

Discussion on the New Concepts of Chemistry Teaching Adapting to the Requirements of Talent Cultivation

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Abstract. The flexible teaching contents and methods, especially the updating of teaching concepts are needed in order to meet the requirements for cultivating the talents of innovative, practice and complex types under new situations. In this paper, new concepts of chemistry teaching were discussed, and several viewpoints were put forward in the light of the requirements for talent cultivating under new situations.

1. Introduction

At present, China is in an important stage of deepening the reform of higher education, science and technology, speeding up the development of the well-off society in an all-round way, and accelerating the socialist modernization. In the new situation of educational innovation and scientific and technological innovation in the world, it is an important task for colleges and universities to cultivate complex talents with "thick foundation, wide caliber and strong ability". The training of different types of talents requires flexible and varied teaching contents and methods. Moreover, the updating of teaching concepts is crucial for the higher education. College teachers should consciously apply the scientific outlook on development to teaching activities, and strive to infiltrate new educational concepts in teaching activities. Chemistry is a basic science that is closely related to the environment and society. With regard to the study and teaching of chemistry related majors in universities, the authors will put forward some brief opinions on the new concepts of chemistry teaching for discussion in order to meet the needs requirements of talents cultivation under the new situation .

2. Discussion and Result

2.1 To infiltrate Green Chemical Concept into Chemistry Teaching

Green chemistry, also called sustainable chemistry, environment-friendly chemistry or clean chemistry, is an area of chemistry and chemical engineering focused on the designing of products and processes that minimize the use and generation of hazardous substances [1]. Environmental chemistry and green chemistry have the same goal of solving environmental problems. Whereas environmental chemistry focuses on the effects of polluting chemicals on nature, green chemistry focuses on technological approaches to preventing pollution and reducing consumption of nonrenewable resources [2]. Green chemistry education offers a solution to our current environmental problems because it provides the opportunity to train future scientists, thus helping move us toward a more sustainable society [3]. Teachers should infiltrate the basic ideas, principles, technologies and techniques of green chemistry into class teaching, imbuing the basic engineering concepts, energy consumption, technological feasibility, atom economy, and compound metabolism to the students. Meanwhile, teachers should infiltrate environmental pollution, such as water pollution, air pollution causes and hazards, green solvents, and catalysis into the chemistry teaching combining with typical examples such as the scientific treatment of waste chemicals in the laboratory. It must be formed such understandings for the students: preventing waste is better than treating or

cleaning up waste after it is created. Synthetic methods should try to maximize the incorporation of all materials used in the process into the final product, avoid using or generating substances toxic to humans and/or the environment, use the renewable and safe materials including solvents and energy sources. Green chemistry is the inevitable choice for the sustainable development of humans.

2.2 To infiltrate innovative educational concept into chemistry teaching

The core of chemistry education is to cultivate students' scientific literacy. There is a proverb in ancient China: to award people with fish is not as good as teaching people how to fish. The purpose of scientific literacy education for students is to train students to form scientific concepts, knowledge, methods and attitudes, so as to form scientific abilities to learn new things, solve problems and coordinate various issues under complex circumstances [4]. As an experimental subject, chemistry provides a good platform for the cultivation of students' creative ability. However, it is not overnight to cultivate students' innovative consciousness, spirit and ability. It needs a long time to explore the road of practical innovation education. In teaching process, teachers should pay much attention to the innovation of teaching methods, change the traditional teaching mode, and adopt a more reasonable examination and evaluation system by creating a relatively relaxed learning environment. Innovation ability is built on a certain amount of knowledge accumulation. Talking about innovation without basic knowledge is like "rootless wood, passive water". Therefore, it is not necessary to excessively stress the innovation for the freshmen. At this time, the first priority for them is to store the basic knowledge as much as possible. It is possible to inspire students' enthusiasm for innovation and demonstrate the hardships and joy behind the success by setting appropriate circumstances to reproduce the chemist's invention previously. And it is of importance to train the students' basic skills through basic chemistry experiments, stimulating their enthusiasm for learning, cultivating their scientific and rigorous spirit, and laying a good foundation for the cultivation of innovative abilities ultimately. For senior students, their proficiency in knowledge can be trained by comprehensive experiments, design experiments, and open experiments. In this way, the students' creative thinking and ability can be cultivated through active exploration of students and appropriate guidance of teachers. Teachers should pay attention to protecting students' innovative buds and give affirmation as much as possible. Through the study and training during the university, the innovative idea is deeply infiltrated in the students' minds.

2.3 To infiltrate sustainable development concept in chemistry teaching

The purpose of education for sustainable development is to promote and more thoroughly focus education as a crucial tool preparing young people to be responsible future citizens, so that our future generations can shape society in a sustainable manner [5]. The sustainable development refers to the development which not only meets the needs of the present generation, but also does not endanger the demand ability of future generations. It includes three interrelated sustainability, i.e. ecological sustainability, economic sustainability and social sustainability. In the past few decades, many countries in the world have neglected to protect the environment and resources, and a series of problems have emerged gradually such as environmental deterioration, resource deprivation, lack of economic development stamina and so on while pursuing the rapid development of economy. The concept of sustainable development has become a new strategic thought of human development. Teachers should highlight the importance of sustainable development through concrete examples during the teaching process. For example, when it comes to the development of mineral resources, such as rare earth resources, coal resources, it is very necessary to use specific data to show the problems in the current utilization of the resources, such as the low comprehensive utilization ratio, the large loss and waste, and the heavy energy consumption. Meanwhile, it is necessary to explicate that large amounts of solid waste and slow progress in the utilization of tailings led to resource depletion, environmental pollution, and energy crisis directly. It is hoped that these problems can arouse students' in-depth thinking. Then, it is pointed out the way to solve the problem on the basis of the students' thinking, i.e. taking the comprehensive utilization of resources, developing circular economy vigorously and promoting sustainable development. In this way, students' awareness of

environmental protection, resource conservation and energy conservation can be cultivated gradually. And a well sustainable development concept on environment, resources and energy for the students can be established.

