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Research on Simulation Experiment Teaching Strategies for High School Physics in Remote Areas

Zhenxing Li

Education Bureau Teaching Research Center in Altay Region of Xinjiang, Altay City, China
Email: ramboli123@163.com

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Abstract

With the arrival of the Information Age, the popularity of modern educational technology is increasing. For some remote areas, this presents a rare opportunity for education to achieve a leap in development. This paper, through the study of physics simulation experiments in secondary schools in remote areas, attempts to identify ways to improve and address the relatively backward state of physics experiment teaching in education—promoting physics simulation experiment teaching. The paper provides a brief discussion on the development of physics simulation experiments, focusing on four characteristics of simulated physics experiments: high efficiency, strong intuitiveness, low operating costs, and high safety levels. The analysis also delves into the value of simulated physics experiments: clearer experimental processes, more accurate experimental data, enhancing students' ability in computer virtual experiments, and fostering students' innovative thinking consciousness. Based on the discussion of the characteristics and value of physics simulation experiments, it is concluded that simulated physics experiments have great prospects and can change the current state of physics experiment teaching in remote areas. The development of physics simulation experiments is closely linked to the advancement of information technology. Not only does the Information Age drive the progress and development of simulation experiment technology itself, but it also continuously reduces the cost of simulation experiments, which is an important foundation for the widespread adoption of physics simulation experiments. Through analyzing physics simulation experiments in secondary schools in remote areas, it is concluded that physics simulation experiments can effectively improve and enhance the local physics experiment teaching level. However, they also face challenges in terms of concepts, funding, and teacher resources. In response to this issue, the authors of the paper have proposed their own suggestions.

Keywords

Physics, Simulation Experiment, Remote Areas

1. Introduction

Physics simulation experiments emerged with the development of modern educational technology. By the late 1980s, the Massachusetts Institute of Technology in the United States had already started the development of simulation laboratories and successfully created the web lab simulation experiment system, which was introduced for teaching purposes in 1988. In his publication "Simulation Experiment Design" in 2000, W. David Kelton emphasized the clear advantages of using simulation experiment design in physics experiments and advocated for its promotion. Currently, simulation experiments are mainly applied in university physics laboratories in China. Physics simulation experiments fundamentally adhere to the laws of physics development. In the course of physics advancement, the formulation and presentation of a physics concept require numerous experiments for verification and analysis. Thus, physics is a science of experiments (He, 2022). Simulation experiments present the process of physics experiments in a more intuitive, convenient, and rapid manner. Their characteristics include high efficiency, strong intuitiveness, low operating costs, and high safety. The value of simulation experiments lies in offering clearer experimental processes, more precise experimental data, enhancing students' skills in computer-based virtual experiments, and cultivating students' innovative thinking consciousness. This represents a significant advancement in the development of physics experiment teaching.

2. The Importance of Physics Simulation Experiment Teaching

2.1. Enriching and Changing the Physics Experiment Teaching Mode in Secondary Schools in Remote Areas

Traditionally, the physics experiment teaching mode in secondary schools in remote areas has been relatively simple, with a focus on traditional physics experiment teaching methods. However, with the development and widespread adoption of modern educational technology, especially in recent years, breakthroughs in technology in areas such as computer technology, the internet, and software have led to a deeper penetration and advancement of modern educational technology, profoundly impacting the changes in educational teaching methods. Physics simulation experiments exemplify this change. The introduction of physics simulation experiment teaching mode represents a profound transformation and disruption of the traditional physics teaching mode. This experimental teaching mode no longer requires a large number of physical experimental equipment or real-world experimental operations; everything can be completed through computer hardware and experimental software (Zheng & Li, 2020). With the emergence of physics simulation experiments, the physics experiment teaching mode in secondary schools in remote areas has become more diverse. On one hand, the mode of physics experiments itself has become more diverse, allowing for the selection of traditional or simulation experiment modes. On the other hand, the content of physics experiment teaching has become richer. In the past, conducting more physics experiments required the acquisition of numerous instruments and chemicals, which was cumbersome in terms of daily management. Therefore, many schools only offered a few basic physics courses. However, under the physics simulation experiment mode, launching a new experimental teaching course requires only the design or purchase of a software package, which is cost-effective, efficient, and easy to manage.

