

Research on the design, production and application of a series of Micro-Course of "Basic Methods of Chemical Experiments" of High School Chemistry

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Abstract

Micro-Course are one of the most creative product to come out of the digital age. The outstanding advantages of Micro-Course are short time, small knowledge points, excellent production and it can bring shocking effects. Through different methods, different kinds of Micro-Course can be designed and produced, and different kinds of Micro-Course can be designed and produced. Micro-Course can achieve different teaching goals. This article focuses on the content of the first section of the first unit of compulsory chemistry in high school "Chemical Experiment Safety" and "Separation and Purification of Mixtures-Filtration and Evaporation", and use text, pictures, videos and animations in the creation. Come to beautify and improve the Micro-Course, and finally carry out in-depth application research on the Micro-Course based on practical applications.

Keywords

Micro-Course, design, production, application research.

1. Introduction

With the further development of education, from traditional classrooms to information-based classrooms and flipped classrooms, Micro-Course are used more and more widely in the field of education. In particular, Micro-Course with multiple functions are becoming more and more popular among teachers and students. For TV, it has the characteristics of short video playback time and excellent content production, which can not only improve teaching efficiency but also greatly stimulate students' interest in learning; for multimedia courseware, it has less knowledge points and can bring shocking teaching effects The outstanding features of, can not only attract students' attention but also invigorate the classroom atmosphere. This article is based on the content of the first chapter of the first chapter of compulsory high school chemistry, and discusses from the overview, characteristics, design, production and application research of Micro-Course.

2. Overview of Micro-Course

2.1. The meaning of Micro-Course

Micro-Course refer to online teaching videos that aim to explain a certain knowledge point, take "short and succinct" online videos as the form of expression, and aim at learning or teaching applications. It conforms to the human ten-minute best memory rule, can be used as a video

material for building MOOCs, and can also be used as a resource for students' independent learning in flipped classrooms and blended learning.¹

2.2. Features of Micro-Course

2.2.1. "short"

"Short" refers to the short duration of online teaching videos, preferably no more than 10 minutes. At present, the school time of primary and secondary school students is generally 45 minutes, and 45 minutes is only part of the effective time for primary and secondary schools. The continuous attention of primary and secondary school students in a class is about 20 minutes, and the continuous attention of middle school students is about 25. minute. The characteristics of short-time teaching of Micro-Course conform to the learner's ten-minute best memory rule. High school chemistry "Basic Methods of Chemical Experiments" series of Micro-Course are composed of micro-class 1 "Chemical Experiment Safety" and micro-class 2 "Separation and Purification of Mixtures-Filtration and Evaporation". The total duration of micro-class 1 is 6 minutes and 26 seconds. The total duration of the micro-class two is 8 minutes and 7 seconds, and the duration of the two Micro-Course is controlled within 10 minutes, which enables the micro-class to exert the greatest effect within the best memory time range of the students.

2.2.2. "small"

"Small" means that the theme of the teaching content is small, and the theme is designed with the goal of explaining a certain knowledge point. In traditional teaching classrooms, the "full class" teaching method can be used to transmit a lot of knowledge to learners in just one class, but students will appear passive in their learning. Those knowledge copied and pasted from the teacher's experience not only cannot be truly mastered by the students, but it will also reduce the efficiency of learning. This series of Micro-Course selected two important knowledge points from the first subsection of the first unit of the compulsory high school chemistry one for meticulous design and production. Each micro-class includes four modules: knowledge introduction, teaching, practice consolidation, and summary, which can greatly stimulate students' interest in learning, enable them to learn actively and actively, and continuously improve their learning efficiency.

2.2.3. "fine"

"Fine" refers to the excellent design, production and explanation of the micro-class video. In the production of this series of Micro-Course, the first step is to analyze various knowledge points through unit teaching design; the second step is to design classroom teaching, analyze learner characteristics, learning objectives, learning content, and determine the key and difficult points of teaching according to the learning content and objectives, and Choose the form of media expression for it and clarify the teaching process; the third step is to determine the topic selection of the micro-class based on the classroom teaching design, and prepare the corresponding materials after the topic selection is determined. The fourth step is to design the micro-class script to clarify the content and effect of each shot; the fifth step is to make it in detail. The design and production of the latter step is based on the results of the previous step, and each step is elaborately produced.

