Research on the Development and Reform of Electronic Physics Laboratory Based on Computer

Ping Tan¹,*

¹School of Communication and Electronic, Jiangxi Science & Technology Normal University, Nanchang, Jiangxi, China, 330013

*Corresponding author e-mail: huantianxidi0000@jxstnu.edu.cn

Abstract. As a basic and innovative natural science discipline, physics has been an important knowledge carrier method for people to study modern natural sciences since ancient times. In the study of science, the subject of physics is also an important science and engineering subject besides chemistry. The school has always attached great importance to the teaching of physics¹[1]. Due to the shortcomings of the traditional and outdated physics laboratory in recent years, people have been discovered. People are no longer satisfied with the use of the original laboratory. In particular, it will also cause huge losses to the school and the students and their teachers. In order to meet the needs of the school's physics laboratory, my country's educational circles have developed an electronic physics laboratory. With the support of computer technology, the emergence of such laboratories will become an important change in physics teaching experiments.

Keywords: Computer, Electronics, Physics Laboratory

1. Introduction
The development of our society and the nation can be achieved only by relying on the efforts of science and engineering special talents for scientific research and technological research. As our country is in the initial stage of progress, the process of internationalization of our society also requires a large number of polytechnic talents. In order to meet the needs of society, our school also needs to make corresponding changes in the process of physics teaching¹[2]. The emergence of the physics laboratory is an expression method for schools to help students to understand concretely physics learning. On this basis, physics experiment courses also play an unprecedented leading role in the study of science and engineering. Since traditional physics teaching is an abstract learning form, what we need to show students is concrete learning skills. The physics laboratory can satisfy the emergence of this technique (see Figure 1).

Unfortunately, in recent years, the outdated physics laboratory has shown many shortcomings. Some human accidents in the physics laboratory often occur. Moreover, due to the inconvenience of school funding in some areas, the equipment of the physics laboratory cannot be prepared. This will also greatly limit the process of students conducting physics experiments. In addition, the damage of various instruments and equipment in the physics laboratory has also become part of the cost loss
within the school. Prompted by various reasons, experts put forward a comprehensive study of the
electronic physics laboratory. Use computer-related intelligent technology to build an electronic
laboratory. Able to combine virtual technology and real-world images, this method of experiment can
also help students conduct advanced physics experiment courses.

2. From the perspective of accident theory, see the shortcomings of traditional and outdated
physics laboratories

2.1. Insufficient equipment of physics laboratory caused by school cost
We should understand that the educational resource cost of the Ministry of Education is limited. The
social funding for education is also limited. In this case, the cost of fund operation of schools in
different regions will also be adjusted accordingly. It is even said that the funding of schools in some
poor areas is very small. In this situation, some instruments and equipment of the traditional physics
laboratory may be under-purchased.

![Figure 1. Establishment of computer electronic physics laboratory model.](image)

2.2. Damage to various instruments in the physics laboratory
In fact, the damage of the instrument also requires capital scheduling to repair. From this perspective,
this problem is also a problem of insufficient school funding. On the other hand, the damage of the
laboratory instruments will also cause the students' physics experiment courses to be unsound in a
certain period of time. It may even happen that some students in poor areas have not seen a complete
physical instrument.

2.3. Various personal safety issues often appear in physics laboratories
We know that students have a playful nature, and their thoughts and behaviors are childish. The
physics laboratory is also a place that can attract them to study and play. Due to the irregular operation
of the students' personal physics experiments, various safety accidents will occur during this period. It
is even said that the errors in the operation of some teachers' physics experiments will also cause
experimental safety problems. It even said that it would affect the life safety of students.

2.4. Geographical restrictions of the laboratory
Traditional laboratories are set up inside the school, and outdated experimental instruments are also
regulated by the school and cannot be taken out of the school. If students want to review after class,
they must repeat the physics experiment in the laboratory. However, the school cannot use its
knowledge to conduct physics experiments outside the school or at home. This obviously shows the
geographical limitation of the physics laboratory.

3. The reform of the physics laboratory in the electronic aspect of the computer based on the
traditional experiment
3.1. Learning of experimental operation of video
The more practical thing in the electronic physics laboratory is the learning of physics experiment operation based on video. Because the teacher's physics experiment operation in modern classrooms may not be standardized[3]. This will mislead students in their physics experiment operation learning. What we need is to use the computer's intelligent skills to guide students in standard experimental operations. This is not only conducive to the solid foundation of students' knowledge, but also conducive to the improvement of students' awareness of standard experimental operations.

3.2. Experimental operation of electronic touch screen
In the process of experimental operation in the electronic physics laboratory, experts proposed that the use of electronic touch screens is also a relatively safe and standard experimental technique. If the school's funds are operating normally, the school can develop its own electronic experiment system. Use tablet computers to show students and help students carry out their own experiments. The application of this virtual technology and realistic display style will become the advantage of the electronic laboratory.

3.3. Experimental error correction supported by data analysis
After the standard experiment operation is carried out, the internal data analysis system of the electronic laboratory will also start to work. It will correct the errors of students' personal experiments according to the order of the instruments operated by the students. Unlike school lecturers, computer systems can provide one-to-one tutoring. In this way, the students' personal physics experiment experience will be further improved.

