

Innovative Analysis on the Teaching Mode of Research-oriented Physical Chemistry Experiments

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Abstract: Modern education is deepening reforms. Education is paying more and more attention to cultivating students' problem thinking and solving abilities. Research-based learning and teaching models can achieve this. As far as the experimental teaching of physical chemistry is concerned, the practical teaching requirements of this kind of courses are relatively high, and the application of the research teaching mode of physical chemistry is one of the key directions of current curriculum teaching research. Through the research teaching of physical chemistry experiments, it can not only deepen students' understanding of physical chemistry theoretical knowledge, enable students to master some corresponding basic operating skills, and cultivate students' scientific thinking and comprehensive, analytical problem-solving and scientific inquiry abilities, but also train students creativity. This project takes the physical chemistry experiment teaching of chemistry major of Xinzhou Normal University as an example. Based on the analysis of the current physical chemistry experiment teaching status and existing problems, it aims at cultivating students' innovative ability, explores the reform of physical chemistry experiment teaching, and trains qualified chemistry teachers.

Keywords: Research Teaching; Physical Chemistry Experiment Teaching; Model; Innovation

1. The positive role of research teaching mode

Research teaching is not only a teaching concept, but also a teaching mode, or a teaching method. It is a kind of teaching that organically combines teacher research professor with student research study, in-class teaching and extra-curricular practice, teacher guidance and student self-study, and achieves a complete, harmonious and unified teaching. Research teaching can not only play the leading role of teachers, but also play the main role of students; It can not only cultivate students' interest in learning, stimulate students' thinking, but also cultivate students' ability to analyze and solve problems; It can not only enable students to master the system firmly. The subject knowledge can cultivate students' practical ability and innovative spirit. The introduction of this teaching mode into the physical chemistry experiment teaching can effectively stimulate students' desire for exploration and curiosity, stimulate interest in learning, and have a positive effect on improving the effectiveness of course teaching.

2. Current problems in the teaching of physical chemistry experiments

2.1 The experimental teaching materials are outdated and the content is updated slowly

As far as the current development of physical chemistry experiment teaching is concerned, the content design of related textbooks for experimental teaching is relatively backward. The physical chemistry experiments included are mostly classic confirmatory experiments. The content and form of the experiments are relatively traditional, lacking creativity and novelty. The comprehensiveness of the experimental design is not enough to meet the needs of physical chemistry experimental teaching at this stage, and it is also not conducive to students to broaden their horizons and increase their knowledge. The

current physical chemistry experiment textbooks are relatively simple in content and lack of new ideas in experimental design. Teacher teaching is also based on theory, and the proportion of experimental teaching is insufficient, resulting in unsatisfactory experimental teaching results. It is also difficult for students to integrate relevant physical and chemistry knowledge.

2.2 The experimental equipment is not perfect and the equipment is

backward

At present, relevant colleges and universities have generally inadequate preparations for physical and chemical experiments in laboratories, experimental equipment, experimental reagents, and materials. The purchase of relevant experimental instruments and equipment is insufficient, and the amount of relevant experimental infrastructure and materials is insufficient. The speed of replacement is slow, and it is difficult to ensure that students' experimental needs are met. Although the construction scale of the related physical chemistry laboratory is still relatively large, the related experimental equipment is insufficient and the equipment is backward. In many cases, it is necessary for multiple students to share the same experimental equipment and equipment to carry out related physical and chemical experiments, so there is no guarantee that every student will be able to hands-on operation, so some students can only watch in the experiment, not hands-on practice.

2.3 The experimental teaching method is single, ignoring the main body

status of students

At present, in many physical chemistry experiment teaching, teachers have an absolute dominant position in the classroom. Teachers will demonstrate relevant experiments to students, explain the precautions in the experiment, explain the experimental process and principles, and let students know about the corresponding physical and chemical experimental phenomena. There is a general understanding of the experimental process and experimental results, but in the process of experimental learning, students really have very little time to think and explore independently. Students lack the sense of exploration and desire in experimental learning, and they are not very motivated to learn.

