

Curriculum Reform and Practice on “Chemistry and Society” Combining “Detective Conan”

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Abstract

Chemistry and Society is one of the most common courses of humanistic literacy in science module of colleges and universities in China. In order to improve the interest of students in classes of humanistic literacy in science module, to change the inactive class atmosphere, we have tried to implement a teaching mode combining the famous “Detective Conan” for the class of “Chemistry and Society” since 2017. Classroom teaching was conducted based on new designed PowerPoint slides, micro-videos associated with “Detective Conan” were made to encourage the students to absorb the knowledge more efficiently. Meanwhile, the WeChat group for certain class was built, to give convenience for task release, group discussion, and feedback. Results showed that, this new developed class is well received by students in campus because of the excellent teaching effects.

Keywords: Curriculum reform, Detective conan, Chemistry.

1. Introduction

“Chemistry and Society” is one of the most common courses humanistic literacy in science module of colleges and universities in China. The course are built to improve the scientific literacy of students majored in Society Science. As those courses have no direct link with their professional learning and job hunting after graduation, the students usually pay less attention to the class compared to required classes. Some students went to class with homework from other courses; some even skip classes for other reasons. In order to improve the interest of students in classes of humanistic literacy in science module, to change the inactive class atmosphere, we have tried to implement a teaching mode combining the famous “Detective Conan” for the class of “Chemistry and Society” since 2017.

The goal of Zhejiang International Studies University (ZISU) was “cultivating internationalized and inter-disciplinary talents for students”, and the students enrolled for this class came from various majors, language majors such as German, French, Italian, Portuguese, Spanish language, Japanese, Russian, Arabic, English, Chinese and Korean; other majors such as Art, Music, Tourism Management, International Trade, Elementary Education, Math, Financial Engineering, Chemistry, Physical Education, Computer Science, E-commerce, and Chemistry. Students from different majors showed evident background in chemistry, half of them haven't learnt chemistry since Senior Two in high school. So curriculum reform of teaching is necessary and urgent to conduct. Chemistry and Society is combining the application of chemical science in daily life, and usually focus on all aspects of the dynamic chemical industry, for example, pharmaceutical industry, agrochemical industry, food additives, flavors and fragrances, surfactants, detergents, cosmetics, adhesives and sealants and their application around us.

Compared to the required major classes, the “Chemistry and Society” is relatively easy for students to learn, as the contents of the course are close to daily life, and most students are familiar with the application [1-3]. Animation and flash has been frequently used in classes to enhance the class effect, but in our class, the cartoon “Detective Conan” can be directly played in class, to present the relevant chemical knowledge for the students to understand easily. “Detective Conan” has been imported in China since 1999 as one of the most famous cartoons. The cartoon was broadcasted one episode every week, and achieved plenty of fans born in 1980s, 1990s and 2000s in China. Compared to other cartoons, the “Detective Conan” has more audience among the students, and with its popularity and intellectual drama, it is much easier for students to catch up with the class. The video resources are also convenient to collect from the internet [4-5]. “Detective Conan” is based on the inference of Conan to track down the criminal, contains plenty of scientific knowledge, we can conduct effective teaching through editing of original videos from the internet. “Detective Conan and Chemistry” was first opened in Central South University by Professor Xu Hai in China in 2012 [6], and now over 20 universities and schools have opened related course.

“Group presentation” part was added to the course, to motivate the participation of students from various majors. Considering the school-running characteristic of ZISU, most majors were associated with foreign languages and foreign trading; other majors contain teacher training and traditional majors. The setup of “group presentation” encourage the students to find the relations between their own major with chemistry or Detective Conan, and present their achievements in the class. The new mode of the course enrich the contents of the class, with not only teacher’s lectures, magic shows, videos playing, but also students’ presentation, performance and sharing. For the past three semesters, a lot of positive feedbacks were received from the students, along with some advices to improve the class. Therefore, the experience of curriculum reform of teaching on Chemistry and Society were shared in this paper, including contents of the classes, reform of teaching methods, practice on students presentation and the course assessment and etc.

2. Curriculum Reform Details

2.1. Contents of the Classes

The course was allocated for 32 classes and 2 credits by the Teaching Affairs Administration of Zhejiang International Studies University. Three classes were arranged each week, with a total of 11 weeks in a regular semester. Ten topics were selected for each lecture based on chemical principles and Conan elements.