2.2.4. "fierce"

"fierce" means that in a short period of time, a small theme through a sophisticated design brings the learner's effect is shocking and unforgettable. This series of Micro-Course is presented in the form of animation videos. The text, graphics, images, and videos inserted in the Micro-Course are all set with corresponding animation special effects, and then the system voice synthesis audio commentary forms an audio-visual teaching with both graphics, text,

¹ [1] Zhiping Zhu. On the design and application of high school chemistry micro-class teaching [J]. Gaokao, 2017

sound, and image. Resources, the external stimulus it provides is no longer just a stimulus to a single sense organ, but a dual stimulus from both visual and auditory aspects. Such stimuli can greatly attract the attention of learners.

2.3. The manifestation of Micro-Course

The manifestations of Micro-Course generally include classroom recording, on-camera explanation, real-life shooting, PPT recording + teacher's avatar + explanation, handwritten explanation, animation presentation, interview teaching, etc.

The series of Micro-Course produced this time are all manifestations of animation demonstrations. Wancai Animation Master is used to make Micro-Course. Both the background of the Micro-Course and the content of the explanation are set with corresponding animation special effects and the demonstration is played in the form of animation.

2.4. Introduction to the series of Micro-Course of "Basic Methods of Chemical Experiments" in high school chemistry

The series of Micro-Course produced this time, Micro-Class 1 "Chemical Experiment Safety" belongs to the teaching category, mainly used to explain the precautions for chemical experiment safety and the names, characteristics, and occurrence conditions of the eight major categories of hazardous chemicals; Micro-Class 2 "Separation and Purification of Mixtures-Filtration and Evaporation" is a combination of lecture and demonstration. It mainly teaches the meaning and characteristics of filtration, the main test equipment, and experimental precautions, and then presents the coarse salt in the form of two-dimensional animation. The filtration part of the purification is explained in the same way and demonstrates the evaporation and repurification process.

3. Teaching Design of "Basic Method of Chemistry Experiment" in Senior Middle School Chemistry

Teaching design mainly uses systematic methods, replacing the principles of learning theory and teaching theory with specific plans for teaching objectives, teaching content, teaching methods and teaching strategies, teaching evaluation and other links, and creating a system of teaching and learning "process" or "Program" [2]. To carry out the design and production of the micro-class, the first thing to do is the instructional design.

3.1. Teaching design of the unit "Basic Methods of Chemical Experiments" in high school chemistry

The unit instructional design can clearly present the structural distribution of unit knowledge and the important and difficult points of unit knowledge. In the unit teaching design, first analyze the teaching objectives of this unit; then analyze the learning objects; then analyze the subject knowledge and ability structure, as shown in Figure 1, and finally analyze the learning objectives of knowledge points.

3.2. High school chemistry "Basic Methods of Chemical Experiments" classroom teaching design

The application of Micro-Course in the classroom can assist teachers in teaching and help students learn, and classroom instructional design is the key to the efficient use of Micro-Course in the classroom. Through classroom teaching design, we can clearly know the development of teaching activities. Circumstances, determine the most appropriate time for the presentation of the micro-class in the teaching process. The first micro-class is used in the first lesson, as shown in Figure 2. The second micro-class is used in the second lesson, as shown in Figure 3.