3. Innovative countermeasures for research-oriented physical chemistry

experiment teaching mode

3.1 Improve the construction of teaching infrastructure and update

teaching materials

In view of the backwardness of related textbooks in physical chemistry experimental teaching and insufficient experimental teaching infrastructure construction, relevant colleges and universities should combine the actual needs of physical chemistry experimental teaching to purchase experimental teaching equipment, equipment, tools, materials, etc., to meet the needs of students independently. Operational experimental research needs. Regarding teaching materials, it is necessary to further accelerate the update of teaching materials, combine some knowledge of life to design more innovative experiments, so that students can explore, continuously strengthen their cognition in research and exploration, and enhance the effectiveness of physical chemistry experiment teaching.

3.2 Focus on innovation in teaching methods and stimulate research

enthusiasm

In the traditional physical chemistry experiment course teaching, the teacher is the main body of the classroom teaching, and the students are relatively passive in the physical chemistry learning. In many cases, the teacher leads the students to learn. The students' willingness to learn independently is not high, and their dependence on the teacher is increasing. In this way, as long as teachers do not supervise and guide, it is difficult for them to carry out effective independent learning. In the physical chemistry classroom teaching, creating problem situations and designing related physical chemistry problems, whether it is fun, challenging or exploratory, can mobilize students' learning autonomy and guide students to conduct research studies. In this process, students' abilities and accomplishments can also be effectively exercised, which is useful for physical chemistry experiment courses. High-quality completion of teaching objectives is necessary.

In the specific physical chemistry experiment teaching classroom, teachers should highlight the students' main learning status, do a good job of leading the classroom, give appropriate explanations to related physical chemistry experiments, set up questions reasonably, guide students to think and research, and explore and discover by themselves problems, explore and solve problems in practice.

3.3 Pay attention to teacher training and improve the level of experimental teaching

In the new era, as a physical chemistry teacher, one should clarify the importance of experimental teaching for course teaching. In physical chemistry experimental teaching, we should change the concept and attach great importance to the practical significance of experimental teaching. Teachers must pay attention to students and actively guide students to pay attention to experimental courses; they must radiate guidance and comprehensively drive experimental skills teaching and research; they must learn and share together, and actively strengthen experimental teaching communication. The school should make full use of high-quality training resources for teachers of physics and chemistry, focus on themes, broaden their horizons, communicate in depth, sum up experience, use the learning platform, through horizontal communication, comprehensive cooperation, learning from each other, and exchange of needs. Strengthen the exchange and sharing of related experimental teaching, build an integrated model of research, learning, and practice, impart research teaching models and methods to teachers, improve their curriculum teaching ability and technical level, and actively explore science for the experimental teaching of physical chemistry. High-efficiency experimental teaching methods, and overall improvement of the teaching level of physical chemistry subjects play an important role.

Relevant physical and chemical experiment teaching skills training should focus on strengthening students' practical operation, situational experience, exploration and knowledge, personal perception and innovation and creation, and strive to improve students' observation ability, hands-on practice ability, creative thinking ability and teamwork ability, for teachers in teaching to expand and innovate, continuously integrate cutting-edge scientific and technological knowledge and the latest technological achievements into experimental teaching to lay the foundation.

4. Conclusion

As far as the current teaching of physical chemistry experiment courses is concerned, the proportion of course experiments in teaching is too low, and in the development of physical chemistry experiments, more teachers follow the experimental procedures and topics of the textbooks to demonstrate and students watch. There are relatively few opportunities for hands-on experimental exploration, so students still have certain deviations in the practical application of curriculum knowledge and the mastery and understanding of the principles of physical chemistry, and the teaching efficiency is not high. Therefore, the research teaching mode is introduced into the physical chemistry experiment teaching, aiming at the existing curriculum teaching problems, providing effective teaching ideas and methods, and accelerating the innovation of curriculum teaching.

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