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Teaching Research of Modular Organic Chemistry Courses in Colleges and Universities Based on Core Chemistry Literacy

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Abstract

The proposal of core literacy pays more attention to the ability of students to acquire knowledge and master learning methods, truly consider the future life-long development of students, and prepare for the cultivation of talents who adapt to the future society. Cultivating the core literacy of students should be realized through the teaching of various disciplines, and detailed to each discipline, the chemistry discipline also has the corresponding core chemistry literacy. The purpose of this article is to research the modular curriculum teaching of organic chemistry in colleges and universities based on chemistry core literacy. On the basis of consulting a large number of literatures, this article puts forward the research content of organic chemistry modular curriculum teaching research based on the core chemistry of chemistry, guided by the cultivation of students' core literacy in chemistry. Based on the construction of a modular organic chemistry teaching model that promotes the cultivation of the core chemistry of students, based on the theory of constructivism and cognitive structure theory, it enumerates the special features of organic chemistry teaching modularization based on the core chemistry of chemistry, and puts forward the advantages of the organic chemistry modular course teaching mode relying on the core chemistry of chemistry. Experiments show that the experimental class has significantly improved performance compared with the control class, which can explain that the student's academic performance is related to the change of teaching methods and is closely related to the modular curriculum teaching model based on the core of chemistry literacy.

Keywords

Core Literacy; Organic Chemistry; Modular Curriculum; Teaching Mod.

1. Introduction

As one of the disciplines closely related to society, chemistry not only plays a pivotal role in the intersection with other disciplines, but also is widely used in real life [1-2]. However, the past chemistry teaching is basically the mechanical filling knowledge of "you write me remember, you say me memorize", which causes many students to seem to understand in class, but do not know how to complete the homework [3-4]. Or remember the experimental phenomenon, but the actual operation is often full of loopholes. There are many reasons for this phenomenon, but the relatively important thing is that students lack the ability to apply knowledge. Knowledge is learned, but it will not be applied to life, causing students' knowledge transfer obstacles. Therefore, it is of great significance to apply chemical knowledge to solve practical problems [5-6]. As an educator, you must change the traditional "you say me remember" indoctrination teaching method. It can no longer only take the past formula theorems or concepts in textbooks as the primary goal of education, but should conform to the new era of

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talent demand standards, to shape the learner's core literacy in teaching and enhance the application skills of knowledge [7-8].

Our country began to explore modular teaching in the 1990s. The establishment of the "Tianjin Advanced Vocational and Technical Training Center" represents the formal application of modular teaching in my country's education field. The training center was established by the Ministry of Labor and the International Labor Organization in 1985. The joint establishment is mainly engaged in the translation and publication of related materials of "Modules of Employable Skills" (Modules of Employable Skills, MES for short) [9]. Since the mid-1990s, vocational educators have discovered the shortcomings of traditional courses, introduced modular teaching into our country's vocational education, and summarized the "wide range" suitable for our country's vocational education based on the MES model and the CBE (Competency Based Education) model. "Basic, flexible module" education model, and began to carry out relevant research and practice on it, compile modular teaching materials, develop practical teaching modules, integrate vocational education and vocational training, and improve the practical and hands-on skills of higher vocational students [10].

Based on this, this article uses literature research methods, survey methods and other research methods to apply the modular teaching model to the organic chemistry curriculum, and conducts theoretical and practical explorations, changing the organic chemistry curriculum to be teacher-centered and knowledge-based Traditional teaching mode.

2. Teaching Research on Modular Courses of Organic Chemistry in Colleges and Universities Based on Core Chemistry

2.1. Modular Teaching Strategy for Cultivating Students' Chemistry Core Literacy

2.1.1. Pay Attention to Inquiry Activities and Strengthen "Scientific Inquiry and Innovation Awareness"

In the process of scientific inquiry activities, chemical experiment inquiry activities are a way of acquiring chemical knowledge, and it is also a process of the formation of students' scientific inquiry consciousness. In the process of activity exploration, teachers are often required to guide, discover problems, discuss together with teachers and students, put forward the subject of inquiry around the problem, determine the method of inquiry, conduct practical inquiry, and analyze actual evidence to reach conclusions and solve problems.

