DOI: 10.53469/jerp.2025.07(06).24

The Application Practice of Computer Information Technology in Junior High School Chemistry Experiments Teaching

Lingbao Meng

Sixth Middle School of Chengyang District, Qingdao 26611, Shandong, China

Abstract: ***The application of computer information technology in junior high school chemistry experimental teaching has significantly improved teaching effectiveness. Through virtual laboratories, multimedia displays, and other means, students can simulate complex experiments in a safe environment and intuitively understand chemical principles. The intelligent teaching system provides personalized learning paths and enhances learning motivation. At the same time, data analysis helps with precise evaluation and timely adjustment of teaching strategies. This practice not only enriches teaching methods but also promotes the cultivation of students' innovation ability and practical skills.***

Keywords: Computer information technology, Junior high school chemistry experiment, Application practice**.**

1. The Importance of Experimental Teaching in Junior High School Chemistry

The teaching of middle school chemistry experiments plays a crucial role in the middle school education system, and its importance is self-evident. Chemical experiments are not only an important way for students to acquire chemical knowledge and understand chemical principles but also a key link in cultivating students' scientific literacy, stimulating exploration interest, enhancing their practical ability, and encouraging innovative thinking. First, experimental teaching vividly highlights the mysteries of the chemical world. Through hands-on experiments, students can observe the phenomena of chemical reactions, such as color changes, gas generation, and precipitation. These intuitive feelings can deepen students' understanding and memory of chemical knowledge more than simple textual descriptions. This finding suggests that the 'learning approach greatly enhances the fun and effectiveness of learning. Second, chemical experiments help cultivate students' hands-on and problem-solving abilities. During the experimental process, students need to learn how to correctly use various instruments, measure reagents, control reaction conditions, etc. Learning and mastering these skills not only exercises students' hands-up abilities but also teaches them how to analyze reasons, adjust plans, and solve problems on the basis of experimental phenomena. The cultivation of this ability will have a profound impact on students' future learning and life. Third, experimental teaching is also an effective means to stimulate students' interest in science and innovative thinking. In experiments, students encounter various unexpected or unexpected phenomena, which often arouse their curiosity and desire for exploration. By guiding students to ask questions, design experiments, and verify hypotheses, we can cultivate their scientific inquiry spirit and innovative thinking ability. Collaboration and communication during the experimental process also helped develop students' teamwork spirit and communication skills. Fourth, chemical experiments also carry the important mission of safety education. In experimental teaching, teachers will strictly require students to abide by laboratory rules, use chemical drugs and instruments correctly, and cultivate their safety awareness and sense of responsibility. This is highly important for enabling students to form correct scientific attitudes and values.

2. Advantages of Computer Information Technology in Experimental Teaching

The advantages of computer information technology in experimental teaching are significant, leading to revolutionary changes in traditional education models. (1) Intuitive display and simulation: Computer information technology can present complex experimental processes, microstructures, or phenomena that are difficult to observe directly in an intuitive and vivid form through multimedia and virtual reality technology. This not only helps students better understand abstract concepts but also simulates high-risk or high-cost experiments in a safe environment, reducing teaching costs and improving teaching effectiveness. (2) Personalized learning support: With the help of intelligent teaching systems and big data analysis, computer information technology can provide personalized learning resources and paths on the basis of students' learning progress, abilities, and interests. In experimental teaching, this means that students can repeatedly watch experimental demonstrations, perform simulation operations, or receive targeted guidance according to their own needs, thereby promoting self-directed learning and deep learning. (3) Instant feedback and evaluation: Computer information technology can achieve real-time data collection, processing, and analysis of experiments, providing teachers and students with immediate feedback. This helps teachers promptly identify students' problems during the experimental process and provide targeted guidance. Students can also immediately understand their learning outcomes, conduct self-assessments and reflections, and adjust their learning strategies to improve learning efficiency. (4) Resource sharing and collaborative learning: With the development of internet technology, experimental teaching resources can be shared globally across geographical constraints. Students and teachers can access rich experimental cases, teaching videos, virtual laboratories and other resources through online platforms for cross-time and space learning and communication. Computer information technology also supports collaborative learning modes, where students can

form teams online to complete experimental tasks, solve problems together, and cultivate team spirit and cooperation abilities. (5) Innovative experimental teaching methods: Computer information technology provides more innovative methods for experimental teaching, such as controlling experimental equipment through programming, collecting experimental data via sensors, and conducting remote experiments. These innovative methods not only enrich the content and form of experimental teaching but also stimulate students' innovative spirit and exploratory desire and cultivate their practical ability and innovative thinking.

