

# Effective Application Strategy of Simulation Physics Laboratory in High School Physics Teaching

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## Abstract

Today in the 21st century, information technology is highly developed, with the development of computer multimedia and network communication technology, human attracted a new information age, also affect the traditional information communication mode and education mode, under the new curriculum standard reform of information technology to physics teaching is also an inevitable trend, but in general, Chinese education department on this research, so, schools and physics teachers the most important, is how to better combine information technology and middle school physics course teaching. This paper first determines what is effective teaching through research, and then has a relatively comprehensive understanding of the simulation physics laboratory, through the analysis of the characteristics of the simulation physics laboratory, to find out the way to integrate information technology into the middle school physics curriculum teaching. Through scientific research methods, we compare the simulation physics laboratory and real experiments, and scientifically find out their respective advances and limitations. Summarizes the effective application strategy of simulation physics laboratory in high school physics teaching, through this study, we call for strengthening the attention of physical educators to simulation physical laboratory, and put forward the effective application of simulation physics laboratory in high school physics teaching, provides reference and reference for first-line physics teaching workers.

## Keywords

High School Physics; Simulation Physics Laboratory; Effective Application.

## 1. Introduction

### 1.1. How Important are Experiments going to be for High School Physics Courses

Physics is a basic discipline. Both the development of natural science and modern technology cannot be separated from physics. Physics also has this irreplaceable role in the development of today's society. Physics is also an experimental science, and experiment is the basis of physics. In middle school physics class, by the teacher demonstration experiment, is an important part of middle school physics experiment teaching, experiment not only follow the correct concept of physics and physics law, but also can help students master physics knowledge, improve students' observation ability, thinking ability, can also cultivate students' exploration spirit, make students into a useful talent to adapt to today's society. So, how can the demonstration experiment be conducted to achieve the above purpose? Next, I will talk about my own views and experience.

The demonstration experiment is vivid and interesting, not boring book knowledge, first of all will ask questions, stimulate students' interest in learning, so that students have the enthusiasm and initiative. Then it will let students see more real experiments than books, but also more

conducive to students' thinking, guide students to explore the correct physical laws, and play a very important role in this process.

### **1.2. High School Physics Experiment Teaching is Still Insufficient**

Now in middle school, physics has become many students "heart hate", the first reason, is the lack of efficient physics experiment teaching, and in many economically developed countries, physics teaching workers pay great attention to effective physics experiment teaching and research methods, such as Japan, high school physics has 75 classes a semester, but students have 20 a semester, demonstration experiment is more to 130, and in many experiments, more than 50% are research experiment, the whole semester of physics learning, based on the experiment. It is obvious that Japanese students receive much more experimental teaching than Chinese students, so the ability and quality of Japanese students in the experiments are also far better than that of Chinese students. The comparison of the data is very clear, and the strength gap is very obvious. Fortunately, China's physics education department has also fully realized this point, and in the new curriculum reform, educators have also put an important position in physics experiment teaching.

### **1.3. Overview of the "Simulation Physics Laboratory"**

Basic introduction of the simulation physics laboratory

Simulation physics laboratory, developed by nanjing jinhua software co., LTD., the function of this software of many, it can on the premise of abiding by the law of physics, in the real world simulation environment, demonstration realistic experimental animation, can also be according to the law of physics, according to the experimental animation, give reasonable experimental data. He and conventional physics teaching software, it is not composed of a few off-the-shelf experiments, the software can provide a fully equipped laboratory, can be designed by the user their own independent design experiment, and in the experimental environment, everything completely follow the law of physics, you can do all the physical experiments you can think of (except high energy experiment).

Simulation physics lab running programming experiments

The software is simple to operate, and there have been many commonly used experiments put in the catalog, free to use even by teachers without many computer foundations. When running the experiment, there are many buttons, "pause", "start" and so on, simple and clear, making it more convenient for users to carry out the experiments, but also improve the experimental efficiency, thus improving the teaching efficiency.

Aspects of simulation physics laboratory

The software is suitable for middle school use, and is an ideal experimental teaching software. It is a more vivid demonstration of difficult to operate physics experiments, so that students have a more intuitive understanding of the complex physics laws, so that the study of the laws of physics is not boring, I recommend you to use here.

### **1.4. The Issue is Raised**

In today's physics learning, we cannot be satisfied with only learning the physics knowledge created by our predecessors. More importantly, we should explore new knowledge, step into the fields that have not been touched by us before, and use the new knowledge of exploration to make our own contributions to the development of Chinese society. We need to look at physics teaching with a brand new perspective, and we need to conduct physics teaching reform with new models and new methods. In order to adapt to the reform of physics teaching, many schools have added physics experiment classes, but also added demonstration experiments, and many schools have introduced professional physics experiment teaching

equipment and hired professional technical personnel, and various measures have greatly improved the teaching efficiency of teachers and students' learning efficiency.

