difficulty of teaching.

Teaching practice has proved that it is difficult to breakthrough the difficulty of teaching using traditional teaching methods. If computer simulation is used, a good teaching effect will be obtained<sup>[4]</sup>. Such as using information technology, some of the complexity of the process of physical change can be intuitively dynamic displayed, to help students grasp the characteristics and laws of the process of physical changes, construct meaning of physical knowledge, and effectively breakthrough the difficulty of teaching.

For example, during the teaching process of formation and propagation of the mechanical wave, due to the limitations of the experimental conditions and teaching space, through demonstration experiments such as the formation of a sound wave, it is difficult for students to

understand the principle as the waves forward spread from near to far, each medium particle takes reciprocating motion up and down near their respective equilibrium position. If there is a software simulation presentation about the formation of waves, it can help students construct visual space prospect, form correct cognitive construction, and facilitate comprehension of knowledge about the process and feature of the mechanical wave propagation.

But it is worth noting that in the process of teachers guiding students exploring mechanical wave formation it is important to deal with the physical problems by information technology, also the traditional teaching methods can not be ignored.

### **3.3. Using information technology for simulation of the inquiry-based experimentation**

Physical experiment is an important means of physics teaching. However the effects of some experiments are not ideal, due to the limitations of time, space, and laboratory instruments. If we use the simulation experiments simulate the real experiment, it can make experiments reproducible and the experimental phenomena intuitive<sup>[5]</sup>. The simulation experiments using computer software to simulate the physical process are different from the general courseware. They have the common characteristics, processes and roles of the real experiments, and can even get the effect that a real experiment can not produce.

In the physical inquiry teaching process, simulation experiments reproduce certain aspects of the real world by analog means. Through the ways of actual operation, students can see the rapid movement of the object or a slight movement in the wide range.

For example, in the teaching chapter "constant current", it allows students to

take advantage of the "New Standard laboratory - high school electrical simulation software" and allows students select equipment to analog connection circuit, and to inquire Resistance law and Ohm's law. Simulation experiments can foster students' circuits design ability and practical ability. Although simulation experiments can not totally substitute for the real experiments, they are important parts of the whole of modern physics experiments. And it is valuable to study their core role for physical experiment teaching.

### **3.4. Using information technology for processing the inquiry data**

Scientific analyzing and processing of the experimental data are important inquiry abilities. Tables and images are common methods of analyzing data and processing data, but the image compared to the table more visually.

In general physics experiment teaching process it requires students to use tables to record data and image to process data. The latter is difficult for many of students. The digital experimental system (DIS) is constituted by devices such as sensors, data acquisition units and computers. In the process of teaching it should give full play to the advantages of the digital experimental system in the processing data and drawing image.

The measured raw data can be presented in tabular form, also be directly generated s-t, v-t, or s-t<sup>2</sup> diagram. Data processing software, Microsoft Office Excel, can also be used to process the experimental data to make a uniformly variable motion image. So the students can easy come to the basic law of uniformly accelerated linear motion according to the experiment intuitive charts.

## **4. Conclusion**

The Physics Discipline is a natural

science based on experimentation. Because the simulation experiment is not a real experiment, and its credibility is not high, in physics teaching it is necessary that traditional classroom demonstration experiment and the grouping experiment should integrate with information technology. In addition, the teaching process is dynamic and developing process, so there will be many unforeseen circumstances. Also the courseware has some burst errors, interactive technical imperfections and other defects. So, information technology does not resolve all of the difficulties in conventional teaching.

In the traditional classroom physical teaching, integration of the demonstration experiment and grouping experiment into information technology is essential. In inquiry-based physical teaching, we should give full play to the function of the traditional experimental methods, but also fully embodies the advantages of information technology.

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