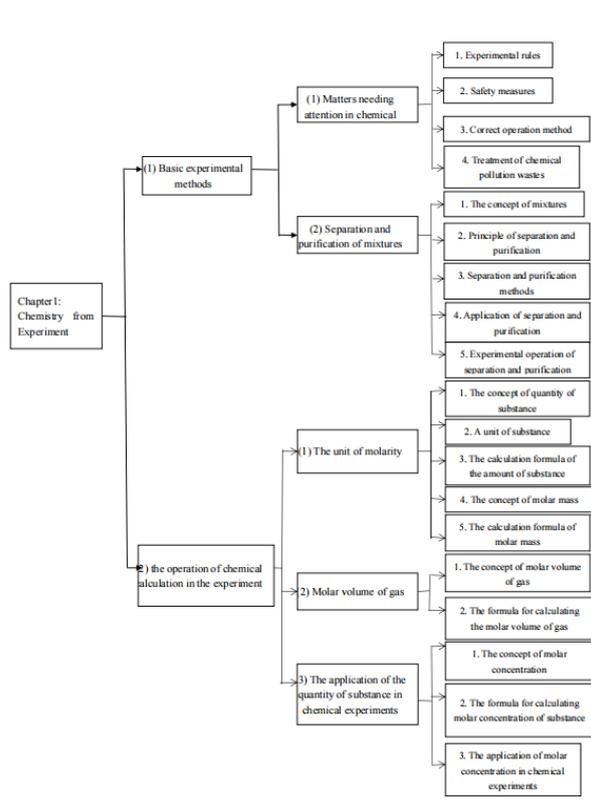


Figure 1 Unit knowledge and ability structure diagram

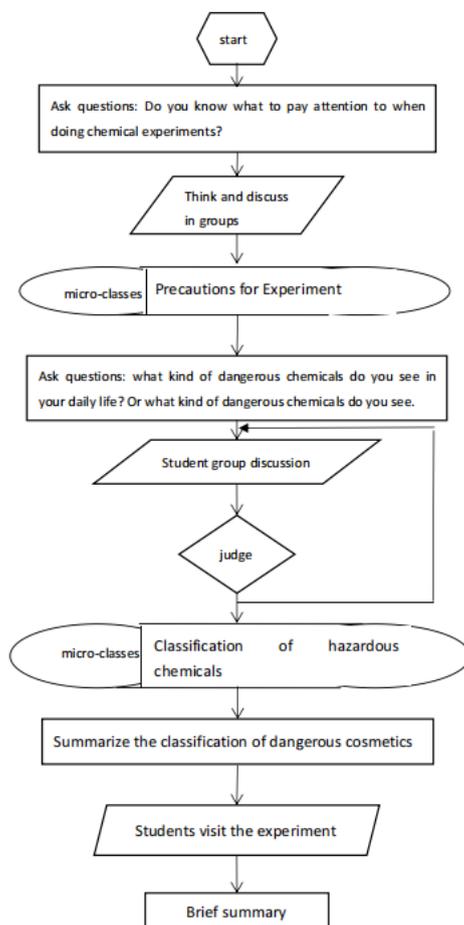


Figure 2: "Chemical Experiment Safety" classroom teaching process design

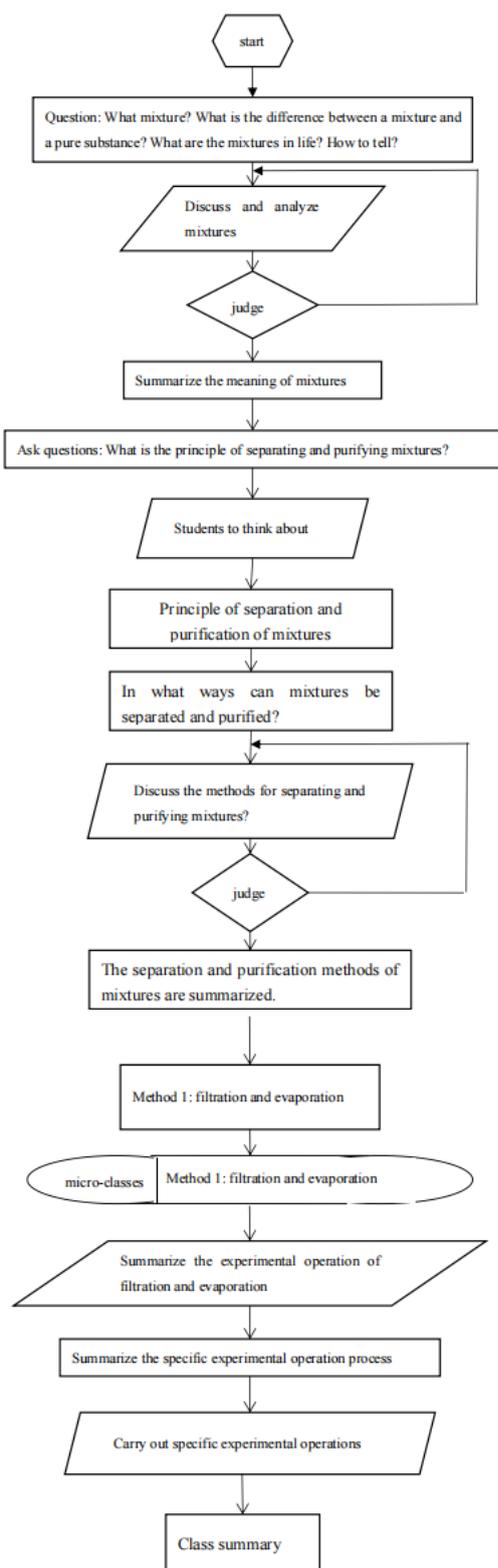


Figure 3: "Separation and Purification of Mixtures-Filtration and Evaporation" classroom teaching process design

Classroom teaching design first analyzes three-dimensional teaching goals, then describes learner characteristics, then analyzes learning goals and teaching important and difficult points, and then conducts media selection and blackboard design. Based on the previous series of

analyses, the classroom teaching process map was designed, and the formative exercises were finally designed for formative evaluation.

4. Design of a series of Micro-Course of "Basic Methods of Chemical Experiments" in senior middle school

4.1. Topic selection of Micro-Course

The topic selection is an important beginning for the design and production of Micro-Course. When choosing a topic, you need to pay attention to the principles of "small questions should be small but not big" and "big questions". Micro-Course are used to elaborate a certain knowledge point as the goal, but not all knowledge points are suitable for presentation in Micro-Course. Micro-Course can be used to deeply interpret the important and difficult points of learning content, through precise analysis, sophisticated design, production, and explanation to visualize abstract knowledge. The study of high school chemistry involves a lot of experimental operations. It is necessary to enter the laboratory to conduct experiments from time to time. It is very important to learn the relevant knowledge of chemical experiment safety. Many students may have been exposed to chemical experiments in the middle school level, and it is easy to ignore the content in this area. When they actually enter the laboratory for experimental operations, various accidents will occur. Therefore, only after earnestly studying the relevant knowledge about chemical experiment safety, can you guarantee your own safety during the experimental operation process and carry out chemical experiments smoothly. The knowledge point of "chemical experiment safety" is regarded as the first part of the first chapter of the first chapter of chemistry compulsory one. Knowledge