

Exploration on Teaching Reform of Comprehensive Chemistry Experiment in Normal Universities

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Abstract

Comprehensive chemistry experiment is a compulsory course for college chemistry majors, which is in a connecting position in the curriculum system. In view of the shortcomings in the traditional comprehensive chemistry experiment teaching, this paper discusses the reform from the aspects of the selection of teaching content and the evaluation method of the innovative experiment course of teaching methods. On this basis, the students' comprehensive chemistry experiment literacy, innovation consciousness and comprehensive experiment ability are comprehensively cultivated. Cultivating normal college students with both applied ability and practical teaching ability.

Keywords: comprehensive chemistry experiment, innovation consciousness, experiment ability

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Comprehensive chemical experiment is an experimental subject and a professional compulsory course for college students majoring in chemistry. Doing a good job in the comprehensive experimental teaching of college chemistry is of great significance to consolidate and improve the basic knowledge, practical ability and comprehensive quality of college students, and to cultivate applied talents to meet the needs of social progress [1]. For normal universities, the cultivation of chemical undergraduate students in addition to training applied ability, more is to cultivate their practical teaching ability, which involves the cultivation of students' comprehensive chemical experiment literacy, innovation consciousness and comprehensive experimental ability [2]. At the same time, in the traditional experimental teaching, the experimental results often only refer to the experimental results and the writing of the experimental report as the usual results, and are included in the total score in a small proportion, which is easy to mislead students to take the experimental class lightly. In the traditional experimental teaching, students often start to do the experiment after the simple explanation of the experimental instructor, which will also make students not understand the experimental principles and precautions, resulting in the failure of the experiment. Aiming at the shortcomings of traditional experiment teaching, the author tried to introduce a new experiment teaching system into comprehensive chemistry experiment, and discussed the reform of teaching content and teaching evaluation mode.

1. Selection of comprehensive chemistry experiment teaching content

Comprehensive chemical experiments focus on the word 'comprehensive', which is first reflected in the teaching content. Through the relevant training of basic chemistry experiments in the lower grades, students at this stage have already possessed the knowledge and ability of basic chemistry theory and basic experiments, and the comprehensive chemistry experiment is an effective combination of the basic chemistry experiments learned by the sophomores, consolidating the basic training, improving the students' comprehensive experimental ability, further consolidating and deepening the basic chemistry experiment operation skills, and strengthening the standardization of students' basic operations. The contents include inorganic chemistry experiment, analytical chemistry experiment, organic chemistry experiment, physical chemistry experiment, instrument analysis experiment and polymer chemistry experiment. Some representative experiments were selected to study the synthesis, separation, analysis, characterization and performance testing of inorganic or organic substances [3]. Its specific goal is to learn the experimental design ideas and methods, understanding a complete scientific research process. Each experiment in this course is related to the knowledge of at least two disciplines. Most experiments involve the application of large analytical instruments, so students are required to be familiar with some basic operation steps of large test instruments. At the same time, in the increasingly serious environmental pollution today, the green chemistry into the teaching content is particularly important [4].

Based on the above analysis, the choice of experimental content should be comprehensive. In our practical teaching, some representative experiments are selected based on the above factors, such as the preparation of inorganic additive flame retardant zinc borate with low hydration. Pure zinc borate with low hydration is a kind of white fine powder. As an efficient additive flame retardant, it still maintains the crystal water in the structure at a higher temperature of 350 °C, which is higher than the processing temperature of most polymers. At the same time, compared with the commonly used flame retardant antimony oxide, low hydrated zinc borate has the

advantages of low cost, low toxicity, less smoke and low color. It has been widely used in the production and processing of PVC film, wall coating, wire and cable, carpet and other materials, resulting in good flame retardant effect. There are many methods for the production of low hydrated zinc borate. In our experimental teaching, the green zinc oxide-boric acid synthesis method was selected. This method uses water as a solvent to minimize the generation of three waste pollution. At the same time, after obtaining the final product, we also asked the students to characterize the structure of the prepared hydrated zinc borate by differential thermal analysis (TGA). Instrumental analysis is integrated into experimental teaching to consolidate students' basic chemical knowledge and cultivate students' comprehensive ability.

