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## RESEARCH ARTICLE

### THE APPLICATION OF QUESTION-ANSWER CENTERED THEORY IN CHEMISTRY TEACHING

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#### ABSTRACT

The question-answer centered theory is another important discovery after the three major theories of modern education (student centered theory, subject centered theory and culture centered theory), and it is also the divergence of educational models between western countries and Eastern countries. Problem centered teaching is a theme of quality education in recent years. Its core ideas mainly include: starting from problems, carrying out innovative questions, cultivating problem awareness; taking problems as a link, running through all links of "preparation, speaking, practice, assistance and examination" in chemistry teaching; cultivating creative thinking and solving problems.

#### INTRODUCTION

The German educator F.A. Diesterweg ever said: "don't be keen on teaching students knowledge. Try to let students find it and get it through their own activities. The real teacher is not to let the students observe the completed science building, but to lead them to participate in the construction project until the completion. Through this process, they were taught the basic methods of construction. First class teachers teach students how to find the truth. Second class teachers ask students to study the truth. Later, an American psychologist Bruner put forward the discovery method. He believed that discovery is not limited to seeking things that human beings have not yet known, but "including all forms of knowledge obtained personally with his own mind". It is suggested that the goal of structural curriculum should be realized by discovery method. Students' learning and scientists' research, their intellectual activities are only different in degree but not in nature. Bruner attaches great importance to human initiative and emphasizes that students should learn actively. In order to cultivate a new generation of knowledge leaders, or in the student era, the new generation will be trained as primary school students and small scientists. This kind of teaching purpose theory, curriculum theory and methodology highly unify and complement each other, which constitutes the unique style of Bruner's teaching theory.

This is to guide students to actively think about, explore and develop corresponding principles and conclusions based on certain problems and materials provided by teachers and books. This kind of teaching method is discovery method. Discovery teaching is called discovery teaching. The discovery method creates the situation of research problems, causes similar tasks and problems of scientific research in students' consciousness, and urges them to explore and master scientific conclusions. Therefore, discovery teaching is hypothetical. Most of the traditional teaching methods are to teach the ready-made knowledge to students; students only want to learn what, remember what, how to memorize it and so on, and they are in a passive state of accepting knowledge. This kind of teaching is explanatory. The author thinks that "problem" is the core and essence of the discovery method. Because all of these activities are inseparable from "problems". From realizing the existence of the problem, or putting forward the problem, to exploring the problem, to solving the "problem", it can be seen as a process of seeking the answer. As early as in the spring and Autumn period of China, Confucius, a great educator, put forward the idea of "questioning, thinking and asking", His wise saying "there must be my teacher for three people" has been handed down to this day. In Han Yu's "persuading students to learn", he said that "teachers, so preachers and dispellers" all emphasized the importance of the problem. Throughout the history of mankind, outstanding creative masters and scientists have always been able to see through the smallest, commonplace and commonplace phenomena and see problems as challenges and opportunities for success.

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In addition, with persistent efforts, we have finally put forward the idea of Straighten to "!".

**Clear the existence of problems and cultivate the awareness of problems:** Problem consciousness refers to the psychological state of perplexity and exploration when people realize some practical or theoretical problems that are difficult to solve and have doubts in the cognitive activities. It is reasonable to say that problem consciousness is the innate instinct of human beings and does not need to be cultivated. "Life is about facing problems, and solving problems is about growing wisdom," said gold ford, President of the American Psychological Association. Creative problem solving is the core of human activities. Please see that as soon as the children learn to walk, they try to get rid of the shackles of adults, leave the big road that adults think is justified and used to, and go to the road that is not the road where there are mud pools, stones and weeds. To say it is not a road is to say it from the perspective of adults; to say it is a road is to say it from the perspective of children. The children didn't have the concept of road originally, it was because of the repeated instruction and coercion of parents that the children gave up the different roads every time and walked onto the recognized Road [4]. But Mr. Lu Xun said: "there is no way in the world, there are many people walking, and it will become a way." This sentence is really thought-provoking.

The watershed between traditional and modern education theories lies in whether children are the starting point, while modern education theories emphasize children as the starting point. The most common thing a child says when he or she is two years old is the question: "what is this?" "What is that?". At the age of three, I began to ask, "why?" Until the age of five. Children of this age often ask scientific questions, such as: "why can pigeons fly to the roof? Why does it have wings? " Why can't geckos fall down on the roof. Unfortunately, with the growth of age, problem awareness tends to be weakened, so the students' problem awareness needs to be specially trained. When primary school students are just entering school, they come into the school with questions in high spirits. They are full of fantastic ideas. Every child has infinite desire for knowledge and expression. Therefore, on the first day when the teacher asked them questions, 60 students raised 120 hands. Everyone wanted to answer the questions too much, so they all raised their hands. In the face of such high enthusiasm, the general teacher's usual reaction was: students should learn the correct posture, raise one hand, and put the other down, so the 120 small hands were reduced to 60, but this did not hinder Children's enthusiasm, a hand on a hand, the rest of the hand is still very high, not only high and shaking left and right, nothing more than to attract the attention of the teacher: "I want to say, I want to say!" In the face of the enthusiasm of the students, the teacher's response is: "raise your hands to have the right posture, arms do not leave the table". Although the children are a little discouraged, they quickly adapt to this requirement. Hold your little hand up as required. When the children's answers meet the standard answer, they will be affirmed and praised by the teacher. If they are unique or ask some absurd questions, they will inevitably be criticized and ridiculed. In the face of such a situation, the enthusiasm of children to ask questions is gradually reduced. We can see the following situation: the students in the lower grade of primary school are like a forest of small hands, the students in the higher grade of primary school are gradually sparse, the students in the middle school raise their hands only like stars,