3.4. Summary of experiments made by the computer system
In the traditional classroom experiment teaching, the most important thing in the experiment is the error analysis and the final experiment summary. Not every teacher can make the most standard and most humane experiment summary for every student. This task can be completed by the electronic laboratory. The computer system can make the final operation conclusion of the basic electronic physics experiment for every student without getting bored.

4. From the perspective of teaching, the advantages and disadvantages of the use of electronic physics laboratory

4.1. It avoids the occurrence of teaching safety accidents
We all know that everyone has only one life. Students are the flowers of the motherland and the future of the motherland. Their lives cannot be put in a teaching safety accident. Traditional and outdated physics laboratories will have corresponding personal accidents due to abnormal operations. The difference is that the use of the electronic physics laboratory can avoid the occurrence of such personal safety accidents. This can help students complete their studies while ensuring their safety.

4.2. It can improve students' enthusiasm for physics experiment learning
Mystery is a point that students should pay attention to in teaching. Since the students' curiosity is relatively strong, they need visual guidance and spiritual encouragement[4]. Every novelty is what they can yearn to learn. Electronic physics experiments using computer technology can definitely increase students' interest in physics experiments. On this basis, the students' physics experiment course guidance can be completed.

4.3. It can help students to conduct experiments in unlimited time and space
The old physics laboratory has geographical restrictions. The emergence of the electronic laboratory has also allowed the physical laboratory to be integrated into a small smart chip. All students need is an ordinary electronic touchpad to conduct a complete teaching experiment. In this way, students can
carry out autonomous experiments regardless of time and place at home or outside class. This experimental form of learning will help students in their extracurricular review (see Table 1).

Table 1. Comparison of characteristics between electronic physics laboratory and traditional laboratory.

| Traditional laboratory | Electronic laboratory |
|------------------------|-----------------------|
| Low cost               | High cost             |
| Prone to safety accidents | Avoid safety incidents |
| Geographical and time constraints | Free |
| Class is not active | Increased student motivation |

4.4. The cost it requires is also very high
But everything has two sides. While the physics laboratory can bring convenience to students, its disadvantage is that it is difficult to complete the purchase and design of the overall electronic laboratory through the basic capital cost of the school. Therefore, the formation of this standardized electronic laboratory can only be limited to schools with higher capital costs. For some poor areas, the reform of the school's physics laboratory is still difficult.

5. Development of the design of experimental projects in the physics laboratory of electronics

5.1. Basic and simple physics experiments are necessary
For the standard electronic physics laboratory, some basic experiments and simple experiments are necessary. Since these experiments can be done in traditional classrooms, these basic experiments in the electronic physics laboratory must use a simple method to help students remember. It is said that the experiment can be completed in the form of direct video learning. When necessary, this method is also feasible.

5.2. Characteristic experiment of natural science
Characteristic experiments are also called special experiments. What we need to understand is that the study of physics is to help students explore natural sciences. Experiments on the characteristics of natural phenomena can help students discover the most advantageous way to live and understand the science of life. The characteristic experiment of the electronic laboratory can adopt the combination of virtual technology and reality display. You can also use experimental methods similar to experimental documentaries.

5.3. Scientific experiments assisted by electronic test equipment
In the process of using the electronic laboratory, auxiliary equipment for electronic experiments is also essential. Generally speaking, these auxiliary devices use optical fiber connection or Bluetooth connection to directly transmit electronic data. For example, the electronic tuning fork that can study the phenomenon of physical sound transmission and the electronic rod that can study the electric charge. Still the same conclusion, the cost of these auxiliary equipment is also very high.

5.4. Electronic experiments that can be designed independently
Compared with the traditional physics laboratory, the biggest advantage of the electronic laboratory is that it allows students to design their own experiments. This way of learning can help students develop their own hands-on ability and the ability to analyze and process data. Compared with outdated laboratories, self-conducted electronic tests do not need to worry about the damage of the instrument and some messy other problems.

6. Technological updates for the future development and reform of the computer-based electronic physics laboratory
6.1. Physics experiment based on online game technology
We have always been exploring how online games attract students' interest. I think that some of its elements that can enhance the colors of reality are rich views that can be used to attract students' game content. If we put physics experiments in online games, using game simulation technology to complete the operation of physics experiments should be a relatively grand technological innovation. On this basis, it will also greatly attract the attention of the students.

6.2. Physics experiment based on VR equipment
The attractive foundation of a VR device is its very realistic physics engine. In addition, there is a combination of virtual technology and reality that can let people fall into the virtual world. Imagine the combination of VR technology and physics experiments. This may help students see the most complete physics experiment. It can even be said to help students complete the operation of physics experiments.

6.3. Physics experiment based on holographic projection
The technology of holographic projection is similar to the technology of three-dimensional modeling. Holographic projection can see a three-dimensional landscape of two-dimensional things. When we watch a three-dimensional movie, the picture that the theater shows us is the process of converting the three-dimensional model into two-dimensional. Holographic projection technology can also be used in the display of standard operations in physics experiments. Students can watch the whole physics experiment process from different perspectives.

7. Conclusion
At present, our society and the country are in great demand for talents in science and engineering. In this situation, the traditional physics laboratory based on computer technology innovation is also very necessary[6]. The emergence of the electronic physics laboratory is not accomplished overnight, it needs the hard work of academics and investment in social education. I believe that in the near future, our school will build an electronic physics laboratory.

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