

Research on the Reform of Chemistry Laboratory Teaching under the Construction of Green Ecological Environment

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Abstract: With the increasing awareness of environmental protection in countries all over the world, the construction of a green ecological environment has risen to the strategic height of a country. In this context, the importance of reforming chemistry experiment teaching is becoming more and more prominent. This article discusses how to reform the chemistry experiment under the guidance of the idea of "green ecology", so as to reduce its harm to the environment and enhance students' awareness of environmental protection. This paper analyzes the problems in traditional chemistry experiment teaching and illustrates them with examples. Finally, the paper puts forward the vision of the future reform of chemistry experiment teaching.

Keywords: green ecological environment, chemistry experiment, teaching reform, environmental awareness

Introduction

Under the wave of globalized awareness of environmental protection, the construction of green ecological environment has become a common concern of governments and the public. Chemistry experiment, as an important part of science education, also faces the problem of how to fit with the green ecological environment construction. The traditional chemistry experiment teaching is often characterized by resource waste, environmental pollution and other drawbacks, which is obviously contrary to the concept of green ecological construction.

1. Problems in traditional chemistry laboratory teaching

1.1 Resource waste problem

In chemical experiments, there are many kinds of reagents used, such as hydrochloric acid, nitric acid, sulfuric acid, etc., which are more toxic and prone to waste. For example, the main raw material for the production of nitric acid is hydrochloric acid, but in the process of using it, if the concentration is too high, it will cause nitric acid poisoning. Besides, if concentrated nitric acid is used in excess, it will pollute indoor air. If a high concentration of nitric acid is over-applied in a test, its residual sulphuric acid will react with the oxygen in the air to form a kind of sulphuric acid mist that both pollutes the environment and endangers human health^[1].

1.2 Environmental pollution problems

In traditional chemistry laboratory teaching, some experiments can achieve the purpose of green environment, but there are certain disadvantages, such as in the use of reagents, some teachers ignore the reuse of reagents in order to save costs; in the experimental design, there are problems such as lowering the dosage of reagents and ignoring environmental

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pollution. These problems exist in traditional chemistry laboratory teaching and affect the environment to a certain extent. Another example is that the experiment will produce a large number of toxic gases or waste water, waste residue and so on. In chemistry laboratory teaching, it will inevitably bring some damage to students^[2].

1.3 Students' environmental awareness is weak

Nowadays, many universities offer chemistry laboratory courses with a focus on theory. Although chemical experiment teaching can improve students' experimental operation skills and observation and analysis abilities, some chemical experiment courses are limited to the required teaching tasks, such as explaining experimental principles, operations, making experimental reports, etc., and environmental education for students is not yet sufficient. On the other hand, due to the insufficient breadth of environmental awareness in some experimental courses, college students lack environmental awareness and cannot truly recognize the importance of environmental protection. Therefore, in chemical experiment teaching, students only consider the teaching tasks assigned by the teacher and conduct experiments, while ignoring environmental issues^[3].

2. Reform measures for chemistry laboratory teaching

2.1 Optimizing experimental design and reducing resource waste

Under the concept of green ecological environment construction, there exists a large amount of resource waste in traditional chemistry laboratory teaching, which has seriously affected students' interest and enthusiasm in chemistry experiments. First, before carrying out chemistry laboratory teaching, relevant information and literature should be carefully consulted to fully understand the advantages and disadvantages of the existing chemicals and experimental devices, as well as the scope of use and other content; second, actively guide students to design their own experimental programs. In designing the program, computer aids can be used to help students optimize and improve^[4]. For example, for the preparation of benzene and nitrobenzene, teachers can use computer assistance to optimize the existing scheme, simulate the synthetic route of benzene and nitrobenzene, and then generate a mixed solution of benzene and nitrobenzene.

2.2 Improvement of experimental equipment

In order to further enhance the efficiency of the test and the effect of environmental protection, it is necessary to adopt energy-saving and environmentally friendly new technology and equipment to reduce energy consumption and pollution of the environment; use more efficient and energy-saving experimental equipment to realize the efficient conversion of energy, which greatly reduces the energy consumption of the experiment; change the traditional open-type test to a closed-type design, which can effectively avoid the toxic gases, dust, and other hazardous substances from the The ventilation system can effectively avoid toxic gases, dust and other dangerous substances escaping from the ventilation system, which will bring safety hazards to the surrounding environment. At the same time, the advanced sewage treatment process is adopted to ensure that the sewage is discharged after reaching the standard, providing a safer and healthier working environment for the researchers.