points, it lays a solid foundation for the subsequent chemistry learning journey. "Separation and Purification of Mixtures-Filtration and Evaporation" is one of the important experiments in the compulsory course of Chemistry for Senior One. As an important and difficult knowledge point, it explains some important basic operating principles of chemical experiments. The knowledge involved is the connection The next chemistry study is a pavement, so presenting it in Micro-Course can help students better understand and grasp the knowledge.

4.2. The design of the scripts for the series of Micro-Course of "Basic Methods of Chemical Experiments"

The micro-course design script can further refine the teaching content and teaching process, and it is the direct basis for the preparation of the micro-course. In fact, neither TV textbooks nor multimedia courseware are produced by the designer's instant inspiration, but a strict production process and clear design ideas, which reflects the micro-course script design in the micro-course design and production process The importance of. In short, only a well-designed micro-class script can make a good micro-class. The micro-class script needs to be designed by lens modules. The design of each module needs to specify the content displayed on the page, what materials are displayed on the screen, and the organization of the materials and each action are described in detail, as shown in Figure 4. Only if the script design is sufficiently detailed, then the later micro-class production can proceed smoothly.

Module serial number	1	Page content	Micro lesson title
Screen display and description	Textbook cover image Subtitles: chapter title, class title, knowledge point title 1. With the corresponding background music. 2. Set the picture, chapter title, class title, knowledge point title <u>appear</u> in sequence.		

Figure 4 Micro-course design script

5. The production of the series of Micro-Course of "Basic Methods of Chemical Experiments" in high school chemistry

5.1. Material collection and processing

5.1.1. Image processing

Some image materials are used in the design of the series of Micro-Course. These materials are downloaded from the website and used image processing software to remove the watermark and adjust the image size to make the background images and teaching required in the Micro-Course. material.