As the background of the students varied evidently, background investigation was conducted at the first class, to provide reference for adjustment of class contents. The 10 topics were carefully selected and related episode of Detective Conan were collected from the internet and edited to match with the duration of each class. Basic contents of the 10 lectures were listed in Table 1.

In lecture 1, as alchemy was the start of chemistry, the origin and development of chemistry was reviewed both in China and around the world. The turning point of high school student Kudo Shinichi becoming pupil named Edogawa Conan was edited from the episode “Flying Carriage Incident”. The toxic drug mentioned in this episode, which turn the high school student to Conan was named APTX4869; the possible structure of APTX4869 was discussed, and the meaning of APTX (apoptosis) was interpreted in the class.

In Lecture 2, the running blood in the toilet bowl was revealed, the criminal added ammonia into phenolphthalein, with pH from 8-10, the solution will turn red, as similar with the color of blood. This is common in analytical chemistry. In class, other color reactions were also introduced, including litmus, iodine and starch, and rhodamine. The magic show about the color reaction of purple cabbage was also conducted in the class.

Table 1. Basic content for 10 lectures in class

No.	Lecture name	Related Episode of “Conan”
1	The legend of rejuvenation	Flying Carriage Incident
2	The truth about mystery apartment	The truth of the ghost apartment
3	Magician in the sky-fireworks	Resurrection Death Message
4	A song of the ice and fire-flammable ice	Jolly Roger in the Deep Azure
5	Lime and life chemistry	News photo killings
6	Will-o'-the-wisp-the secret of phosphorus	The dog's magic wildfire
7	Invisible indoor killer-formaldehyde and atmosphere chemistry	Invisible killer
8	Chocolate and sweet memory of love	The truth about the Valentine’s Day
9	The pros and cons of excitant	The tragedy in OK pasture
10	Flowers can kill-pollinosis	The pollinosis

In Lecture 3, the sound of fireworks was often used to cover up the criminals in several episodes. The flame test of different metal elements was revealed (Fig. 1), for example, yellow for Na and Ca, purple for K, red for Sr and green for Cu.

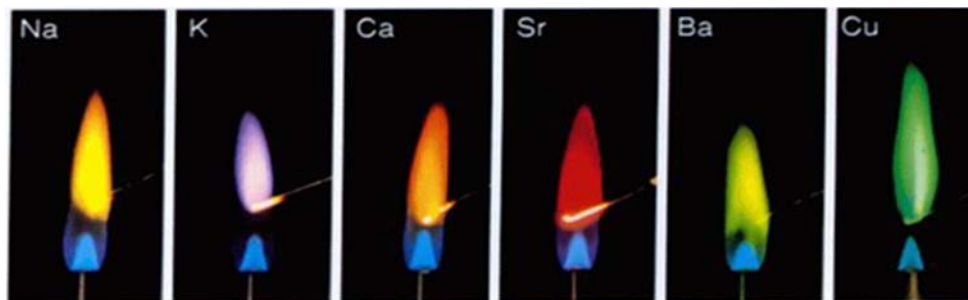


Fig.1. Flame test for six different metal elements

In Lecture 4, one of the movie series for Conan “Jolly Roger in the Deep Azure” was selected as the class material, at the end of the movie, Conan use the flammable ice below the sea to conduct an explosion, finally save his girlfriend and himself. For the extending part, students were taught to distinguish gas, natural gas, methane from liquid petroleum gas. Methane is the primary component in flammable ice, and is highly contributed to greenhouse effect [7]; related topics can be raised according to the interests of students, which can also be chosen for the topic in group presentation. Magic show of “snowball on fire” was also one of the favorite parts of this course.

In Lecture 5, the chemical property of lime was used by the murder (a journalist) to create a fire for the best news photo in the episode of “The news photo killings”. There were several different compounds with similar properties for lime, such as CaO , Ca(OH)_2 , CaCO_3 , saturated Ca(OH)_2 solution and turbid

Ca(OH)₂ liquid. A small competition was conducted in the class; the group with correct answer will get additional credits in the final score. Results showed that it effectively motivated different groups to compete for higher scores.

In Lecture 6, the chemical property of phosphorus (P) was emphasized with the episode “The dog’s magic wildfire”. Put the LED light on a dog’s body in the evening, and a magic dog with wildfire will be found, which is caused by PH₃.

