

## Let the Students Feel the Charisma of Chemical Language: Teaching Strategy Based on Linguistic Intelligence

HAN Qingkui<sup>[a],\*</sup>

<sup>[a]</sup>Professor Qufu Normal University, China.

\*Corresponding author.

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### Abstract

In a view of linguistic intelligence, the paper analyzes chemical learning and proposes six chemical teaching strategies. These are using stories to raise learning interest; creating situation to arouse learning motivation; teaching in research-style to enlighten thought and listen; organizing discussion to induce expression and communication; making good use of figure of speech to deeply comprehend chemical conception; being humorous to deliver teaching information in another style. These strategies are discussed in details and illustrated one by one.

**Key words:** Linguistic intelligence; Chemical teaching; Teaching strategies

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Linguistic intelligence is one of most widely used in school learning based on Gardner’s multiple-intelligence theory. It refers to the capability of effectively using languages and words in oral expression and writing. It shows up in chemical learning as understanding and applying chemical concept, principle and chemical terminology precisely, describing chemical object, phenomenon and process smoothly, expressing chemical learning outcome and communicating with other people. According to elements of linguistic intelligence and

features of chemical teaching, the teacher should design appropriate teaching strategies based on own teaching style and students’ characteristics, and then apply them to classroom teaching to lead students study chemistry by using linguistic intelligence.

### 1. USING STORIES TO RAISE LEARNING INTEREST

Stories and legends are juvenile students’ favorites. At the beginning of a class, a touching story or a wonderful legend can get students into learning situation quickly. Humorous and suspense chemical stories which certainly should be closely connected to teaching content are enlightening and educational, so if used correctly, they can be very helpful.

For example, the introduction of steelmaking section can be a story as follow. One day in the winter of 1954, a British mega tanker was under sail. Suddenly, cracks appeared in the middle of the tanker, and then quickly the tanker divided into two parts with a loud crash. Both the tanker and the crew drowned in the sea. Through further investigation, the scientists revealed the mystery. High phosphorus content in the steel which was used to make the tanker caused the steel brittle at low temperature. After the story, the students will have known that phosphorus should be removed from steel.

### 2. CREATING SITUATION TO AROUSE LEARNING MOTIVATION

Teaching activity is a kind of intentional activity with emotional meaning. Well-designed learning situation can arouse great studying interest among students. All these will make both students and teacher twice the result with half the effort. During the chemical teaching

process, teacher can tactfully trigger some kind of positive affect from students and then transfer it to related chemical teaching content by using affect-transfer model. In this way, the teaching activity is given emotional meaning finally.

In order to enhance the appeal of language, when it comes to worldwide Chinese ancient porcelain, some teachers cite “as thin as paper, green day, bright as a mirror, sound like qing” to describe exquisite craftsmanship, so that the students could hear the sound, see the person and convincingly get patriotic education; Again, such as “have you ever been to guilin? Have you ever seen a water-eroded cave? That hanging stalactites, tall stalagmites, the various birds and beasts show the nature of creation miracle! When you go to cave and witness the magnificent landscape, you will be proud of declaring: I have learned the chemical principle?” passion, artistic conception and intoxicating majestic country stimulate students’ infinite passion of love for the motherland and encourage students to pursuit the chemical principle.

### 3. TEACHING IN RESEARCH-STYLE TO ENLIGHTEN THOUGHT AND LISTEN

Exploratory explanation is that teachers propose problem questions and assumptions, guide students to analyze problem, abstract or verify the hypothesis through the experimental facts or existing knowledge, and then guide the student to come to the conclusion by means of comprehensive generalized methods. The characteristic is that it is helpful to attract students’ attention, stimulate students’ learning interest and the enthusiasm of listening and thinking, to cultivate the students’ thinking ability and improve the classroom efficiency.

Question: what is the structure of the molecule methane?

Hypothesis: we can guess two possible molecular structures from molecular formula of methane. One type is square planar structure which means that the C atom is arranged in the center of the square with four H atoms sitting at each corner of the square. Another type is three-dimensional tetrahedron which means the C atom is arranged in the center of the tetrahedron with four H atoms sitting at the vertices of each four-sided tetrahedron.

Hypothetical deduction: if the molecular structure of CH<sub>4</sub> is square planar, CH<sub>2</sub>Cl<sub>2</sub> must have two kinds of isomeride. Conversely, if it is tetrahedron, there is no isomeride of CH<sub>2</sub>Cl<sub>2</sub>.

Scientific fact: scientific experiments proved that CH<sub>2</sub>Cl<sub>2</sub> had no isomeride.