5.1.2. Video processing

The courseware is designed for high school students. High school students learn to reach an abstract level. This video is aimed at the two experiments in the class. The two-dimensional animation about the experimental operation and demonstration is produced through flash two-dimensional animation production software and output as a video. .

5.2. The production of a series of Micro-Course of high school chemistry "Basic Methods of Chemical Experiments"

The series of Micro-Course are produced using the animation video production software Wancai Animation Master. In order to facilitate the production, multiple scenes can be created. The background of each scene is similar in series but different in shape. The internal use of each scene is the same background.

5.2.1. The production process of the "Chemical Experiment Safety" micro-course.

The micro-class "Chemical Experiment Safety" created a total of eight scenarios, and the micro-class lasted 6 minutes and 26 seconds.

5.2.2. The production process of the "Separation and Purification of Mixtures-Filtration and Evaporation" micro-course.

The micro-class "Separation and Purification of Mixtures-Filtration and Evaporation" created a total of six scenarios, and the micro-class lasted 80 minutes and 7 seconds.

6. Applied research on the series of Micro-Course of "Basic Methods of Chemical Experiments" in high school chemistry

High school is a turning point. The first stage—junior high school is the basic level of learning, the latter stage—university is the level of professional knowledge, and high school is the

systematic and comprehensive level of knowledge. The knowledge to be learned in high school is complicated, abstract and difficult to understand, and students are under great pressure. In addition, most high school teaching still uses traditional classroom teaching. Teachers occupy the dominant position. A class is 45 minutes and the teacher spends almost 40 minutes on it. Blindly instill knowledge into students, treat students as learning machines, and hope that students can learn as much as they teach in a lesson. This is counter-intuitive. Even though the teacher talks on the podium in a messy and dry tongue, the attention of the students under the podium will not be 100% concentrated in the classroom, so the teaching efficiency is not high. Under such a teaching environment, students are in a passive position. After long-term teaching, they only cultivate nerds who can only "dead and read", and lose the ability to independently study, collect and process information.

The emergence of Micro-Course, a product that conforms to the development of education, can inject energy into this lifeless classroom. As the scholar Silberman said: "What we can learn is-10% of what we read; 20% of what we hear; 30% of what we see; 50% of what we can understand by combining audiovisual; Discussing with others is 70% effective; personally experiencing 80% gains; 90% of what you teach to others belongs to yourself." Micro-Course are a combination of text, graphics, images, animation, audio, and video. Teaching resources reflect the combination of audiovisual and audiovisual features. They can achieve 50% understanding of knowledge, plus some other teaching activities, such as practical operations, classroom discussions, cooperative exploration, and consolidation exercises to improve the understanding of knowledge. It is also very possible that memory and memory can reach 100%. This kind of teaching method is used in high school classrooms, especially in subjects with strong logic and deep abstraction like high school chemistry, which undoubtedly adds a touch of color to the dull and colorless world of knowledge.

6.1. The design of the questionnaire

This questionnaire designed a total of 13 questions, divided into three parts, the first part (questions 1-6) is to understand the students' learning conditions in general, and the second part (questions 7-12) is about the use of Micro-Course The third part of the survey (13 questions) is the students' evaluation and suggestions for revision of this series of Micro-Course.

6.2. Issuing the questionnaire

This series of Micro-Course is applied to high school chemistry classes, and is aimed at high school students who use the series of Micro-Course of high school chemistry "Basic Methods of Chemical Experiments" to study. High school students have the ability to make correct value judgments about things, and can clarify what is beneficial to their own learning and what is suitable for their own learning methods. Questionnaires were distributed to the students after the class. A total of 40 questionnaires were issued, 30 valid questionnaires and 10 invalid questionnaires were returned. The questionnaire recovery rate was 75%.

6.3. Statistics and analysis of survey results

Through systematic analysis and research on the survey data, a total of 30 people participated in the questionnaire survey, including 18 girls and 12 boys. Regarding the teaching methods of teachers, 23 people like teachers to use multimedia for teaching, accounting for 77% of the total surveyed population, indicating that students like active classrooms and receive information from multiple senses, and hope that teachers use multimedia teaching to organize their classrooms.