2.2. Adjusting and Reducing the Disparities in Physics Experiment Teaching Levels among Schools in the Same Region

The emergence of physics simulation experiments provides a practical approach to rapidly adjust and reduce the differences in physics experiment teaching levels among different regions and schools. Currently, the popularity of physics simulation experiments is not very high, meaning that in terms of the construction and development of physics simulation experiments, most regions and schools are basically starting from the same starting line (Zhang, 2021). If the government takes comprehensive planning and initiatives to promote the unified establishment and management of physics simulation laboratories in most secondary schools and coordinates and encourages teachers from different regions and schools to learn simulation physics experiment teaching skills, it would gradually narrow the gap in the physics experiment teaching levels among different regions and schools within a short period. This would be extremely valuable and meaningful for the balanced development of education.

2.3. Laying the Foundation for the Enhancement of High School Students' Physics Experiment Research Skills and Lifelong Development

Physics is a fundamental science, and for high school students aspiring to engage in scientific research, the physics experiment teaching course is crucial. Due to past limitations in experimental conditions, many high schools have not placed enough emphasis on the offering of physics experiment teaching courses, with very few or even no physics experiment courses offered. This lack of emphasis is detrimental to the cultivation of high school students' basic physics experiment knowledge and skills and may even affect their interest in researching physics. The promotion of the physics simulation experiment mode allows more high school students to access and understand physics experiment knowledge, master physics experiment skills, and experience the charm of physics through experiments. This will ignite their interest in exploring scientific knowledge through physics experiments. In particular, physics simulation experiments are based on computer technology. Once high school students are accustomed to and grasp this experiment mode, it will greatly aid them in their future pursuit of advanced physics experiment research. Modern advanced physics experiments heavily rely on computer simulation experiments, which is fundamentally similar to physics simulation experiments. Hence, it can be said that simulated physics experiments have a profound impact on the future development of high school students.

3. The Teaching Effect of Physics Simulation Experiments in Secondary Schools in Remote Areas

3.1. Altered the Current State of Physics Experiment Teaching

In some remote areas, the level of educational development in secondary schools, particularly in physics experiment teaching, is relatively low and not given much importance. Physics experiment teaching mainly relies on teacher lectures, and many schools lack dedicated physics laboratories with severely old or damaged equipment, making it challenging to conduct physics experiments. Since the introduction of physics simulation experiments, the change in the landscape of physics experiment teaching is quite noticeable (Ying et al., 2021). Currently, schools with the necessary resources have started offering physics simulation experiment courses, albeit on a small scale, which marks a positive beginning. Schools without the necessary resources, after observing and understanding physics simulation experiment courses, are also considering offering these courses as they are much simpler and more convenient to implement compared to traditional physics experiment courses.

3.2. Stimulated Students' Interest in Learning Physics Experiments

In remote areas, students have provided minimal feedback on conducting physics experiments. Those who have conducted physics experiments either did so due to the requirements of participating in physics competitions and received special training in physics experiment operations, or they performed certain physics experiments through personal interest by some means. During the ten years of teaching, I made efforts to integrate and manage the existing physics laboratory teaching resources, striving to provide students with open access as much as possible. As a result, there has been a noticeable shift in students' lack of interest in physics experiment teaching. Some students have shown increased interest after being introduced to and conducting physics experiments (Leng, 2022). Overall, students' interest in physics experiment teaching has greatly increased, with some students even proactively approaching teachers to request conducting physics experiments. However, limited by resources, students have limited opportunities to participate in physics experiments, and they can only conduct simple experiments. Therefore, a significant portion of students still lack interest in physics experiment teaching, let alone sustaining interest. After attempting to implement physics simulation experiment teaching, students' interest in physics experiment teaching was quickly revitalized. This method allows for the rapid conduction of multiple experiments in a short period, with a faster experiment pace, providing most students with hands-on experience. The number of students participating in physics simulation experiments has significantly increased, with some students even queuing up eagerly to conduct experiments. Some students have immediately lined up for another turn after completing an experiment and leaving the laboratory.

