



Teaching Strategy of Chemistry Concepts Based on Deep Learning

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ABSTRACT

Deep learning is a meaningful learning process in which students are fully engaged, successful, and developed around challenging learning topics. Based on deep learning, this paper discusses the teaching strategies of chemical concepts such as summary, analogy, deductive reasoning, and multiple representations, as well as the application cases of strategy implementation, and introduces in detail the application of multiple representation strategies and the requirements of each representation method.

Keywords: chemistry concept, teaching strategy, deep learning

INTRODUCTION

The concept of chemistry is rational knowledge abstracted from chemical phenomena and chemical facts by using methods such as comparison, synthesis and induction, reflecting the essence of chemical phenomena and facts, and is the basis of the knowledge system of chemistry [1-3]. Therefore, the study of chemical concepts has a very important position in the whole course study. The study of chemical concepts can help students deeply understand matter and change, improve their logical reasoning ability, and eventually develop the core literacy of chemistry.

Deep learning refers to the lifelong learning process in which learners can devote themselves to challenging learning tasks, gain successful experience, and obtain comprehensive physical and mental development under the careful design of teachers, in the process of developing the habit of creative, scientific thinking and critical thinking, gradually forming the basic logical thinking ability in the field of chemistry, summarizing and transforming into internalized learning knowledge, so as to learn to use the basic knowledge of chemistry to deal with real problems[4-6].

With the rapid development of chemistry, the dimension and depth of chemical concepts continue to expand, and the pre-scientific concepts (or mythical concepts, different ideas) formed by students based on their existing life learning experience will hinder students' mastery of correct concepts and the formation of scientific understanding, and cannot smoothly transfer the knowledge learned for deep learning [7,8]. In order to help students, complete the learning of chemical concepts and promote the application of in-depth understanding of concepts, this paper discusses the following four strategies for teaching concepts based on deep learning, and introduces them in detail with multiple representation strategies.

THE TEACHING STRATEGY BASED ON DEEP LEARNING

The process of concept establishment is the interaction between the student's subject and the object of cognition, and the information is fed back into the subject's mind after the interaction, and then the subject is processed in combination with the original experience to establish the concept [9,10]. The teaching strategy of chemistry concepts based on deep learning has the following four points (Figure 1).

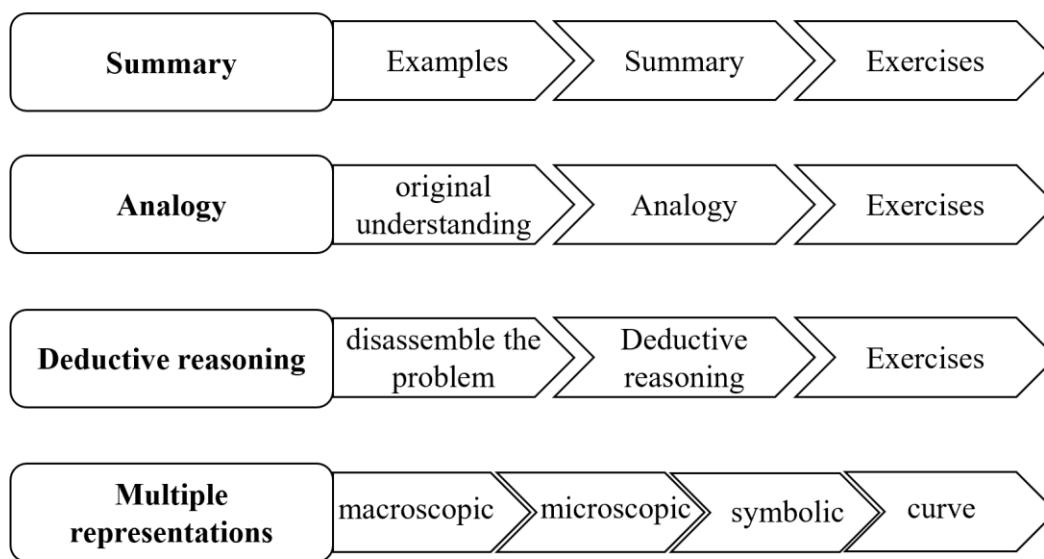


Figure 1 Teaching strategies for chemical concepts based on deep learning

Summary

From this perceptual knowledge, the teaching strategy of summarizing the concept can be developed in the following three links: First, presents students with corresponding examples to enrich their perceptual understanding; Second, on the basis of perceptual knowledge, and then establishes the regular concept; Third, provides some exercises and other examples to help students promote the understanding of this concept.