Conclusion: the structure of molecular methane is three-dimensional tetrahedron with bond angle of 109°28’.

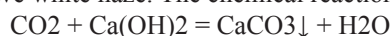
### 4. ORGANIZING DISCUSSION TO INDUCE EXPRESSION AND COMMUNICATION

Class discussion is an effective teaching strategy. Concepts, regularity and conclusion respectively are based on students discussion form, discussion findings and discussion acquisition. Teachers act as a director and valuator. Time-consuming process is to improve students’ language intelligent and deepen the understanding of chemical basic concepts and theories.

Discussion of chemical knowledge in idiom of dripping water wears through a stone:

Teacher: First, please think about what is the phenomenon of bubbling CO<sub>2</sub> into clear limewash and what has changed if bubbled excess CO<sub>2</sub>. Then on the basis, discuss in groups how the rain carved so many dents on limestone. Finally, conclude chemical knowledge in this idiom and write down relevant chemical equation.

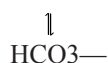
Student 1: Bubbling CO<sub>2</sub> into clear limewash will have white haze. The chemical reaction is:



Student 2: The white haze will fade away if bubbled excess CO<sub>2</sub>.



Student 3: Is it more clearly expressed by this way?



Teacher: Your explanation is pretty well.

Student 4: I know how the rain carved limestone. The rain water dissolved CO<sub>2</sub> in the atmosphere and CO<sub>2</sub> reacted with H<sub>2</sub>O into H<sub>2</sub>CO<sub>3</sub>. After that, the rain water is slightly acidic because of partial ionized H<sub>2</sub>CO<sub>3</sub>. Eventually, the rain water carved many dents on limestone.

Student 1: according to our discussion, we conclude the chemical knowledge referred in idiom of dripping water wears through a stone. ① Some CO<sub>2</sub> in atmosphere dissolve in water and generate H<sub>2</sub>CO<sub>3</sub> partly; ② H<sub>2</sub>CO<sub>3</sub> is weakly ionized making natural water weak acidic. ③ Water like this can eat away at the CaCO<sub>3</sub> in limestone slowly and generate soluble Ca(HCO<sub>3</sub>)<sub>2</sub>; ④ limestone is scoured by weak acidic water finally wear through.

### 5. USING METAPHOR TO DEEPLY UNDERSTAND CHEMICAL CONCEPT

Chemistry theory teaching tend to be more abstract, students tend to be boring. Changing specific, abstract things into image of the metaphor is an effective method

to make knowledge become popular and specific. Students is easier to accept and grasp knowledge, and transform mechanical memory into understanding memory and image memory, have the same knowledge in different parts of the brain marked in order to realize long-term memory and improve the learning efficiency.

For example, we can use the metaphor below for catalyst. There are two ways to point B from point A across the river. One way is to cross the bridge far away along the river wall which will cost much time. It is used metaphorically to indicate the reaction will proceed but in a lower rate. The other way is to take a faster way by boat from A to B which means catalyst facilitate chemical reaction by changing reaction pathway. The whole chemical reaction with catalyst compares to the trip from A to B by boat. The boat here refers to catalyst in reaction. The boat remains the same before or after embarking which indicates catalyst is used to facilitate chemical reaction without being consumed or altered in the reaction while negative catalyst is opposite.

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## 6. BEING HUMOROUS TO EXPRESS TEACHING INFORMATION IN ANOTHER WAY

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Humor language, action and expression can be appropriately applied to transfer teaching information in the “alternative” manner, which is helpful to ease tension, regulate mood, arouse interest, and inspire thinking approach. In addition, chemistry knowledge is

closed with real life, a lot of phenomena coming from daily life are related to chemical knowledge, and these results tend to produce humorous effects. According to the teaching need, Chemistry teachers can take some comedy phenomenon as an example, guiding students to use what they’ve learned to explain problems in real life.

when writing the formula of electrolytic salt water, some students forget to write down basic conditions:  $\text{NaOH} + 2\text{NaCl} + 2\text{H}_2\text{O} = 2\text{Cl}_2 + \text{H}_2$ , the teacher said humorously: “we eat salt and drink lots of water every day, that is to say, everyone is a production of caustic soda chemical plant? By-products are easily to be caught:  $\text{Cl}_2$  and  $\text{H}_2$ !” The students began to be confused, then suddenly laughed and burst into laughter. At this point, all the classmates understand the fact that when writing chemical equation without reaction conditions will make a joke.

Applying humorous language to descriptive interpretation, teachers should grasp the best time to teacher students by using jokes, allusions, and so on.

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