In the survey of students' listening status under normal circumstances, only 14 of the 30 classmates were able to listen to the lectures most of the time, and the remaining 16 had low learning efficiency in classroom learning, indicating that the general traditional teacher-teaching classroom atmosphere is dull and boring. Bored, boring, and students are relatively

passive. Under this circumstance, students must have good self-discipline and perseverance in order to be effective in learning. However, for current primary and secondary school students, their thinking is jumping and their attention is more Easy to be affected by the external environment, like to add to new things

With attention, if they are allowed to sit in their seats for the entire class, listen to the teacher, take notes, listen to the lecture, and take notes again, the rigid dogma will make their listening state become sluggish and lazy.

In the survey of students' attitudes towards learning by watching videos, 27 out of 30 students like to learn by watching videos. Learning by watching videos is a novel way of learning. Compared with traditional teaching methods, it delivers vivid images, auxiliary audio for explanations, and very individual animation decorations, giving students a strong feeling. The impact of the visual and auditory sense. Children in the information society are exposed to a lot of avant-garde knowledge and information, and can use more scientific and technological means to acquire knowledge. Therefore, compared with traditional learning methods, students are more willing to accept video teaching.

According to the survey of students' exposure to Micro-Course, only 6 out of 30 students have been exposed to a lot of Micro-Course, and the remaining 24 students have little or no exposure to Micro-Course. Nowadays, the development and application of Micro-Course is very common, but it is really surprising that only 6 students in the survey have been exposed to a lot of Micro-Course, because Micro-Course are a very good teaching resource, and they can be used to train students. The self-learning ability and innovation ability can double the effect of classroom teaching. Micro-Course are rarely used for teaching in colleges and universities. On the one hand, under the education system of our country, high schools have a lot of learning content, and teachers are under great teaching pressure. A little carelessness will cause the teaching progress to fail to keep up. If it is not a semester teaching content, the use of Micro-Course in the classroom will cause a certain amount of time, and long-term use will cause delays in teaching progress. On the other hand, the way students receive education from elementary school to high school is to obtain knowledge through teacher's explanation. The way of obtaining knowledge is narrow and rely heavily on teachers' books. Therefore, no matter how good the micro-class is, students rarely pay attention to it. In classroom teaching, it can be used appropriately under the permission of teaching progress and teaching conditions to stimulate students' learning enthusiasm.

Regarding the intention survey of different types of Micro-Course, 12 of the 30 classmates like micro-film-style Micro-Course, 9 tend to be animated explanations, and the number of video explanations and PPT presentations is relatively small. Because students have little exposure to Micro-Course, and do not fully understand the types of Micro-Course, the advantages and performance of different types of Micro-Course, the preference for the types of Micro-Course is selected according to the students' subjective intentions. In classroom teaching, you can flexibly choose the most suitable micro-class for lectures according to the characteristics of the teaching content, which can not only improve the teaching efficiency, but also enable students to have a certain understanding of the micro-class.

According to the investigation and analysis of the characteristics of high school chemistry "Basic Methods of Chemical Experiments" series of Micro-Course that most attract students, 21 out of 30 students thought that the vivid and vivid explanations of the series of Micro-Course of high school chemistry "Basic Methods of Chemical Experiments" are the most attractive. , Accounting for 70% of the total number of people. It reflects that the design and production of this series of Micro-Course are reasonable and effective in terms of explanation, and they have been designed, produced and used to promote teaching.

Regarding the investigation and analysis of the use of high school chemistry "Basic Methods of Chemical Experiments" series of Micro-Course for learning to help students, 28 out of 30 students thought that using high school chemistry "Basic Methods of Chemical Experiments" series of Micro-Course for learning is more knowledgeable. It is very helpful to acquire and master. It shows that the use of novel teaching methods and the creation of lively classrooms can greatly stimulate students' interest in learning; secondly, the vivid expression of learning content through micro-class images can deepen students' impression and memory of knowledge and understanding; the last micro-class as a teaching resource can be used many times and can run through the entire link of learning. Therefore, the students think that the use of the series of Micro-Course for learning is very helpful to the study.