For example, the hydrolysis of salts is taken as a case analysis. In the first link, students can use pH test strips to test the acidity and alkalinity of different salts, so that after multiple sets of experiments are made, it can be obtained that the acidity and alkalinity of different salt solutions are different. After establishing the perceptual understanding, the second link guides the students to summarize the conclusion, and by analyzing the alkaline salt solution and the acidic salt solution separately, it is found that the strong alkali weak salt solution is alkaline, the strong acid and weak alkali salt solution is acidic, and the positive salt solution with strong acid and strong base is neutral. In the third link, the teacher can give different cases of salt hydrolysis for students to deepen their application.

Analogy

Starting from this original experience, the conceptual teaching strategy of establishing new concepts by analogy can be carried out according to the following three links: first, it is necessary to consider students' original understanding, and call students' original understanding as much as possible to establish contact; Second, through analogy, connect the

original understanding with the new problem to find similarities, and use the original understanding to help students establish a new understanding. Incorporate this new understanding under the original framework, form new concepts, and deepen and enrich this process; Third, application deepening, presenting students with a large number of examples, exercises, and cases, allowing students to do the application of transfer, deep learning^[11].

Taking the valence layer electron pair mutually exclusive model as an example, the problem is put forward: "How to distribute the balloons more stable overall by tying 2, 3 and 4 balloons of the same size together", and guiding students to compare "2, 3, and 4 pairs of electron pairs around the central atom to be more stable as a whole" through their original life experience, and students are easily transferred, and then derive the spatial structure of valence layer electron pairs, that is, the VSEPR model.

Deductive Reasoning

Deductive reasoning is to start from existing concepts, and then establish new concepts through reasoning, which can be carried out in accordance with the following three links: first, disassemble the problem, build a step for students to understand, and let students follow this step to go deeper; Second, analytical reasoning, students analyze and solve problems according to the guidance of teachers; Third, application deepening, presenting students with a large number of examples, exercises, and cases^[12].

Taking salt hydrolysis as an example, students can directly predict the acidity and alkalinity of ammonium chloride solution, but if you only throw this problem to students, students may not be able to start, and teachers can provide students with some steps in understanding. If we disassemble the problem into several sub-problems and guide students to analyze each sub-problem, students may be able to come up with the corresponding answer, disassemble into the following three small questions, guide the idea of analysis, what particles exist in the solution, what is the source? What is its interaction? And what is the result of the effect? Students will find that when adding ammonium chloride solids to the aqueous solution, its presence particles contain both water molecules of the solvent, it has hydrogen ions and hydroxides ions, and also includes solute ammonium chloride, which will ionize into chloride ions and ammonium ions, hydroxide can combine with ammonium to form a weak electrolyte - ammonia monohydrate, in such a process after interaction will lead to promote the ionization of water, and the dissolved ion hydroxide will be less than hydrogen ions, making the solution acidic, through such an analysis, the ammonium chloride solution is acidic.

Multiple Representations

The teaching mode of "quadruple representation" in chemistry refers to the representation of "macro-micro-symbol-curve" and the transformation between representations. Macroscopic representation is the way macroscopic knowledge or information is recorded and presented in the brain, which mainly refers to the reflection of external observable phenomena presented by matter in the learner's mind, such as experimental phenomena or life experience, to provide students with perceptual understanding, which can help students understand; Microscopic representation is the way microscopic knowledge or information is recorded and presented in the brain, which mainly refers to the movement and interaction of particles (such as atoms, molecules, ions, etc.) that cannot be directly observed, the microscopic composition and structure of matter, reaction mechanism and other microscopic properties reflected in the

learner's mind, such as providing students with a ball stick model, pictures, schematic diagrams, or simulation animation, through microscopic simulation to help students understand the concept and understand the corresponding chemical term; Symbolic representation is to symbols, chemical formulas, equations, etc. to describe macro and microscopic representations, the expression of chemical concept systems is mostly expressed by symbol systems, including element symbols, chemical formula symbols of substances, equations, equilibrium constants A series of concepts, chemical symbols are a highly generalized and abstract professional language, chemical education should help students to establish a symbolic discourse system; Curve representation refers to the reflection of the change of the dependent variable caused by the change of certain independent variables in the form of the curve of the coordinate chart in the learner's mind, combining the physical meaning of the coordinate axis, the starting point, the end point and the inflection point curve direction on the curve with experimental data, reflecting the change trend of things, the curve chart has simplicity, can provide students with visual stimulation, can convey a lot of information that words can not convey, and the fastest presentation of information, but also the bridge to link macro representation and micro representation [13,14].