3.3. Complementary Development between Simulation Experiments and Traditional Experiments

While physics simulation experiments are beneficial, their current level of popularity in remote areas is quite low. Many schools do not have sufficient conditions and funding to conduct physics simulation experiments. Therefore, only selected pilot schools and demonstration schools are able to establish physics simulation laboratories on a small-scale basis to offer physics simulation experiment teaching courses. Despite the modest scale of physics simulation experiments, their impact is significant, particularly in igniting student interest in learning physics, thereby improving their academic performance in physics. As a result, many schools have begun to reflect on their past attitudes towards physics experiment courses and re-evaluate the importance of physics experiment teaching in secondary school physics education (Yang, 2022).

Some schools, even though they do not currently have physics simulation laboratories or offer physics simulation experiment courses, are making efforts to seek funding and technical assistance from higher-level authorities and are also finding ways to secure funding and train teachers. Simultaneously, they are starting to place importance on traditional physics experiment courses that were previously neglected, using existing physics experiment teaching resources to conduct some simple traditional physics experiment courses. I believe this is a positive development because physics simulation experiment teaching cannot entirely replace traditional physics experiment teaching; in fact, the two methods complement each other very effectively. Physics simulation experiments essentially demonstrate the mindset of physics experiments in a more intuitive and tangible virtual manner, while actual hands-on physics experimentation skills can only be cultivated through traditional physics experiment teaching methods. These two approaches complement each other.

4. Analysis of Challenges and Countermeasures in the Promotion and Development of Physical Simulation Laboratories in Remote Areas

4.1. Analysis of Conceptual Issues and Research on Countermeasures

4.1.1. Analysis of Conceptual Issues

The reason why we place conceptual issues at the forefront is that without addressing these issues, there will be significant resistance to the subsequent work. Conceptual change is the foundation, and obstacles related to concepts mainly stem from the following reasons: First, in mainstream teaching concepts in remote areas, college entrance is still considered the top priority for schools and students. While physics simulation experiments can improve students' grades to a certain extent, the performance improvement for students who are already high achievers may not be significant. These students are typically the main candidates for college entrance. The greatest advantage of simulation physics experiments is not the improvement of grades, but rather the cultivation of students' awareness and interest in learning physics, allowing high school students to have a deeper understanding of physics experiment knowledge. However, this is not a focal point in local education. Changing this mindset will take a considerable amount of time. Second, local education budgets are already tight, and in the eyes of the local education sector, the construction of physics simulation laboratories is not considered as significant or urgent. Many people do not see the urgency in allocating a large sum of money for the construction of physics simulation labs by local education departments or schools, reflecting another conceptual obstacle (Zheng, 2023).

4.1.2. Research on Countermeasures

To address conceptual issues, it is necessary to consider the following strategies:

1) Time: Any new concept or practice requires time to be accepted and endorsed. The development and acceptance of novel concepts in education, such as physics simulation experiments, will take time to gradually gain recognition within the local education community and thereby create greater opportunities for development.

2) Real Convincing Factors: Physics simulation experiments must demonstrate practical effectiveness to be accepted by teachers, who are the primary implementers of educational reforms. Teachers must be presented with compelling evidence, such as improved physics learning outcomes or enhanced physics learning abilities, to gain their complete endorsement and become strong advocates and promoters of this teaching model.

3) Proactive Promotion: The power of promotion should not be underestimated. Even the best innovations will progress slowly without adequate promotion. The concept of simulation physics experiments is new and promising, thus effective promotion is essential. Increased visibility and understanding will lead to greater acceptance, facilitating mindset changes and promoting the adoption of this teaching method.

