Exploration and Practice for the Management of University Chemistry Course

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Abstract. On the basis of the specific conditions of Beijing Institute of Graphic Communication, the methods applied in the management of university chemistry courses were detailedly described in this paper. Experiments are particularly important parts in the university chemistry class because they can not only impart knowledge and skills, but also improve the comprehensive quality and abilities of students. Experiments in the university chemistry class have multiple forms, mainly including two aspects: verification experiments and exploration experiments. The verification experiments include student experiments and demonstration experiments. In order to cultivate students' scientific literacy, exploration experiments are using the "physical and chemical practice innovation base" as the platform, taking the students' scientific research of Beijing Institute of Graphic Communication as the starting point and then using the scientific research of the university students in Beijing as the driving force. In addition, the regular organization of the university students' chemistry competition is also an important aspect of the management and construction of chemistry course.

Introduction

Training world-class scientists and talents in scientific and innovative research is the only way to make China an innovative nation. As an important link, in the process of cultivating creative talents, college classroom teaching takes on the historical responsibility of cultivating students with innovative consciousness and ability. How to truly cultivate students to have innovative consciousness and ability while teaching basic knowledge, basic theory and basic skills at the college classes in which the students are the main body and the teachers are the dominator has become an important topic deserving further research.

Literally, Chemistry is the science of change. Chemistry is one of the most important basic sciences, which is the science of researching the material composition, structure, nature, and change rule of material.[1] Due to the university chemistry having its own unique characteristics in the classroom management aspect, to design and manage the university chemistry classes needs to apply many methods, which is so different from other disciplines.

Viewpoints

Firstly, Chemistry is an experimental science with strong intuition and systematicness. Students are required to obtain the basic knowledge, basic theory and basic skills through the teaching and teaching practice at the college chemistry classes. As the basic theory course, it should pay special attention to the teaching and consolidation of basic theoretical knowledge in the teaching process, which can lay a solid theoretical foundation for the study of relevant professional courses. More importantly, it is more significant to pay special attention to train students to analyze problems, to solve problems and to practice hands-on in the teaching process. Therefore, it’s essential to add the experiment link in the university chemistry class.
The chemistry experiments not only can impart knowledge and skills, but also can improve the students' comprehensive quality and abilities. Experiment links involve multiple forms, mainly including two aspects: verification experiment and exploratory experiment. The verification experiment includes student experiment and demonstration experiment.

**Verification Experiment**

Taking the basic course of Applied Chemistry in Beijing Institute of Graphic Communication as an example. In order to cooperate with the class teaching, we set up 5 student experiments as follows:
1) Determination of the ionization constant of acetic acid;
2) UV spectrophotometry;
3) Ionization equilibrium and precipitation reaction;
4) Colloidal properties;
5) Synthesis of isoamyl acetate.

These five experiments are divided into two parts. The first three experiments were arranged in the first half of the first semester of the first year of college, and the latter two experiments were arranged in the second half of the semester. The arrangements can be combined with the content and schedule of Inorganic & Analytical Chemistry as well as Physical Chemistry and Organic Chemistry in the course of teaching. Students could better grasp the theoretical knowledge and improve the comprehensive quality through the combination of classroom learning and experimental operation, which have acquired good teaching effect. At the moment of the teaching class, according to the characteristics of the course, we use the teaching mode of combining teaching with demonstration experiment through the use of material object, teaching model and audio-visual teaching means. For example, in the course of teaching the material structure, in order to make the student accept it more easily, the abstract chemical structure is vivid by using the teaching model and simulation animation demo. And in the classroom teaching, it is interesting to insert some of the experimental demonstration videos, analog animations or videos, etc., which have greatly improved the students' learning interest and strengthened the effect of visual teaching.

**Exploratory Experiment**

On the other hand, the development of exploratory experiment can encourage students' interest in learning and the desire to seek knowledge actively. In this respect, students' basic quality is developed through taking "physical and chemical practice innovation base" as the platform and taking the university students' scientific research of Beijing Institute of Graphic Communication as the starting point. A group of two or three students, firstly, they need to learn the basic operation method of instruments, learn how to review literatures, set and carry out experiment scheme, report regularly, discuss in group, mutually communicate with each other and learn from other groups. After a certain scientific research foundation, we then guide students to apply for the project of Beijing college students' scientific research project, independently responsible for and complete a research project.[2-4] Through careful research and training, in the process of continuous discussion and correction of errors, they finally write research reports or papers, and form a good scientific literacy. [5]

Through these activities, students’ ability in the literature review, experimental data analysis and practical hands-on ability have been significantly improved. Their innovative spirit and teamwork awareness have been significantly strengthened.[6-9]

**Carry out Competition Activities**

In order to cultivate students' innovative practice ability, we also provide them with many opportunities and a broader stage to exchange their achievements and show themselves. We regularly organize the school chemistry experiment subject contest, to stimulate students' enthusiasm for
learning. And we also organize the outstanding students to participate in the Beijing university students’ chemistry competition to cultivate students' innovative spirit.

Discussion

While the rapid development of knowledge economy, it becomes more and more important to develop the ability of science and technology innovation of university students. It has very important practical significance for the development of the advanced innovative talents who adapt to the development of the contemporary economic society. Summary of the situation, we consider that we have a lot of room for improvement in the following aspects.

1. We think that it is necessary to deepen the heuristic teaching.

   In the course of teaching, we inspire students to think, to stimulate students' interest in learning, to encourage students to explore the answer in the way of presenting the problem. In the process of exploring the answers, we guide students to consult the literature and sort out ideas, to improve the ability of students' autonomous design experiments and solve problems. From the design and implementation of the experiment, students have learned how to analyze problems and solve problems. The teacher can improve the teaching efficiency by guiding the students to get the answers of the questions. Therefore, the students' learning state is gradually changed from the passive acceptance to the active exploration.

2. We will lead the students to the well-known scientific research institutes and key laboratories in China. Through visiting institutes and taking part in the subject, students can feel the charm of scientific research and enhance their research enthusiasm. This will be a great inspiration and motivation for students who have plan to take the postgraduate entrance examination.

3. Based on the characteristics of school, we will combine basic chemistry course with students' own major and specialty of school, which makes students in the classroom can apply what we have learnt in use and easily grasp the classroom knowledge.[10]

Summary

In summary, in this paper combining with the actual situation of our school, the methods applied in the management of university chemistry courses were detailedly described.

Experiments are particularly important parts in the university chemistry class because they can not only impart knowledge and skills, but also improve the comprehensive quality and abilities of students. This paper focuses on the importance of the experimental link in university chemistry class from the three aspects of the verification experiment, exploration experiment and chemistry competition. In order to cultivate students' scientific literacy, exploration experiments are using the "physical and chemical practice innovation base" as the platform, taking the students' scientific research of Beijing Institute of Graphic Communication as the starting point and then using the scientific research of the university students in Beijing as the driving force. In addition, the regular organization of the university students’ chemistry competition is also an important aspect of the management and construction of chemistry course.

Moreover, this paper discusses the methods of teaching improvement and efficiency promotion, from strengthening heuristic teaching, the importance of visiting the famous scientific research institutes and key laboratories in China, as well as combine basic chemistry course with students' own major and specialty of school.
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