The design and analysis of teaching case of “chemistry and material development”

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Abstract: "Chemistry and material development "is a typical example of applying chemical knowledge to industrial production. This course case introduced the great contribution of chemistry in material development with the topic of non-metallic materials, organic polymer materials from petroleum and composite materials with excellent performance. This case was designed carefully according to the flipped classroom mode, Through the study of new materials, students can make clear the purpose of learning chemistry and improve their interest in learning.

1 Introduction

"Flipped classroom" a new achievement of researchers at home and abroad who have used modern information technology to change teaching mode[1]. The main purpose of this paper is to readjust the time inside and outside the classroom and reverse the traditional teaching process of "Teaching knowledge in classroom and completing homework after class", The traditional teaching process is reconstructed to transfer and internalize the knowledge, and return the decision-making power and classroom to the students. According to the connotation of flipped classroom, constructionist learning theory and systematic teaching design theory, the teaching process is mainly composed of two parts: pre-class learning and classroom learning[2]. "Chemistry and material development "is a typical example of applying chemical knowledge to industrial production. This course case introduced the great contribution of chemistry in material development with the topic of non-metallic materials, organic polymer materials from petroleum and composite materials with excellent performance. This case was designed carefully according to the flipped classroom mode, Through the study of new materials, students can make clear the purpose of learning chemistry and improve their interest in learning[3].

2 Textbook analysis

Chemistry is a subject which studies on the composition, structure, property and law of change of substances, and is a central science closely communicating and penetrating with materials, life, information, environment, energy, etc., and is the main means to discover and create new substances. This section introduces the great contribution of Chemical Science in material development with the topics of widely used nonmetallic materials, organic polymer materials from petroleum and composite materials with excellent performance. Through the study of new materials, students can make clear the purpose of learning chemistry and improve their interest in learning. In addition, the new materials applied on spacecraft in China are shown by pictures. This is not only a good patriotism education, but also the importance of students' understanding of learning chemistry[4].

3 Teaching process

[Teacher] The dream of human beings has finally come true with the leap of thousands of meters of flying people in wing. Today, let us feel the wonderful moment together (Play micro video)

Division: the flying man landing safely because he has wing suit and parachute. The teacher is also very excited to see here. If the winger puts on our school uniform as wing suit, can it meet the needs of its risk-taking in the air?

[Student]No

[Teacher]What do you think?

[Student] (Thinking and answering)

[Teacher] What kind of material should used for wing suit? What are the characteristics?

[Student]Thinking and answering: strong.

[Small survey]

What are the fabric you wear? How do you know that?

What else do you know about the application of these fabrics?

[Student](Thinking and answering)

Teacher encourage: class is yours, while paying board

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position important words.

Activity 1 Let's feel what the properties of organic fiber are with our own hands. Start. Complete observation report form

Table 1. Observation report

	Natural fiber	Synthetic fiber
Air permeability		
Strength		
Elastic		
Wear resistant		
Chemical resistance		

[Student]Observe the cloth in the experimental box one after another.

[Teacher]Report your experience and achievements.

[Student] (Answer one after another) compare the advantages and disadvantages of cotton fiber and synthetic fiber.

[Teacher] The synthetic fiber performance is better. When the students reported just now, some students said that the fabric is two components. Think about it. If it is combined, what will be the benefit?

[Student]Natural fiber and synthetic fiber have their own advantages and disadvantages

[Teacher] Like synthetic fiber, highlight your personality and show yourself (Sheet synthetic fiber)

[Teacher] The researchers are studying to mix fibers and other materials together to composite into new materials to meet people's needs. This material has better performance. In order to meeting the needs of wing suit, it can also help more people realize the dream of flying sky. Through the label, we can know what the fabric of the clothes is? It is because of the label that the teacher encountered such a problem: before winter, I bought a sweater. Because the label is unclear, the opinions are different after reading, some of them are wool fiber, some are synthetic fibers[5]. Can you help me to identify it?

[Teacher] The leader of the group took out the fiber samples from the experimental platform. This is taken from the clothes I bought. Discuss it in the following group to help the teacher design the identification scheme. Okay, let's go.

[Student]Group discussion, teacher inspection and guidance, student answer: burn, smell

[Teacher] OK, say burn on, for our safety, please look at the activity on the study plan to explore the friendship tips, which students would like to read for you?

[Student]read: friendship tips, 1. be careful of scalding. 2. extinguish the flame after burning a part.

[Teacher] I believe that your experiment must be successful under the guidance of the teacher's friendship. The students began to do the experiment, and the teacher inspected and guided them.

Table 2. Observation report

	Phenomenon (smell)	SAfter cooling, twist the residue to see if it is easy to twist
Cotton fiber		
Wool thread		
Synthetic fiber		
Unknown fiber		

End of experiment

[Teacher] Which group of students will exchange your results and report them?

[Student]Very good answer. ([Teacher] there should be applause here) student clap

[Teacher] You are so clever. Can you help the teacher again? Design package scheme: the world garden fair is about to start. Friends come from Beijing and send the newly fried Laoshan green tea to friends in Beijing. Who will help me?

[Student]Vacuum packaging

[Teacher] what materials do you use?