Concept teaching through the fourfold representation mode of macro-micro-symbol-curve, on the one hand, to promote students' understanding of the essence of the basic concepts of chemistry, on the other hand, in order to achieve the transformation between the four representations in teaching, teachers through macroscopic phenomena, microscopic simulation animation, symbolic language and handheld experimental curves and other ways to present the knowledge externally, students form and master the concept at the same time, learning enthusiasm and interest, scientific concepts, scientific quality and other aspects will also be improved to varying degrees. The four representations are equally important in the learning of chemistry and complement each other, and the concept teaching uses multiple representations as much as possible to provide students with rich stimuli, and help students establish abstract concepts from different perspectives. This article lists the following two application cases.

Taking ion reaction as an example, white precipitation was observed by the reaction of barium hydroxide with sulfuric acid (macroscopic characterization); provides ionization models of barium hydroxide solution and sulfuric acid solution in water, and microscopic simulation animation of the reaction of barium hydroxide with sulfuric acid (microscopic characterization); determine the conductivity in the solution during the reaction, draw the conductivity change curve of the solution during the reaction, and verify the microscopic conjecture (curve characterization); motivate students to establish a particle view and thus write an ionic equation for the reaction of barium hydroxide with sulfuric acid(symbolic representation).

Taking the reaction of hydrochloric acid with sodium carbonate and sodium bicarbonate as an example, through the experiment of sodium carbonate, sodium bicarbonate and hydrochloric acid and the balloon inflating, it is found that the rate of reaction between sodium carbonate and hydrochloric acid is slower, or the foam fire extinguisher uses sodium bicarbonate instead of sodium carbonate, and the life situation is introduced (macroscopic characterization); Guide students to guess the mechanism of the reaction between sodium carbonate and hydrochloric acid from a microscopic perspective (microscopic characterization); The pH change curve of

the solution during the reaction is plotted with a pH sensor, verify the conjecture (Curve characterization) ; Encourage students to establish a particle view to write ionic equations for the reaction of sodium carbonate, sodium ammonia carbonate and hydrochloric acid (Symbolic representation).

Suggestions for multiple representation teaching strategies, teachers should consciously guide students to establish the connection between macroscopic phenomena and microscopic representations in experiments, teach students to observe and express experimental phenomena, and inspire students to discover the microscopic nature of reactions through phenomena; Chemistry is a science based on microscopic particles such as molecular atoms, and teachers need to guide students to independently imagine and construct, simulate the microscopic world with macroscopic visibility, and promote students' understanding of the microscopic world; Chemical symbols are the basis for learning chemistry, so teachers should let students be familiar with the meaning of symbols, standardize the writing rules of chemical symbols, play the intermediary role of symbols, and establish the structure of the chemical world through symbolic representation; Finally, handheld technology can also be introduced in chemical experiments, real-time can convert the microscopic changes of substances into curve representation, teachers pay more attention to strengthening the integration between disciplines, consciously linking mathematical functions and chemical images, guiding students to process and process chemical images, cultivating students' ability to screen information, and finally effectively correlating curve representation with other representations, realizing the improvement of quadruple representation conversion ability, and promoting deep learning^[15].

CONCLUSION

Concept teaching is a very important part of chemistry teaching, and students' understanding of chemical concepts contributes to their deep learning. When teaching concepts, teachers should respect the attributes of chemistry disciplines, and select different teaching strategies according to different types of concepts and students of different levels, which are not opposed to each other, but can be combined with each other and organically integrated. In short, teachers should pay attention to guiding students to think, avoid conclusion indoctrination, and enable students to learn chemical concepts while continuously improving scientific thinking and deep learning.

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