In Lecture 7, invisible indoor killer (formaldehyde, HCHO) was introduced in class, HCHO was not only used in the invisible killer episode of Conan, it was also frequently found in new decorated house, new cars, and even new clothes [8]. Therefore, the adverse effect of HCHO should be paid urgent attention. Advance in technologies for removing HCHO will be presented for reference [9].

In Lecture 8, chocolate was the main topic, as one of the favorite foods for most girls, the component of the chocolate in the market raised their interest, the difference in nutrition value and health risk of cocoa butter, cocoa butter equivalent and substituted cocoa butter was introduced, and one magic show with chocolate and gum was conducted with the help of the students-disappearing gum. They really enjoyed this kind of magic show close to daily life, and easy to learn. For the extending part, the top 10 chocolate brands were reviewed, such as Godia from Belgium, Lindt from Swiss, Guylian from Belgium, Ferrero Rocher from Italy, Kinder Bueno from Italy, M&M from United States and etc.

In Lecture 9, the murder used chocolate to feed the horse in OK pasture, causing the horse loss of temper, and killed an innocent person. The theobromine in chocolate acts as an excitant for humans, but for animals like horses and dogs, it is a toxin. The extending part of this section introduced abuse of excitants in Olympic Games; scandals of athletes involved in excitants taking were reviewed.

In Lecture 10, flowers usually give people an impression of beautiful, elegant, happiness and sweetness, but the pollenosis caused by the flowers can kill people allergic to them. The extending part of this section presented lots of beautiful images for farina from flowers or trees.

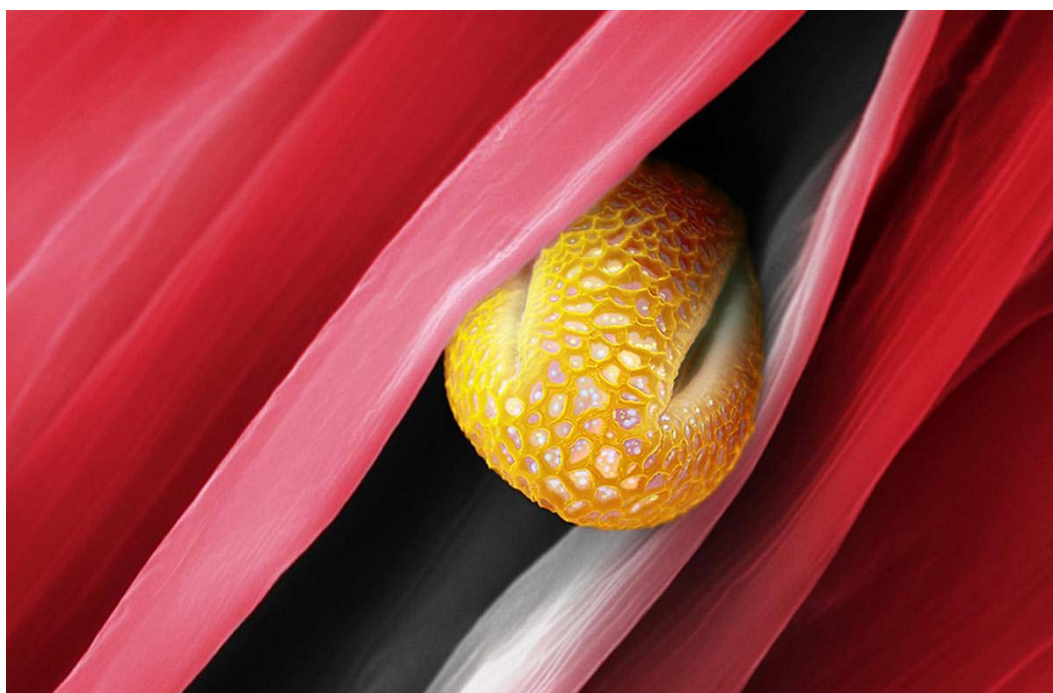


Fig.2. Example for high resolution images of farina

2.2. Reform of the teaching methods

The contents of class were renewed for the previous course; the teaching methods were also improved. First, each class was redesigned in 8 different parts, including story of Conan, chemistry in Conan, travel around the world with Conan, magic show with Conan, inference with Conan, test with Conan, music with Conan, and outlook with Conan.