and no one raises their hands in the high school. They understand the rules of answering questions, and know that if they don't answer or ask questions, there will be no trouble, but if they don't answer well, there will be unpleasant results. This is the first; the second is that all the questions of teachers have standard answers, and asking is only a means. People gradually learn to listen passively and wait for teachers to ask and answer themselves. With the development of this kind of attitude, the problem consciousness is also gradually weakened. Only when college students and graduate students do knowledge will they find that the previous problem consciousness and thinking ability are quite important for scientific research and invention and creation, but "stereotype" limits their thinking ability. In the face of students' questions, we should encourage the questioners to find information, provide possible answers, and evaluate the possible answers.

**Take the question as the link, run the question through each link of the chemistry teaching process:** Since the establishment of the education system, there have been special problems. The problem is the accompanying production of the education system. Since we have textbooks, we have exercises. That's right and wrong. After Chinese children come home from school, the first sentence of parents is: "have you finished your homework today? Does the teacher still assign homework? "And another country in the world, like China, which is particularly concerned about the next generation of education, Israel, when the children come home from school, the first words of parents are: "did you ask the teacher at school today?" If the child says proudly, "yes, the teacher didn't answer!" Then parents will be as happy as their children. Another example: at the end of 1998, an American science education delegation visited Shanghai, hoping to listen to an open class of science education in high school. The receptionist arranged a very famous key middle school to give them a physics lesson in the first year of high school. The teacher is an excellent super teacher. In the teaching process, the teaching purpose is clear, the teaching content is clear, the teaching method is flexible, there is theory and experience; the teaching process is active, the teacher asks questions, the students answer questions, the teachers and students interact with each other, and the atmosphere is warm; the teacher's language is accurate and concise, and the teaching time is well arranged, when the teacher says, "this class will come here." Wait, the bell for class is ringing. According to our habitual concept, this class is seamless. Next, nearly 100 teachers applauded as the bell rang. But five American guests had no expression. The next day when the receptionist asked them to talk about their impressions, their answers were unexpected. They asked, "the teacher asked questions and the students answered questions in this class. Since all the students can answer the teacher's questions, what else can they do in this class?" It can be seen that different countries have different educational traditions and need international exchanges and mutual reference to develop their strengths and make up for their weaknesses.

In the traditional teaching process, the knowledge transfer to students is basically realized by recurring and concluding questions. But in the above two ways of asking questions, students are allowed to accept the ready-made knowledge in books, without fully considering how to teach students to create, so it is impossible to cultivate students' creativity very well. The fundamental purpose of learning is to better serve human beings.

For example, according to the law of gravitation, scientists have made earth satellites. Therefore, it is an urgent task for us educators to cultivate students' creativity, ask creative questions and make them have creative thinking. Many scientific discoveries come from problems, such as Newton's discovery of the law of gravitation: Why did Apple land? If you take this question to ask a person who has no scientific brain, he will definitely say: "nonsense, where does apple fall? Will it fall into the sky? "But Newton spread out his imagination wings. He thought, "why does the apple on the tree fall on the ground instead of fly to the sky? No matter how high the apple tree is, the apple will fall, so it has nothing to do with the height of the tree. If the tree is higher than the moon, will the apple fall from the moon? Isn't the moon a big apple? Why doesn't it land on earth? "After a series of in-depth and detailed research, we finally found the law of universal gravitation. The graduation project of the famous "Massachusetts Institute of technology" and "Harvard University" needn't write papers, but to submit physical works, which is a good method.

#### **Ask creative questions and cultivate creative thinking:**

Creative questioning is to raise creative questions in teaching, and then lead to the teaching of creative thinking. First of all, we must make clear what is creative problem. In order to be creative, one of the following two conditions must be met: first, the problem should enable students to understand the actual process of previous creation. Second, the problem should be able to make students try to carry out a creative activity. This is the starting point to analyze whether a problem has creativity in teaching. For a specific question, we should consider the following two aspects to judge whether it is creative: first, the relationship between the question and the existing knowledge level of students; second, the way of asking questions. That is to say, how to ask questions can make them think positively and answer enthusiastically in the direction you expect, so as to avoid students' feeling that "a dog has no place to bite a hedgehog". Creative teaching questions are mainly to let students understand the ways of previous research and problem-solving, in which the knowledge of scientific history and chemical history is essential. The development of science is a model of putting forward - solving - putting forward again in practice - solving problems. It is called "learning by doing" for researchers to study and work with problems.