2.4 To infiltrate philosophy concept in chemistry teaching

Philosophy is about the common and universal laws and principles of nature, society, and human thinking. It is also the generalization and summation of natural science and social science, the systematic and theoretical worldview. At the same time, it is also the way to observation, analysis, and solution of various problems. Chemistry, a branch of natural science, is a science that studies the composition, structure, properties and change rule of matters. Its basic concepts, theories, and internal mechanisms are rich in dialectical materialism, such as the material, the movement, unity of opposites, the law of qualitative and quantitative change, the phenomena and nature, the principal contradictions and minor contradictions, the contingencies and inevitability, and so on. There exists an inevitable and internal relationship between philosophy and chemistry, and every philosophical principle can find fresh examples in chemistry. Take As_2O_3 for example, it is a deadly poison, but also a cure for cancer and malaria. Therefore, teacher should pay much attention to the infiltration of philosophy thought to the students during the chemistry professional teaching process. The responsibility of teacher is not only to help the students learn and master the chemistry knowledge, what's more importantly is that guide them to establish the correct world outlook and methodology. In this way, the cultivation of the philosophical thinking of college students could be intensified. Only when students integrate philosophical concepts into the study of professional knowledge, they can understand chemical knowledge more comprehensively and profoundly, grasping the mode of scientific development, and analyzing the today and tomorrow of chemistry using development insights. And finally, the spirit of scientific exploration can be cultivated, and creative potential of the students can be inspired.

2.5 To infiltrate lifelong education concept in chemistry teaching

Since the middle of 1960s, lifelong education has been widely disseminated throughout the world as an extremely important educational concept under the strong promotion and popularization of the United Nations Educational, Scientific and Cultural Organization (UNESCO) and other relevant international organizations [6]. Lifelong education is an update of traditional education concepts. And its core is lifelong learning. It not only brings a new concept of education, but also greatly promotes the renewal of education essence, education content, methods, education time, space, and teaching methods. Colleges and universities shoulder the important responsibility of cultivating creative talents for the country. Lifelong education is beneficial to the cultivation of creative talents, and is considered to be a kind of education that can achieve all-round development, develop individual imagination to the maximum extent, cultivate creativity, and develop potential. Lifelong education is the inevitable trend for human society development.

Chemistry as a central subject, its content system is constantly developing and updating every minute. For example, new compounds are constantly being discovered, and new chemical theories are constantly being proposed. It is impossible to master the new knowledge and make breakthrough achievements by the traditional classroom learning. Therefore, in the teaching process, the role of teacher-leading should be changed, students' learning enthusiasm should be fully mobilized, and students' ability for literature retrieval and self-learning should be strengthened. In fact, students can use modern information technology (such as internet technology, distance education technology, etc.) to acquire rich learning resources and constantly enrich themselves.

2.6 To infiltrate people-oriented concept in chemistry teaching

Nowadays, countries all over the world are competing to cultivate high-quality innovative talents as an important strategy for national development. Colleges and universities shoulder the important responsibility for cultivating creative talents for the country undoubtedly. The key of people-oriented concept is that students should be regarded as the principle part of education rather than the guests. It

means that teachers not only instruct students the basic knowledge, but also teach the ability of self-learning and innovation. It also means that students' innovative ability should be trained throughout the whole teaching process, taking the curriculum content as the carrier. Thus, the student's study enthusiasm and initiative can be aroused. And more and more students can involve in teaching, find, analyze and solve problems. Finally, teaching effectiveness and students' innovative ability can be improved. In this way, it is necessary to break up the phenomenon of focusing on the conclusions and heavy points in the traditional teaching, but paying much attention on the accumulation of knowledge and scientific research. Because knowledge comes from experiments, students can explore doubts and obtain new knowledge through experiments. To achieve the people-oriented teaching goal, the experimental arrangements should be relatively reduced, the proportion of exploratory, comprehensive and design experiments should be appropriately increased. In addition, the experiments should be derived from and combined with real life as far as possible. The teacher should give the initiative to the students, giving them a free hand. The idea of "student-oriented" education will give students a great deal of freedom. And students could design their own experimental plans, and choose the appropriate experimental instruments and reagents to observe the phenomenon and draw conclusions by collecting the data or discussing with the teacher. And then the ability to find and solve the problem is trained. This will improve students' interest in learning and enthusiasm for learning. It will also be conducive to the healthy growth of the students, prompting the teachers to broaden their knowledge.

3. Summary

With the development of society and the progress of the age, the teaching concepts should be innovated and carried out constantly in accordance with the requirements of the new education situation. Of course, the above views are not comprehensive enough, only limited to the cultivation of students' scientific literacy. In addition to the cultivation of students' scientific literacy, it is also necessary to consider the cultivation of students' humanistic literacy, so as to really promote the all-round development of the students.

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