4.2. Analysis of Conceptual Issues and Research on Countermeasures

4.2.1. Analysis of Funding Issues

Although education funding has been increasing annually, there is still a disparity in funding allocation for education in remote areas. The needs for funding in local education are vast, including infrastructure renovation, improving teacher salaries, and more. In comparison, the promotion and development of physics simulation experiments may not be seen as an urgent priority, making it less likely to receive preferential treatment and funding support. Physics simulation experiments require the construction of physics simulation laboratories as a prerequisite. However, the initial basic construction costs of these laboratories are relatively high. The procurement of computers for physics experiments, software design and procurement, network setup, and other associated costs can quickly add up. Based on the current standards that accommodate 50 to 70 students for conducting physics simulation experiments, the cost to establish a simulation physics laboratory exceeds 500,000, with the primary budget allocated to the purchase of computer hardware and software. Compared to traditional physics laboratories, these construction costs are significantly higher. Moreover, some schools already have traditional physics laboratories and may prefer to allocate funds for the maintenance and management of existing facilities rather than investing a large sum in establishing new physics simulation laboratories. Additionally, annual maintenance costs are also a significant consideration. Under the premise of limited education funding, local schools may approach the construction of physics simulation laboratories with caution and conservatism.

4.2.2. Research on Countermeasures

To solve the funding problem, measures need to be taken:

1) Change of mindset: Education management departments and school leaders should recognize the value of physics simulation laboratories to attract funding for construction. Through understanding the value of physics simulation laboratories, overall planning and unified procurement of hardware and software can reduce construction costs.

2) Active support: If physics simulation laboratories are beneficial in improving students' physics experimental abilities, levels, and grades, schools will cooperate with higher-level management departments, and are inclined to support construction through funding (Yuan, 2022). Considering the high initial construction costs of laboratories but low operating costs in the later stages, schools will approve such investments.

Practical approaches to address funding issues:

1) Apply for national funding: Local governments can research the feasibility of physics simulation experiments based on local educational needs and submit specific feasibility reports to apply for special financial support from the national government.

2) Self-funding: Select pilot schools and support partial construction costs through local government funding, accumulating experience for subsequent national funding applications.

3) Seek corporate support: Connect with companies willing to support education in remote areas or cooperate with enterprises specializing in physics simulation experiment planning and design. Negotiate for pilot demonstration collaboration, secure the best prices, and arrange for phased payments, thus reducing costs to the minimum (Bian, 2023).

4.3. Analysis of Human Resources (Technical Expertise) Issues and Research on Countermeasures

4.3.1. Analysis of Human Resources (Technical Expertise) Issues

The reason for combining human resources and technical issues is that in the construction of simulated physics laboratories, specialized personnel are involved in the design and construction process, which doesn't require separate consideration. However, for day-to-day operation and management, physics teachers are needed, and this involves technical aspects that may not be highly complex but can affect daily management and usage. In remote area secondary schools, most physics teachers lack experience and expertise in this area (Jin, 2023). Without addressing human resources and technical issues, the operational physics simulation laboratory in secondary schools, even if constructed, will face numerous challenges in its future development.

4.3.2. Research on Countermeasures

1) Employ specialized physics simulation teachers on a regional basis.

The operation and management of physics simulation experiments require specific professional skills that non-professionals may not possess. Given the economic conditions of secondary schools in remote areas, it may not be practical to assign a specialized physics simulation teacher to each school. Therefore, one approach is to hire specialized physics simulation teachers based on regional divisions, with each teacher responsible for overseeing the operation and management of physics simulation laboratories in multiple schools within their designated area. As managing multiple schools in a detailed manner may be overwhelming, their role would primarily focus on providing guidance. This approach also raises the requirement for a higher level of professionalism and competency for physics simulation teachers.

2) Conduct training for physics simulation teachers.

To expand physics simulation experiment teaching, there will be a significant demand for teachers capable of managing these tasks. Relying solely on external recruitment may not be practical due to challenges with talent acquisition and high costs. Therefore, a practical solution is to organize centralized training for a group of physics teachers from local secondary schools. Each school can select one or two physics teachers, and the education authorities can coordinate their training. The main focus of this training would be on the operation and management of physics simulation laboratories, ensuring that these teachers have a basic proficiency in using the software and hardware facilities for conducting physics simulation experiment teaching (Wu, 2023).