### 1.5. Objective of the Study

Traditional education and teaching strategy has a long history, and profound, then we need to do, is to choose the education methods suitable for this era and inherit, and will not improve; and the new education and teaching methods, not necessarily all correct, with a dialectical view, to choose, choose the education and teaching methods suitable for this era. By simulating the physics laboratory of this software, we can effectively integrate information technology into the physics teaching, thus creating a brand new teaching environment completely different from the traditional teaching environment. This paper only makes a preliminary exploration, each era has suitable for this era, and this new teaching environment for this era, still needs a long time and countless practice to test, but also needs the opinions of countless physical educators to constantly improve.

## 2. Theoretical Inquiry

### 2.1. What is Effective Teaching

Effective teaching, literally speaking, is effective teaching. His specific meaning is to teach in the average efficiency on the premise of fitting this era and values, that is, effective teaching. Effective teaching can improve students' innovative thinking, exploration spirit and creative ability. Effective teaching does not oppose practice, but against the sea tactics. Effective teaching proposition is that teachers speak less, but they speak the essence, that is, say less carefully, and then leave more time to students, so that students have more time to study independently. Effective learning does not focus on the students' examination results, but the hope that the students to develop good learning habits and learning methods. and can let the classroom have a strong atmosphere of cooperation and inquiry, more conducive to students' understanding and absorption of knowledge. In the teaching process, teachers teach is not bitter, students do not learn tired, in order to ensure that students have obvious improvement at the same time, but also to ensure the efficiency, the real sense of the "effective" two words.

### 2.2. Advantages of Simulation Physics Laboratories

#### ① scientificness

The software developed by Nanjing Jinhua Ke Software Co., Ltd. This software follows the real-world physics law and can effectively help students connect experiments and problems and solve problems.

#### ② safety

The simulation physics laboratory of middle school meets the relevant safety requirements and must be used to ensure no danger and personal safety.

#### ③ is conducive to the development of research learning

Each experimental method is a good research subject, and student research on this subject can obtain a variety of knowledge and rules.

#### ④ is helpful in developing students' innovative abilities

The software can effectively cultivate students' innovative thinking, and thus effectively improve the innovation ability.

#### ⑤ is interesting

Secondary school simulation physics laboratory can stimulate students' interest, enhance curiosity, and make happy physics, happy chemistry, and happy creatures a reality.

### 2.3. Inspiration for Effective Application of Simulation Physics Laboratory

There has always been the problem mentioned above. While today's schools largely have broadband networks and relatively affluent computer equipment, usage has been low. There are many reasons, such as the lack of technicians. Many teachers do not know very much about computers, can not be very skilled in using information technology, and integrate it into physics teaching, so some technical personnel who have a certain understanding of information technology to improve their technical ability for insufficient teachers. For another example, teachers do not have enough time to study and use it. Nowadays, middle school teachers have a lot of workload and less free time, and many teachers do not have enough time to study, leading to the inability to integrate information technology into physics teaching in the best way. The simulation physics laboratory developed by Nanjing Jinhua Ke Software Co., Ltd. can make up for these deficiencies. The software is easy to use and easy to operate, and it does not need teachers to invest too much time to study.

But simulation physics laboratories are not omnipotent, either. Through the analysis of the above, we know that educating students is not the work of teachers alone, but requires the joint efforts of teachers, students, schools, and even the whole society. Only by multi-department cooperation and joint efforts, can teachers teach more effectively, and students can learn more effectively and make greater progress.

## 3. Introduce Adaptive Studies in Simulation Physics Laboratories

### 3.1. Importance of the Experiment for Physics Teaching

The demonstration experiment is vivid and interesting, not boring book knowledge, first of all will ask questions, stimulate students' interest in learning, so that students have the enthusiasm and initiative. Then it will let students see more real experiments than books, but also more conducive to students' thinking, guide students to explore the correct physical laws, and play a very important role in this process.

### 3.2. Differences between Real Experiments and Simulation Experiments

Simulation experiment is the premise of the real experiment. There is a simulation process for the experiment first, before there is the next real experiment. But simulation experiments are not visible after all, but also need real experiments in the material world to verify. The two are both interrelated, and have essential differences, the difference between the two: To carry out the simulation experiment, first we need to build a physical model, and the establishment of this model, it requires a lot of theoretical knowledge support and a lot of experience to help, not only that, the simulation experiment of the simulation physics laboratory is the computational results under a specific physical model. So: From this point of view, simulation does not completely replace real experiments. From another perspective, "practice is the only criterion for testing truth" and simulation cannot completely substitute for practice. But the rationality of the simulation cannot be denied accordingly.

### 3.3. Advantages and Limitations of the Simulation Physics Laboratories

Merit:

1 low cost

There are also many economically underdeveloped areas in China, where many schools do not have enough funds to buy many of the equipment needed for physics experiment teaching. But using the simulation physics laboratory, students create a virtual laboratory on the computer, using virtual equipment in the laboratory, to conduct virtual experiments, thus obtain experimental data. This virtual experiment, which requires neither expensive equipment or no restrictions on time and venue, effectively reduces cost.

2 more secure

There are many experiments that prohibit students from using dangerous agents or requiring operation. A major advantage of the simulation physics laboratory is absolute safety and not causing danger due to operational errors.

3 efficient

In the virtual environment built by the simulation physics laboratory, the experiment is no longer limited by time and space, and the students can conduct more complex, time-consuming and laborious experiments in a shorter time, thus greatly improving the efficiency of the engineering experiments.