[Student]Plastic

[Teacher] Why do you choose plastic?

[Student]Convenient

[Teacher] How to seal?

[Student]Heating and melting

[Teacher] You know a lot.

Can all plastic be heated and melted? Now, let's read the contents of activity 2:

Activity 2:

1)Will heating polyethylene plastic sheets melt? What happens when it is cooled and then heated?

2)Will the fragments of heated jade socket melt?

Table 3. Student Activity Report

Activity content	Experimental phenomena
Heat the polyethylene plastic sheet in the tube, and cool it after the phenomenon occurs, Reheat.	After heating_____ melt; After cooling, the system can be used to ensure that the cooling is not available; After reheating_____ melt.
After cooling, heat the pieces of the electric jade socket in the tube.	After heating_____ melt

[Teacher] Are you ready? Start the experiment. Inspection and guidance of Teachers

[Student](Answer)

[Teacher] Why are the same as plastic, but the heating phenomenon is different? Please see the extension of the school case

[Extended]

Because the polymer compounds are mostly small molecular polymerization, they are also often called polymers. For example, polyethylene is a polymer compound formed by thousands of ethylene molecules. When small molecules are connected to form polymers, some form long chains, some form a network of chains.

The polymer materials with chain structure (such as polyethylene plastics) melt when heated, and then become solid after cooling, and then melt after heating, so they are thermoplastic. This kind of polymer material can be processed repeatedly and used repeatedly, and can be made into thin film, drawn into silk or pressed into various shapes needed for industrial, agricultural and daily life.

Some polymer materials with mesh structure (phenolic plastic, commonly known as electric log); Urea formaldehyde plastic, commonly known as electric jade), once processed, will not be heated to melt, so it has thermosetting.

There are many kinds of plastics, and their uses are different. The most uses are polyethylene and PVC.

Question 1. How to seal the polyethylene plastic bag with cards? What is the basis?

Question 2. Can the electric jade socket be connected by heating after it is broken? Why?

[Student](Answer)(blackboard: small molecule polymer)

[Teacher] What is chain?

[Student](Explain)like hand-held, thermosetting, stable

[Teacher] After reading, he found the key points and showed human wisdom (blackboard: human wisdom)

[Teacher] Now the teacher has a small request. Please cooperate with the students. All the students stand up and a row of students hold hands. This is a chain structure, like a friendly family. Now, change it. This is the mesh structure. We are a united group.

[Teacher] We know that the structure of plastic is different, so we have the thermoplastic and thermosetting properties just now. This again illustrates the core concept of our chemistry. What determines what is the most common saying?

[Student]Property determines the use.

[Teacher] (Responsive wit) I said it earlier. According to the reminder of the courseware: What is this?

[Student]Structure determines property.

[Teacher] Based on the problem of plastic pollution, some people say that making good use of it is a blessing and development is the last word. In order to meet people's needs, the application of new materials has been developed in an environmentally friendly direction. Let's take a look at what new materials are available (Click on the courseware)

Regarding the materials of the future, what are your other beautiful visions? Spread the wings of imagination and communicate

[I imagine, I look forward]

Regarding the material of the future, what are your other beautiful visions?

[Student](Answer)

[Teacher] The answer is very good. The new materials in the future are derived from your dreams today. Time flies quickly, today’s class is about to end, take an inventory of your harvest today

[Teacher] Today’s study has opened the door to materials. In the past, humans used his wisdom to polymerize small molecules into high molecular compounds, creating new materials such as plastics, synthetic fibers, and synthetic rubbers that are widely used, which has promoted mankind. Teachers look forward to your progress, take your dreams, love chemistry, learn chemistry, and create new materials you can imagine to improve our quality of life and national strength.

4 Conclusions

This lesson "Chemistry and Material Development" is taken from the second section of the eleventh unit of the second volume of the ninth grade of chemistry (Shandong Education Edition). It is a typical lesson example for applying chemical knowledge to industrial production, and it is also for students It is a good subject for quality education and patriotism education. A good study of the content of this section can better stimulate students' interest in learning chemistry, and better cultivate students' ability to cooperate, communicate, and explore.

From the point of view of teaching design: ①The teaching goal design meets the teaching standards and can make the teaching goal function. According to the psychological characteristics of students' curiosity and inquiry, through creating problem situations and applying pleasant teaching models, students' thinking will always

follow the teacher's problems. Setting up ideas not only stimulates students' best thinking ability and interest in learning, but also cultivates students' abilities. Give full play to the subjective initiative of students in teaching, so that students can change from passive learning to active learning, and can actively participate in teaching activities, so as to achieve a good learning effect. ②The teaching content is relatively well handled. ③ In the selection of teaching methods, the method of inquiry learning can be adopted in accordance with the characteristics of the textbook and the students, and the subject requirements. At the same time, it can also supplement the teaching method of question exploration, teaching method, heuristic method and contrast method according to the independence of thinking when students master knowledge. Means, good at guiding students in the classroom, no matter in the design of the lesson type, or in the processing of the textbooks, they have been carefully designed to achieve the purpose of highlighting the key points and breaking through the difficulties.

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