3. The Application Status of Computer Information Technology in Junior High School Chemistry Experiments

The application of computer information technology in junior high school chemistry experimental teaching is becoming increasingly widespread and in depth, leading to significant changes and improvements in chemistry experimental teaching. Currently, many junior high schools have begun to integrate computer information technology into chemistry experiment teaching, providing students with richer and more diverse learning experiences through multimedia teaching equipment, virtual laboratories, online teaching resource platforms, and other tools. Multimedia teaching equipment, such as projectors and electronic whiteboards, enables teachers to easily display multimedia materials such as experimental videos and animated simulations, helping students understand experimental principles and operating steps more intuitively. The virtual laboratory is another highlight of the application of computer information technology in junior high school chemistry experimental teaching. Through virtual reality technology, students can conduct experimental operations and observe chemical reaction phenomena in a virtual environment without worrying about potential safety risks or resource limitations in actual experiments. This approach not only improves the flexibility and reproducibility of experiments but also stimulates students' curiosity and exploratory desire, enhancing their enthusiasm for participating in experiments. With the increasing popularity of the internet, an increasing number of junior high school chemistry experiment teaching resources are being uploaded to online platforms for teachers and students to access and learn at any time. These resources include experimental video tutorials, electronic textbooks, interactive exercises, etc., providing students with convenient conditions for self-learning and consolidating knowledge. Notably, although the application of computer information technology in junior high school chemistry experimental teaching has achieved certain results, several challenges and limitations remain. How to ensure that students remain focused and effective in using computer information technology for chemical experiment learning is also an important issue that teachers need to pay attention to.

4. Principles and Methods of Applying Computer Information Technology in Junior High School Chemistry Experimental Teaching

4.1 Role and advantages of computer information technology in teaching

The role of computer information technology in junior high school chemistry experimental teaching is multidimensional. First, it transforms abstract and difficult-to-understand chemical concepts and complex experimental processes into intuitive and vivid visual experiences through multimedia display methods such as high-definition videos, dynamic images, and 3D simulations, greatly increasing students' interest in and participation in learning. This intuitive teaching method helps students grasp knowledge points faster and deepen their memory. Second, the application of computer information technology in experimental teaching, especially the introduction of virtual laboratories, provides students with a safe and risk-free learning environment. In traditional experiments, certain reactions may be dangerous or require expensive experimental equipment and materials. Virtual laboratories allow students to conduct simulated experiments in a virtual environment without worrying about safety issues in actual operations while also reducing experimental costs. The virtual laboratory also provides repeatability and customizability of experiments, allowing students to conduct multiple experiments according to their learning progress and needs until they fully master [3]. The advantages of computer information technology are also reflected in personalized teaching. Through intelligent teaching systems and big data analysis, teachers can provide customized learning resources and paths for students on the basis of their learning habits, abilities, and interests. This personalized teaching approach helps meet the needs of different students and improves teaching effectiveness and learning efficiency. Computer information technology also supports real-time feedback and evaluation, allowing teachers to understand students' learning situations in a timely manner and providing targeted guidance and assistance.

4.2 Characteristics of Virtual Laboratory Software

The application of virtual laboratory software in middle school chemistry experimental teaching has many unique characteristics. First, it can highly simulate the real experimental environment, including various aspects such as experimental equipment, reagents, and reaction conditions. In a virtual laboratory, students can conduct experimental operations, observe experimental phenomena, and even experience subtle changes during the experimental process, similar to a real laboratory. This immersive experience helps students better understand the experimental principles and operational steps. Second, virtual laboratory software provides abundant experimental resources and cases. These resources and cases cover most of the experimental content in junior high school chemistry courses, and students can choose and learn according to their interests and needs. The virtual laboratory also supports custom experiments, where students can design experimental plans on the basis of their own ideas and conduct simulation operations, thereby cultivating their innovative thinking and practical abilities. Third, virtual laboratory software has real-time feedback and evaluation functions. During the simulation experiment process, the software can provide students with real-time operation results and feedback opinions, helping them discover problems and improve in a timely manner. The software can also record and evaluate students' experimental process, providing them with

personalized learning suggestions and guidance. Fourth, virtual laboratory software also has flexibility and scalability. With the continuous development of educational technology, the functionality and performance of virtual laboratory software are also constantly improving. Schools can choose suitable virtual laboratory software on the basis of their own teaching needs and technical conditions and carry out corresponding customization and expansion.

4.3 Teaching Design Method via Computer Simulation Experiments

When computer simulation experiments are used for teaching design, certain steps and methods need to be followed. Clear teaching objectives and content are key, and teachers need to have a clear understanding of which knowledge points and experimental skills will be taught in this lesson, as well as the importance of these knowledge points and experimental skills in subsequent learning. Appropriate computer simulation experiment software or platforms are selected on the basis of teaching objectives and content. These software or platforms should be able to meet teaching needs, provide rich experimental resources and cases, and have good user experience and interactivity. Designing a teaching process is a crucial step, which should include introducing the experimental background, demonstrating experimental principles, guiding simulation operations, and organizing discussions and exchanges. When introducing an experimental background, teachers can stimulate students' interest in learning by telling relevant stories, displaying objects or pictures, etc. When demonstrating experimental principles, teachers can use multimedia tools to present complex chemical principles in an intuitive and understandable way. When guiding simulation operations, teachers need to explain in detail the operation steps and precautions and guide students to conduct simulation experiments according to requirements. When organizing discussions and exchanges, teachers can encourage students to share their observations, feelings, and thinking results, promoting classroom interaction and thinking collision. The implementation of the teaching process and the evaluation of teaching effectiveness are essential steps. During the teaching process, teachers need to closely monitor students' learning situation and provide timely guidance and assistance; at the same time, it is necessary to adjust the teaching plan on the basis of students' reactions and performance to ensure that the teaching effect achieves the expected goals. After teaching, teachers can check students' mastery of experimental content through quizzes, assignments, or classroom discussions and adjust subsequent teaching plans on the basis of feedback results.