4.4. Analysis of Implementation Risks and Research on Countermeasures

4.4.1. Analysis of Implementation Risks

When opposing the use of physics simulation experiments, there is a viewpoint that is quite reasonable: the design of simulation experiment software is based on established physical laws and logic, and the generation and variation of experimental data actually follow pre-set physical logical rules, which may hinder groundbreaking physics research. If high school students become completely accustomed to and reliant on simulation experiments, they may rely more on simulation experiments for research in the future. Their practical experimental skills may be severely compromised, and some students may excel in simulation experiments but lack basic skills when it comes to real experiments validation. This could be detrimental to the long-term development of students' physics experimental skills.

At first glance, this viewpoint seems quite valid, as continuous dependence on simulation experiments could potentially hinder the development of students' practical experimental skills. However, this issue needs to be viewed from a developmental perspective, particularly concerning the design of physics simulation software for high school physics experiments. Naturally, the design of physics simulation software for high school experiments follows established logic and framework, as the content mainly involves verified and reasoned physics knowledge, without much content that extends beyond this framework. Therefore, the design of simulation experiment software is relatively straightforward (Xiao, 2022). In reality, when it comes to cutting-edge physics research, the design and development of simulation experiment software are more complex and rigorous. The design involves only basic logic, and data generation is random, rather than fixed within a framework. This approach ensures minimal differences between simulation experiment results and real experiment results, reducing the disparity to a minimum.

4.4.2. Research on Countermeasures

Even with a strong emphasis on conducting physics simulation experiments, the issue of students' traditional practical physics experimental skills needs to be addressed. Schools can reduce traditional practical physics experiment teaching while promoting physics simulation experiments, but not eliminate it entirely. The primary goal of offering traditional practical physics experiment teaching is to cultivate students' basic experimental skills rather than focusing too much on experimental data. By effectively combining physics simulation experiment teaching with traditional physics experiment teaching, students can effortlessly conduct physics experiments while also mastering and enhancing their fundamental practical experimental skills (Wang, 2022). Strengthening traditional physics experiment teaching alongside conducting physics simulation experiments, and integrating the two approaches, is an effective strategy to address this issue.

5. Case Study and Conclusion

5.1. School Profile

The sample case study school is a high school in a remote county, with a current enrollment of 532 students and 57 teachers, including 8 physics teachers.

5.2. Construction of Physics Simulation Lab

Due to constraints such as funding, embarking on a stand-alone project for the construction of a physics simulation lab may not be entirely feasible. To ensure that it does not impact the offering of computer courses, the school temporarily repurposed the computer room into a physics simulation lab. This involved installing various physics simulation software and procuring and setting up large projection screens for teacher guidance and analysis.

5.3. Organization of Physics Simulation Experiment Courses

For 11th-grade students, a physics simulation experiment class is conducted once every two weeks. The content of physics simulation experiments is predetermined based on the curriculum and generally follows the textbook content with fixed experimental courses and content.

12th-grade students also have a physics simulation experiment class every two weeks, with the course content determined by mutual agreement between physics teachers and the physics simulation experiment administrators.

The scheduling and content of physics simulation experiment classes for 12th-grade students are uncertain and are adjusted as needed based on teaching requirements, particularly for exam preparation. Specific implementation is determined by the 12th-grade physics teachers and the physics simulation laboratory administrator.

5.4. Content of Physics Simulation Experiment Courses

Currently, the high school's physics simulation lab has introduced 8 fundamental physics experiment courses that cover topics in mechanics, optics, electricity, and thermodynamics relevant to high school level education. These are essential courses that are included in the school's curriculum. Additionally, there are several elective physics experiment courses available. Some of these elective courses cover experimental testing aspects related to physics high-stakes exams, while others focus on internationally trending simulation physics experiment content, such as environmental protection and new technologies. These elective courses are optional and are scheduled through negotiation between teachers and students.

5.5. Comparative Analysis of Student Physics Experiment and Physics Learning Scores Before and After Establishing the Simulation Lab

The sample consists of 30 randomly selected students, and the assessment includes final exam scores in physics. For 12th-grade students, the assessment includes scores in the physics high-stakes exam and experimental question scores. The score data is in average points, and for ease of comparative analysis, non-percentage score data has been converted to percentage scores (Tables 1-3).