4 boundedness

After all, the simulation physics laboratory is done by computer and does not have a real world sense of touch and convincing. If the analysis and synthesis of error analysis and the analysis of error sources in the evaluation of experimental conclusions are missing, it may delay the cultivation of students' comprehensive ability, and it may even delay the cultivation of innovation ability.

### **3.4. The Role of Simulation Physics Laboratory in High School Physics Teaching**

Through the collation and analysis of the above materials, we conclude that the simulation experiment is only a supplement to the real experiment, and cannot completely replace the real experiment, the real experiment and the simulation experiment have their own role, each has its own scope of application, they complement each other, and play a role in the middle school physics teaching. Different from the previous traditional learning methods, the simulation physics laboratory provides students with a completely different learning method. This new era of learning method encourages students to study and study independently, and pay more attention to cultivating children's exploration spirit and innovation ability.

## **4. Current Analysis and Research of Simulation Physics Laboratory in High School Physics Teaching**

### **4.1. Current Situation of Simulation Physics Laboratory in High School Physics Teaching**

Through the network access to information, I found that although the simulation physics laboratory as early as 2000 has been successfully developed and released, but has not walked into people's vision, utilization rate is not high, until the third edition, began to slowly into people's vision, but the utilization rate is not a leap, teachers use the most or PowerPoint and flash animation. Analysis the reason is a problem between teachers and schools. Many teachers traditionally believe that even if there is the idea of integrating information technology into physics teaching, because of the huge workload, teachers do not have enough time and energy to conduct in-depth research and study. To sum up, the simulation physics laboratory has only been introduced to many schools, and is not really deep into the physics experiment teaching, and there is still a long way to go.

### **4.2. Research Investigation and Analysis based on Physics Teachers**

1. Many middle schools, the financial conditions have been reached, and the simulation physics laboratory has been introduced, but many teachers do not like to use it in physics teaching, resulting in the utilization rate has not been high. Since it is not the reason of capital, it is largely a problem of teacher concept. Many teachers traditionally believe that physics teaching only needs chalk and blackboard is enough, and do not recognize the important role of simulation physics laboratory in physics teaching. This traditional view is clearly backward.



Some schools in 2, although they have introduced the simulation physics laboratory, and they are also actively used by teachers, but the effect is not particularly obvious, and the reason is likely to be technical. First, teachers should strengthen the understanding of the software of simulation physics laboratory, only really understand the software, can be better applied to the physics teaching; second, improve the use of knowledge, can not only stay in the understanding level; third, in the case of wave function demonstration experiments, the idea of function to simulation. Therefore, the application of the simulation physics laboratory should not only stay in the preliminary application, should be more proficient, so as to make the teaching and learning more effective.

## 5. Case Analysis and Strategy Studies

### 5.1. Application Strategy of Simulation Physics Laboratory in Classroom Teaching

We summarize the characteristics of simulation physics laboratory in specific teaching, and find that simulation physics laboratory is not universal, but also has a certain range of application, need specific analysis of specific problems. Before using the simulation physics laboratory, we should first consider several problems, after which we can then decide whether to use the simulation physics laboratory. Does this experiment have to be a simulated experiment rather than a real one? Is using the simulation physics lab better than using real experiments? Can students accept this form? Can using simulation physics laboratories make both teaching and learning more effective? If the answers to these questions are yes, then physics can be taught using simulation physics laboratories.

### 5.2. Application Strategy of Simulation Physics Laboratory in Students' Independent Learning

The simulation laboratory is simple and easy to operate, because the design is designed to be used by people with different levels of knowledge, especially for students who lack a computer foundation. The software not only has supporting description documentation, but also has templates for many typical simulation experiments. Students can open the documents directly for simple simulation experiments. This lays the foundation for students who can utilize simulation physics laboratories for autonomous learning. With the joint efforts of teachers and students, teaching can be more effective, and learning can be more effective. Today's society needs young people with the spirit of exploration, innovation and practical ability. Only with the joint efforts of teachers and students can teaching be better and students can go further in the future.

## 6. Research Summary

According to the above research, to let the simulation physics laboratory play a real role in the physics experiment teaching, it is necessary to fully understand the software of the simulation physics laboratory itself, and improve the use of skills. With students' independent learning as the main part, teachers' guidance and explanation as the supplement, teachers and students combined, make full use of the simulation physics laboratory itself, to cultivate students' exploration spirit, innovative thinking and to improve students' practical ability as the goal, to carry out effective teaching and learning. In the practical teaching practice, I think the author should grasp the following points:

Before 1, learning, we first used the characteristics of the simulation physics laboratory to stimulate students' interest in learning. Let the students learn more independently.

2, simulation physics experiment and a series of other teaching tools such as chalk and PPT, which are better or worse, and we are more suitable in a certain environment.

In practical teaching, 3, encourages teachers and students to exchange, so that students can look at problems from different perspectives, which is conducive to the formation of good learning habits.

4, focuses on cultivating students' ability to analyze problems and improving their ability to build a five-force model. This can help students discover the nature of the problem.

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