2. Innovation of teaching method of comprehensive chemistry experiment

In view of the comprehensive chemical experiment, it is a comprehensive subject based on basic chemical experiment and chemistry course. Its teaching requires us not only to simply teach the training of operation skills and the verification of theoretical knowledge, but also to cultivate students' scientific research ability, as well as to cultivate good scientific literacy and laboratory work habits, so as to improve students' comprehensive quality and meet the needs of social development [5]. At the same time, the purpose of university comprehensive chemistry experiment is not only to consolidate the knowledge learned before, but also to cultivate students' comprehensive ability and innovation ability. Therefore, we have explored and improved the teaching method of chemical comprehensive experiment in experimental teaching.

First of all, before the class, we ask students to make a good preparation before the experiment class, write a good preparation report, and understand the basic principles of the instruments and experimental operations used in the experiment. In order to make the preparation targeted, teachers first ask some thinking questions so that students can seriously think, and explain the possible phenomena in the experiment through the knowledge that has been mastered in the theoretical and basic experimental courses. In addition, we know that there is a certain degree of danger in chemical experiments. Therefore, we also require students to independently consult the MSDS of the drugs used in the experiment to understand the physical and chemical properties of each chemical drug. The experiment is based on safety. At the same time, we also encourage students to use the relevant knowledge learned before to design synthesis and preparation routes other than experimental textbooks. Through the network and library access to literature and other means, students' creative thinking is encouraged, and students' independent work and preliminary scientific research ability are cultivated. For students to design the route and focus on the feasibility of the program in the classroom, the model reverses the traditional experimental teaching in accordance with the experimental teaching materials 'prescription' phenomenon. The experimental teaching follows the teaching philosophy of 'student-centered, teacher-led', trying to achieve the interaction between teaching and learning, to promote teacher-student interaction, while cultivating students' team spirit [6,7]. In the course of the experiment, we require students to complete the construction of the instrument independently, in the process of building for non-standard operation to correct in time, for the phenomenon in the experiment to be recorded in time, and asked to record the experimental phenomena and data, cultivate a rigorous and realistic scientific attitude. Through the innovation of teaching methods such as preview and practical operation, we hope to cultivate students' comprehensive ability.

3. Performance evaluation of comprehensive chemistry experiment course

In the process of comprehensive chemistry experiment teaching, the evaluation of experimental results is a key link [8]. In traditional experimental teaching, students' experimental results are judged by the writing of experimental results and experimental reports, which easily makes students ignore the importance of experimental courses. It is of great significance to improve the evaluation method of comprehensive chemistry [9]. At present, the performance evaluation of university comprehensive chemistry experiment is generally carried out in a diversified way. Comprehensive chemical experiments adopted the usual results, experimental operation assessment, and inspection report three parts combined, the proportion of the total score were 30 %, 30 %, 40 %.

First of all, the usual performance mainly examines the students' preview ability, which includes the situation of students' answering questions, the situation of data access, the standardization of operation in the experimental process, the writing of experimental reports and data analysis, and the cooperation ability between students. Through the comprehensive investigation of all aspects, the ability of students is measured in an all-round way, which accounts for 30 % of the total score. In addition, we take an experiment as an investigation experiment, so that students can independently preview, build experimental devices, record and analyze experimental phenomena, write experimental reports, and score students in each step. This part accounts for 30 % of the total score. The last part is the open assessment method, which requires students to design a chemical experiment independently with the theme they are interested in. It requires students to read the literature. The designed experimental program includes raw materials, reagents, instruments, steps, precautions, and thinking questions. Focus on cultivating students' subjective initiative, the cultivation of innovation ability is

particularly prominent, and the results of the experimental investigation report directly reflect the students' practical comprehensive ability.

Conclusion

University comprehensive chemistry experiment is the last experimental course in university. It is a comprehensive course based on basic chemistry course and basic chemistry experiment. Comprehensive chemistry experiment teaching can lay a good foundation for students' follow-up courses, graduation design and future scientific research. At the same time, for normal universities, the cultivation of students is not only to cultivate applied ability, students' practical teaching ability is also an important aspect. In this aspect, it involves the cultivation of students' comprehensive chemistry experiment literacy, innovation consciousness and comprehensive experiment ability. Therefore, it is necessary to carry out certain teaching reform. Teaching reform is a long-term and arduous work, which needs continuous exploration and practice. As a teacher, we should constantly increase the knowledge reserve and cultivate different talents needed by the society.

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