Comparative Analysis: From the data comparison above (Tables 1-3), it can be observed that after establishing the simulation laboratory, the physics scores of students in all three grades have shown improvement, with a larger increase seen in 11th and 12th grades. The increase in experimental question scores is greater than the increase in physics scores, especially with a significant rise in the proportion of students scoring full marks in the experimental questions, which has more than doubled.

Table 1. Comparison of 11th-grade students' physics experiment scores and physics learning scores before and after establishment of the physics simulation laboratory (Unit: Students).

	Physics Score	Experimental Question Score	Number of Students with Full Marks
Before Establishment	71	64	5
After Establishment	78	83	16

Table 2. Comparison of 12th-grade students' physics experiment scores and physics learning scores before and after establishment of the physics simulation laboratory (Unit: Students).

	Physics Score	Experimental Question Score	Number of Students with Full Marks
Before Establishment	69	59	4
After Establishment	74	68	8

Table 3. Comparison of 13th-grade students' physics experiment scores and physics learning scores before and after establishment of the physics simulation laboratory (Unit: Students).

	Physics Score	Experimental Question Score	Number of Students with Full Marks
Before Establishment	74	72	3
After Establishment	83	88	12

5.6. Comparison Analysis of Teacher and Student Supportive and Opposing Attitudes

The sample was randomly selected with 30 students and 10 teachers.

1) Comparison of Teacher Support and Opposition Attitudes Before and After Establishment of the Simulation (Table 4).

2) Comparison of Student Supportive and Opposing Attitudes Before and After Establishment of the Simulation (Table 5).

Comparative Analysis: From tables (Table 4 and Table 5), it can be observed that before the establishment of the simulation laboratory, there was a significant opposition from teachers, where the support and opposition were roughly balanced. However, after the establishment, the convincing results seem to have shifted the balance towards the supporters, although opposition still exists. As for students, there hasn't been much change before and after the establishment, with the overall dominance of supporters both before and after.

Table 4. Comparison of teacher supportive and opposing attitudes before and after establishment of the simulation laboratory (Unit: Person).

	Before Establishment	After Establishment	Change
Oppose	4	1	Decrease by 3 people
Support	6	9	Increase by 3 people

Table 5. Comparison of student supportive and opposing attitudes before and after establishment of the simulation laboratory (Unit: Person).

	Before Establishment	After Establishment	Change
Oppose	4	2	Decrease by 2 people
Support	26	28	Increase by 2 people

5.7. Simulation Experiments Have Shown to Significantly Enhance the Level of Physics Experiment Teaching in Remote Areas

As a physics teacher, I have tried to organize and utilize the existing physics experiment teaching resources in the local area. I opened up the unused physics laboratories to students, guided them to conduct basic physics experiments, and found that students showed high interest in conducting physics experiments and achieved good results. Based on this understanding and the current status of teaching development in the region, I expanded my thinking to consider and experiment with introducing physics simulation experiment methods (Wang & Wang, 2022).

As demonstrated and analyzed in the previous discussion, the effect of simulation experiments in enhancing the level of physics experiment teaching in the region is significant. Specifically, it has led to increased student interest in physics experiments, improvement in students' physics experiment learning levels, and enhancement in students' physics experiment scores, including overall progress in their physics learning results. Although the current level of simulation experiments in the area is still in the experimental stage and has not been widely promoted, existing cases indicate that this method of physics experiment teaching is highly popular among students. Teachers' acceptance and recognition of this approach are also increasing as it is simple to operate and has the potential to improve learning outcomes.

6. Conclusion

6.1. The Popularity of Simulation Experiments in Secondary School Experiment Teaching

The advancement of technology, coupled with cost reductions, along with the inherent advantages of physics simulation experiments such as intuitive experimental processes, clear demonstration of experimental principles, ease of data analysis, and easy management of simulation experiments leading to high efficiency, has increased the value of promoting physics simulation experiments. In reality, many developed countries, including some advanced cities and regions in China, have already established successful simulation physics laboratories or are in the process of planning them. With the progress of electronic technology and the widespread use of the internet, this trend is expected to continue expanding to smaller cities and ordinary schools. It can be foreseen that in the future, more and more regions and schools will establish simulation physics laboratories and conduct simulation physics experiments, making it an inevitable trend.