Take Lecture 8 for example, the course design was listed in Table 2.

Table 2. Course design for lecture 8

NO.	Sections	Key points
1	Story	The truth about the Valentine's Day
2	Chemistry	Cocoa butter, cocoa butter equivalent and substituted cocoa butter, trans-fatty acids, excitant
3	History	Mystery about the Valentine's Day, the origin of DOVE
4	Magic show	The disappearing chocolate-chocolate with gum
5	Inference	A doctor was killed with a melting chocolate in the pocket
6	Test	Choose the right description for the common component of chocolate-vanillin (the chemical structure was provided)
7	Music	Mustard and chocolate
8	Outlook	Love and share

2.3. Group Presentation

The students attending humanistic literacy courses in college are usually much more than those of specialty classes. The students often majored in different departments, and didn't know each other even when the course was finished. To improve the efficiency of the class, and give opportunity for students and teacher to communicate effectively, group presentation was applied in this course.

At the beginning, take 100 students for example, 10 group leaders were selected according to their own intention. Then the 10 group leaders chose a topic either related to Conan, or linked to chemistry in daily life. The list of topics were announced in the WeChat group, other students who were interested in the topic would contact the group leader, and add a number before his nickname in the WeChat group, for example 1-Zhangsan-English. Five weeks were allocated for the 10 groups to establish, until all groups have 10 students to conduct the group sharing part. Students with similar interests gather together, discuss, collect resources, and work together to finish the presentation. Competition existed between the students in the group and also among the groups. Everyone wanted to try the best to accomplish the mission, which encourage the communication and teamwork for the students. After the group presentation part was finished, they gave feedbacks and really appreciate the teaching reform of this part, some students made really good friends with the classmates during the group working period. Several group presentation topics were listed in Table 3.

Table 3. Melting point analysis of products

No.	Topic	Key points
1	Dub show	8 students use 8 different kinds of languages to dub for a fragment of Conan episode
2	Toxins in Conan	KCN, NaOH, KCl, aconitine
3	Tall incidents in Conan	Running anthropometric dummy, the cursed stairs
4	Carbon oxide and Conan	Prevention of danger from CO
5	Secrets about chemistry	Keep the white shoes for clean, remove the incrustation easily use chemicals, secrets between shrimps and tomatoes
6	Inference with Conan	Murder on the Orient Express
7	Explosives and Conan	TNT, Teteryl, PETN, RDX
8	Glory and Conan	Brocken Bow

3. Assessment of the Course

3.1. Assessment

Assessment of the course is composed of attendance, in-class activity (magic show response and participation in inference with Conan), group presentation, and final exam. Part 1 (attendance and in-class activity) accounted for 20% for the final score of the course, part 2 (group presentation) and part 3 (final exam) accounted for 30% and 50% for the final score, respectively. After the teaching reform, the attendance rate increased by 10%, and the participation rate in class also rise, indicating the teaching efficiency is good.

3.2. Feedbacks

Positive feedbacks were received from students finished the course and many of them wanted to study for another semester. Student A said "This course remind me the knowledge learn in high school, chemistry was my favorite course in high school, it was so amazing learn it back in the university with Conan". Student B said "The new mode in the class was wonderful; I really appreciate for the well prepared class from the teacher, and have opportunity to know interesting friends from different majors during the group presentation part, Thank you". Student C said "The way of combing the cartoon and knowledge learning in class is excellent, though Conan was familiar cartoons since primary school; little was understood before this class, really useful". Student D said "Perfect course with well-designed PowerPoint and teaching contents, I really enjoyed the Conan episodes and also learned a lot of chemical knowledge at the same time, I will recommend other students to choose the course".

For feedbacks from more than 200 students, 96% of them confirmed enriched scientific knowledge in class, 98% of them thought the cartoon part increased their interests in class, and improved the teaching efficiency evidently. More than 95% of them wanted to learn the course again, and would recommend the course to others.

4. Conclusions

The new teaching mode combining the cartoon and chemical knowledge together and have a practice on teaching reform of "Society and Chemistry". Classroom teaching was conducted based on new designed PowerPoint slides, micro-videos associated with "Detective Conan" were made to encourage the students to absorb the knowledge more efficiently. From feedbacks from students, the teaching efficiency

was improved evidently. Results showed that, this new developed class is well received by students in campus because of the excellent teaching effects.

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