4.4 Utilizing Multimedia to Showcase the Experimental Process and Results

In junior high school chemistry experiment teaching, the use of multimedia to display the experimental process and results is a very effective teaching method. By using multimedia devices such as projectors or electronic whiteboards to play experimental videos or animated simulations, the experimental process can be presented clearly to students. These videos or animations usually have high-quality visuals and sound effects, which can attract students' attention and stimulate their interest in learning. Videos or animations can also reveal microscopic phenomena or reaction processes that are difficult to observe in experiments, helping students better understand experimental principles and operational steps. When demonstrating the experimental process, teachers can use explanations and annotations to guide students to pay attention to the key steps and phenomena of the experiment. For example, when demonstrating a chemical reaction, the teacher can point out the reactants, products, and their changing relationships; when demonstrating the usage of an experimental instrument, teachers can emphasize the structural characteristics and precautions of the instrument. Through this approach, students can gain a deeper understanding of the experimental content and master relevant skills. Using multimedia to display experimental results is also a very effective teaching method. By visually displaying the changing trends and patterns of experimental data through charts, images, and other forms, students can better understand the experimental results and discover the regularities and correlations within them. Teachers can also guide students in analyzing and discussing experimental results, cultivating their critical thinking and problem-solving abilities. Using multimedia to display the experimental process and results can also promote classroom interaction and collision. During the display process, teachers can encourage students to ask questions and doubts and guide them to think and explore; students can also be organized to participate in activities such as group discussions or class-wide exchanges to share knowledge.

5. Future development trends in Computer Information Technology in Junior High School Chemistry Experiments

The future development trend of computer information technology in junior high school chemistry experimental teaching will move in a more intelligent, personalized, and integrated direction. On the one hand, intelligence will become an important feature of future chemistry experimental teaching. By introducing technologies such as intelligent teaching systems and virtual teaching assistants, the teaching platform will be able to conduct real-time analysis and feedback on the basis of students' learning behavior and performance, providing customized learning advice and guidance for each student. Intelligent experimental equipment has gradually become popular and can automatically record experimental data, analyze experimental results, and provide students with real-time experimental guidance and feedback, thereby improving the accuracy and efficiency of experiments. On the other hand, personalized teaching will become an important trend in future chemistry experiment teaching. With the transformation of educational concepts and the advancement of technology, an increasing number of educators are paying attention to the individual differences and needs of students. In the future, chemistry experiment teaching will pay more attention to students' subjectivity and participation, providing students with diverse learning resources, flexible learning paths, and personalized learning support through computer information technology. Students can choose suitable learning content and methods on the basis of their interests, abilities, and needs, thereby achieving more autonomous and efficient learning. Integration is also an important direction for future chemistry experiment teaching.

With the accelerated development of interdisciplinary and fusion, chemistry experiment teaching will no longer be limited to a single disciplinary field but will be integrated and promoted with other disciplines, such as physics, biology, and information technology. With the support of computer information technology, teachers can overcome disciplinary barriers, design interdisciplinary experimental projects, allow students to experience the connections and interactions between different disciplines in practice, and cultivate their comprehensive literacy and innovation ability.

6. Conclusion

The in-depth application of computer information technology in junior high school chemistry experimental teaching marks the entry of chemistry education into a new digital era. It not only optimizes the allocation of teaching resources but also stimulates students' interest in learning and exploration. In the future, with the continuous innovation of technology, chemical experiment teaching may become more intelligent and personalized, laying a solid foundation for students' comprehensive development.

References

[1] Zhang Wanrong. The Application of Information Technology in Junior High School Chemistry Experiment Teaching [J]. Academic Weekly, 2020, 14 (14): 131-132.

[2] Lu Fengjiao. Analysis of Construction Strategies for Junior High School Chemistry Experiment Teaching under the Background of Information Technology [J]. Exam Weekly, 2020 (33): 137-138.

[3] Xie Shunfeng. A Brief Discussion on the Application of Information Technology in Junior High School Chemistry Experiment Teaching [J]. Read Write Calculate, 2020, 1151(04):26-26.

[4] Liu Bingmei. Exploration of Application Strategies of Information Technology in Junior High School Chemistry Teaching [J]. Science Consulting (Technology and Management), 2021 (07): 275-276.

[5] Yuan Jianxia. The Application of Information Technology in Junior High School Chemistry Experiment Teaching [J]. Western Quality Education, 2019, 5 (17): 125-126.

[6] Wang Shaopeng, Wang Huina, Wang Yufei, Li Jingjing. The Application of Information Technology in Chemical Experiment Teaching [J]. Guangzhou Chemical Industry, 2019, 47 (16): 169-170+175.