6.2. The Application of New Technologies Will Promote the Integration and Development of Physics Simulation Experiments with Traditional Experiments

The fundamental driving force behind the development of physics simulation experiments is technological progress. We are in an era of rapid technological advancement, with new technologies emerging constantly and their dissemination and application accelerating. For instance, virtual reality technology can make simulation physics experiments more realistic and enhance observability. This technology is already being actively applied in some sophisticated simulation physics laboratories. Thus, the future widespread promotion of simulation physics laboratories in universities and high schools is only a matter of time. Additionally, artificial intelligence technology will enhance the design of simulation experiment process models, the randomness of physical experiment reactions, and ensure that the statistical data analysis of physics experiment results aligns more closely with real-world situations. These technological innovations and advancements will bring simulation physics experiments closer to traditional real-world experiments and simplify their implementation.

Furthermore, with the advent of big data, all simulation physics experiments can be conducted online in the future. This connectivity will make the results of physics experiments more representative and universally applicable. Students will also have the opportunity to discuss physics results with students from other countries and regions through the internet. This approach to physics experiment teaching will add significant value and relevance.

In conclusion, Physics is fundamentally an experimental science, and physics experiments are a crucial method driving the advancement of the discipline. The closer simulation physics experiments come to real-world experiments, the higher their experimental value. With the application of new technologies, simulation physics experiments and traditional physics experiments are expected to converge and mutually enhance each other's development.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

References

Bian, X. (2023). Application of Simulation Physics Laboratory in the Teaching of Difficult Problems in High School Physics. *Mathematical World: High School Edition, No. 22,* 69-71.

He, F. Q. (2022). Research on the Application of Virtual Simulation Experiments in Junior High School Physics Teaching. *Chinese Science and Technology Journal Database (Citation Edition) Educational Science, No. 7,* 171-174.

Jin, X. S. (2023). Practice of Simulation Experiments to Assist High School Physics Experimental Teaching. *Tianjin Education, No. 15,* 123-125.

Leng, X. R., & Liu, G. F. (2022). Application and Analysis of Virtual Simulation Technology in Middle School Physics Optical Experiment Teaching. *Chinese Science and Technology Journal Database Research, No. 8,* 109-112.

Wang, H. Q., & Wang, S. F. (2022). Using Simulation Physics Laboratory Software to Explore the Law of Interaction between Two Point Charges. *Middle School Physics, 40,* 50-53.

Wang, X. J. (2022). Research on the Role of Simulation Experiments in High School Physics Experiments. *Century Star—High School Edition, No. 15,* 142-144.

Wu, W. T. (2023). Application of Simulation Experiments in High School Physics Teaching. *Road to Success, No. 4,* 97-100.

Xiao, Y. (2022). Simulation Experiments Help High School Physics Experimental Teaching Become Smarter. *Success, No. 15,* 47-48.

Yang, F. F., & Si, D. P. (2022). Research on the Strategy of Assisting the Teaching of "Two Kinds of Charges" Based on NB Virtual Experiments. *Middle School Physics Teaching Reference, No. 16,* 22-24.

Ying, O. Y., Y., & Fu, X. Y. (2021). Application of Simulation Experiments in Middle School Physics Teaching. *Discussion on Physics Teaching, 39,* 66-68.

Yuan, L. L., Liu, X. B., Lai, H. L. et al. (2022). Discussion on Simulation Experiments to Assist Physics Experimental Teaching—Taking "Measuring the Electromotive Force and Internal Resistance of Power Supply" as an Example. *Hunan Middle School Physics, No. 1,* 61-63.

Zhang, X. N. (2021). Simulation Physics Experiments Help Junior High School Physics Teaching. *Teaching Instruments and Experiments, 37,* 83-86.

Zheng, K., & Li, X. H. (2020). Case Design and Research of Junior High School Physics Simulation Experiment Based on VR. *China Educational Technology Equipment, No. 15,* 111-114.

Zheng, Y. (2023). Research on Simulation Experiments to Assist High School Physics Experimental Teaching. *Middle School Curriculum Guidance, No. 23,* 39-41.