College students with problems to attend classes, to learn, will receive twice the result with half the effort. For example, when talking about the theory of acid and alkali, from the earliest proposal of the concept of acid and alkali to the coming out of "Arrhenius's acid and alkali ionization theory", let students understand the development of the theory along the historical footprint, and understand its historical contribution and limitations. In order to solve the problems left by this theory, the "acid-base proton theory of brownstead" is introduced. When one problem is solved, another problem arises. This problem needs to be solved by another theory - "acid-base solvent system theory". In this way, in the exploration of solving the old problems and generating new problems, we have comprehensively mastered the modern acid-base theoretical knowledge. Suhomlinsky pointed out that "research-based learning refers to a learning method in which students obtain knowledge and apply knowledge in a similar way to scientific research under the guidance of teachers." This method follows the law that the teacher's leading role and the

student's main role are opposite, unified and mutually restricted, embodies the guiding ideology of heuristic teaching, and realizes the principle of democratization and subjectivity of teaching. This educational concept is the value and goal to be established and pursued in the implementation of quality education today. Through research and learning, students' questioning ability can be cultivated. The so-called research, first of all, is to detect the existence of the problem, clarify the content of the problem, and then form a hypothesis, and then verify or overturn the hypothesis through experiments, surveys, literature review and other methods, and then write the research process, data or conclusions into a report, if possible, make suggestions. Participate in research questions, let students experience the actual process of invention and creation under the guidance of teachers, so as to preliminarily realize the attempt and imitation of creation activities. In fact, research is also based on problems. If there is no "problem", what should we study? And we can train students' innovation ability in one question and many questions. For example, when we talk about super-acid, we mentioned that HF belongs to the category of super-acid, and its acidity is stronger than  $H_2SO_4$ . Some students are confused. At this time, "why HF belongs to super-acid" should be put forward and answered in time. To answer this question, we may first ask a question: "what acid is the most acidic among the acids we have learned in basic inorganic chemistry?" "How does its acidity manifest?" Some students answered  $H_2SO_4$ , some said  $HNO_3$ , some said HCl, and some said "aqua regia", so aqua regia is the strongest in terms of its solubility to metals. The reason is that in the aqua regia system with the strongest solubility, it contains not only strong oxidants such as  $HNO_3$ ,  $Cl_2$  and  $NOCl$ , but also high concentration of  $Cl^-$  which is easy to form stable complexes with metal ions. For example,  $[AuCl_4]^-$  or  $[PtCl_6]^{2-}$ , thus reducing the concentration of metal ions, which is conducive to the reaction in the direction of metal dissolution. Next, we will further question the condition of HF as weak acid. Under what circumstances is HF weak acid? Students often have incomplete answers. In fact, HF is a weak acid when the concentration is small. When the concentration is large, the acid is very strong. The next answer is that HF is the reason for superacidity.

Through the analysis, we know that the root cause of not accepting HF as super acid is that their thoughts are still "immersed in aqueous solution". We can make a finishing point. The premise of discussing super acid is "in non-aqueous solution", turn this around first, and then explain the characteristics of especially strong protonation ability. After step-by-step explanation, students can master it well, I was also very impressed. Another example is to give students a bottle of colorless solution or white precipitate to analyze its components. Students can solve this problem better than giving them ten theoretical lessons to explain this problem. It is an excellent content to use the analysis scheme of anion and anion system in chemical analysis, but many schools have cut off this chapter because they are too troublesome and time-consuming. It's not worth the loss! Therefore, it is quite reasonable for some chemistry departments of key universities to arrange the experimental class hours as well as the theoretical class hours, or even more than the theoretical class hours. Stephen divides the questions in the discussion into seven types and points out that the core pillar of participating in the discussion is to master the skills of questioning, listening and answering. The students' knowledge and skills are formed between asking and being asked, answering and being answered.

The ability of asking lies in the students. It depends on the teachers' level whether they can run through the teaching with questions. Some problems are relatively simple, and most of them are very complex, so we need to learn the skills of finding problems. This skill is not the stars in the sky, but can be mastered by everyone through learning. The way to learn is to understand and practice. After a period of training, you will get the courage necessary to face the problem.

### Conclusion

To sum up, putting forward problems, analyzing problems and solving problems play an important role in cultivating innovative talents, which is also an essential part of scientific research. Taking problems as the center and making students develop the habit of loving to use their brains will greatly promote the emergence of various innovative talents. Applying the theory of problem Center widely in chemical teaching will often achieve twice the result with half the effort Fruit!

No matter in life or in science, we should not be discouraged by too many problems. Instead, we should not curse the problems, but thank them. Problems provide opportunities for human imagination to display their skills, and provide a continuous stream of raw materials for human thought processing plants. If human beings are always right and never make mistakes, things will never be messed up; if all the thorny problems are thrown on the moon, many people's work will be totally meaningless now. If educators can find more problems, master creative solutions, establish a correct outlook on problems, and see problems as opportunities rather than as pain and disaster, human life will change, and people will be full of sense of giving, achievement and happiness.

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