2.3 Strengthening waste treatment to prevent environmental pollution

In order to reduce the pollution of the environment caused by the waste produced in chemistry experiments, it is necessary to accelerate the change of its treatment method to meet the requirements of our green ecological environment. First, before the beginning of the experiment class, through the way of "waste classification", let them understand the importance of waste classification. Secondly, the waste generated in the chemical experiment should be classified and disposed of, and the solid waste and solid waste should be recycled separately. For gaseous waste, it can be disposed of by confinement or incineration. Thirdly, all kinds of wastes such as chemical reagents, waste liquids, waste residues, etc. should be cleaned and disposed of in a timely manner, such as the disposal of wastes should follow certain steps and methods.

2.4 Incorporating green concepts into education to enhance students' environmental awareness

The concept of "green ecology" has been put forward to not only improve the quality of enterprise products, but also to strengthen the public's awareness of environmental protection. In order to better improve the environmental awareness of college students, the "green" concept into the experimental teaching is very necessary. First of all, the idea of green ecological penetration into the experimental content, for example, in the teaching process, water treatment experiments, exhaust gas treatment experiments and other experiments related to the environment, mainly on the principles of chemistry and environmental protection knowledge, so that the students in the actual operation of the new things to learn, to enhance their awareness of environmental protection. Secondly, according to the characteristics of the discipline, the "green" teaching should be implemented; the teaching content of chemical engineering mainly includes basic knowledge, basic skills and basic methods. For example, chemical industry should master the knowledge of wastewater treatment process, chemical production safety and environmental protection, etc. At the same time, the knowledge of environmental protection can also be integrated into daily life to enhance students' awareness of environmental protection; on this basis, we can also organize students to participate in environmental protection activities to enhance their environmental awareness.

3. Practice cases and analysis

This paper takes the reform of chemistry laboratory teaching in a university as an example, and introduces the concept of green classroom into the laboratory course, and carries out a comprehensive reform and practical exploration.

3.1 Reform measures and practices

3.1.1 Optimization of experiment content

The school has comprehensively organized and optimized the contents of the original chemistry experiment teaching. Firstly, some of the toxic and hazardous substances have been reduced or replaced, and environmentally friendly substances have been selected. Secondly, the preparation and application of environmentally friendly catalysts, waste treatment and resource utilization and other related experimental contents have been included to give students a deeper understanding of the ideas and practices of green chemistry.

3.1.2 Improvement of experimental methods

The school has also made some adjustments to the experimental methods. For example, the use of miniaturized experimental method reduces the consumption of reagents and the generation of waste; the continuous flow process is vigorously developed to improve the reaction effect and reduce energy consumption.

3.1.3 Improving the evaluation system of experimental teaching

In order to ensure the smooth implementation of the green chemistry experimental teaching reform, the college has also improved it. In the new examination system, not only the students' experimental skills and knowledge level are emphasized, but also their environmental awareness, innovative thinking and team spirit. On this basis, we also encourage students to participate in the research and development of green chemistry experimental projects, and combine the research results with the assessment of experimental teaching to cultivate students' innovative consciousness and practical ability.

3.2 Reform effectiveness and impact

Through one year's teaching practice and exploration, our school has achieved good results in chemistry laboratory teaching. The experimental ability and environmental protection awareness have been obviously enhanced, and they have gained a deeper understanding of green chemistry. Meanwhile, the students showed a strong sense of innovation and teamwork in practice, which laid a solid foundation for their future research and career.

Meanwhile, the experience and practice of green chemistry experiments were widely disseminated nationwide

through academic exchanges and special lectures. This initiative not only enhances the visibility of our school in chemistry laboratory classes, but also provides a reference for other schools, thus promoting the development of overall chemistry laboratory classes.

4. Conclusion

In the process of teaching chemistry experiments in universities, experiments are reformed by optimizing experimental plans, selecting more environmentally friendly reagents and reaction conditions, reducing the generation and discharge of waste, and lowering the risk of environmental pollution. Students should consciously consider the environmental impact and develop habits of reducing pollution and conserving resources when conducting subsequent chemical experiments, thus cultivating a new generation of talents with strong environmental awareness.

Conflicts of interest

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

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Fund projects

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