Regarding the survey on which stage of the high school chemistry "Basic Methods of Chemical Experiment" series of Micro-Course is more helpful for learning, 13 people tend to use it in the lectures, and 7 people in the introduction stage and the consolidation stage respectively. There are 3 people who use it after class. After using a series of Micro-Course for learning and having a little understanding of Micro-Course, investigate students' tendency to use Micro-Course in various teaching stages. Students will only make decisions based on their usual learning habits and subjective views of Micro-Course. The choice cannot be judged objectively. In the future learning process, you will have more contact with the Micro-Course, and you will be able to make correct and objective judgments after you have learned more.

Regarding the survey of students' knowledge of the students after studying the high school chemistry "Basic Methods of Chemical Experiments" series of Micro-Course, 24 out of 30 students were able to master the knowledge they had learned, and only 6 of them only mastered part of the knowledge. After using Micro-Course for teaching, most students can master the knowledge, which shows that the Micro-Course are reasonable and efficient in the classroom. A small number of students have not been exposed to Micro-Course before, and used Micro-Course to carry out teaching activities for the first time, and failed to adapt to this teaching method in time, so they only mastered part of the knowledge. This part of the students can use Micro-Course after class. Carry out consolidation review, feel the charm of Micro-Course by the way, and deepen your understanding of Micro-Course.

Regarding the survey on the degree of satisfaction with the overall layout of the high school chemistry "Basic Methods of Chemical Experiments" series of Micro-Course, none of the 30 students were dissatisfied with the overall layout of the series of Micro-Course of "Basic Methods of Chemical Experiments" in high school chemistry. The micro-class teaching experiment made this time was very successful. The students liked the teaching experience of this series of Micro-Course, but the Micro-Course still had shortcomings. It was just because the students did not have much contact with the Micro-Course, so there was no condition to compare the good and the bad.

Regarding the survey of students' willingness to use Micro-Course for learning in the future teaching process, 27 of the 30 students expressed their willingness to use Micro-Course for teaching in the future, 3 did not care, and 1 was unwilling. Most students are willing to re-use the new micro-class teaching method, which shows that students like this learning method and can truly master knowledge in this learning process. For those who don't care and don't want to use the micro-class Attitudes that lead to resistance due to ignorance, or carelessness, can give them proper guidance,

Let them get in touch with Micro-Course and truly appreciate the power of Micro-Course.

The suggestions for improvement after the use of the Micro-Course are as follows: (1) The content of the picture is not attractive enough. The improvement opinions are to make the picture more colorful, and the teaching content in the picture is more concise and orderly; the picture connection is more compact. (2) The commentary using system dubbing has no emotion,

and the improvement opinions are to use real people's emotional dubbing; (3) The consolidation part is not rich enough, and the improvement opinions are to extract more consolidation exercises from the teaching content to help students deepen The memory of knowledge; (4) The content lacks interest. The improvement suggestions can set up some meaningful situations and discuss collaborative activities in the micro-class to make the teaching process more abundant.

7. Research summary and outlook

Through the use of the high school chemistry "Basic Methods of Chemical Experiment" series of Micro-Course in the classroom, students' learning efficiency and interest in learning have been significantly improved. They are also satisfied with the overall design of this series of Micro-Course. They also expressed their willingness to continue using Micro-Course in subsequent studies. Lessons for learning. Traditional teaching methods are indispensable in classroom teaching, but some fresh elements can also be appropriately added to make learning full of fun, make students easy to learn, and teachers enjoy teaching and reduce teaching pressure.

The learning resources that contemporary high school students can access in their lives are becoming more and more diversified, and their learning methods are becoming more and more multimedia-based. The traditional lecture-style classroom atmosphere is dull, learning and thinking are rigid and mechanical, which is not conducive to students' enthusiasm and initiative, and hinders the development of innovative talents. Therefore, traditional lecture-style teaching is no longer suitable for them, and they are more inclined in the process of receiving education. In the multimedia teaching method. The combination of traditional lecture-style teaching and multimedia teaching in school classrooms can not only improve the learning efficiency of students, but also realize the rich emotional exchanges between teachers and students. Micro-course is an important multimedia teaching aid resource, with abundant text, pictures, audio, and video information, which can effectively organize teaching content and highlight the important and difficult points of teaching content. Applying it in the classroom at the most suitable time can maximize the advantages of Micro-Course, attract students' attention, and help teachers better complete teaching.

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