In the activities and inquiry process of analyzing the influencing factors of the chemical reaction rate, teachers should not do it in one hand, and directly demonstrate several related experiments. After the students' observation and analysis, the factors that affect the chemical reaction rate can be obtained through evidence reasoning. Teachers should pay attention to the guidance of the process of investigating activities that affect the rate of chemical reaction, and guide students to put forward guesses about the factors affecting the rate of chemical reaction based on life experience and combined with existing experimental experience, and design as many and more persuasively as possible. The experimental plan of the force, through the completion of the experimental operation, the comprehensive analysis of the recorded experimental phenomena, and the conclusion of the activity exploration [11-12].

2.1.2. Create A Situation, Pay Attention to the Value of Learning, and Experience the "Spirit of Science and Social Responsibility"

Chemistry is closely related to the development of social production and other aspects. In the process of chemistry teaching, combining teaching knowledge, rational use of the "Chemistry History", "Expanding and Promoting" and other columns set in the textbook, consciously creating new progress in chemistry-related science and technology, and chemists' arduous

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scientific research road. The relevant teaching situation reflects the educational value of chemistry. Combining the content of the "Investigation and Research" column of the textbook and the topics of the after-school exercises "Investigation and Discussion Type", resources and environment and other related teaching situations, it reflects the application value of chemistry. Through the study and research of chemical phenomena within the reach of students in life, students' learning can be brought closer to life, prompting students to pay attention to chemistry problems in social life, and actively contribute to the health and safety issues of the entire society during the investigation and discussion process.

2.2. Advantages of Modular Curriculum Teaching of Organic Chemistry in Colleges and Universities Based on Chemistry Core Literacy

2.2.1. Strengthen the Professionalism and Systemicity of Teaching Materials

The implementation of module teaching can promote the compilation of thematic teaching materials. According to the different needs of the modules, different teaching contents can be selected to form thematic teaching materials. The module course is a major reform in the construction of textbooks in ordinary colleges and universities, breaking the traditional textbook model classified by chapters, and highlighting the professionalism and practicality of the courses.

2.2.2. Improved Students' Practical Ability

Modular teaching is a teaching mode with the cultivation of students' hands-on ability as the core. It not only emphasizes the transfer of theoretical knowledge, but also emphasizes the application of knowledge. Throughout the implementation of modular teaching, teachers are only participants in the entire learning process rather than the leader. Most of the time is done by students themselves. Through their own hands-on operation, students gradually changed their learning from "want me to learn" to "I want to learn", which greatly improved the students' practical ability and enthusiasm.

3. Organic Chemistry Modular Course Teaching Research Experiment Based on Chemistry Core Literacy

3.1. Questionnaire Design

First, 8 people were selected to conduct a small-scale questionnaire survey to ensure that each question in the questionnaire can be directly understood by the surveyed. Principles of questionnaire preparation:

(1) Purpose principle. Through refining problems, we will not miss the problem so that the information is incomplete, and we will not waste the problem to obtain unnecessary information.

(2) The principle of logic.

(3) The principle of popularity. The important task of questionnaire design is that researchers need to transform theoretical, academic, and professional terms into easy-to-understand language, so that the respondents can understand the questions and be willing to answer them correctly.

3.2. Research Methods

Two classes were randomly selected from an organic chemistry class in a university in this province, one of which was an experimental class and the other was a control class, with 50 students in each class.

This article uses the controlled variable method.

Experimental group: adopt modular course teaching;

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Control group: adopt traditional teaching method to teach.

The experimental class and the control class are two parallel classes. The average scores of the two classes are basically the same, and the knowledge and intelligence are basically the same. The same teacher teaches, different teaching methods, the same teaching content. The teaching time is the same, all for one academic year. In teaching, the practice questions and unit test questions selected in the experimental class are the same as those in the control class, and the same indicators and test methods are used to test both the experimental class and the control class at the same time.

3.3. Data Processing and Analysis

This article uses SPSS 22.0 software to count and analyze the results of the questionnaire, and conduct a t test. The t-test formula used in this article is as follows:

$$t = \frac{\overline{X} - \mu}{\frac{\sigma X}{\sqrt{n}}} \tag{1}$$

$$t = \frac{\overline{X_1} - \overline{X_2}}{\sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}(\frac{1}{n_1} + \frac{1}{n_2})}} \tag{2}$$

4. Experimental Analysis of Organic Chemistry Modular Course Teaching Research Based on Chemistry Core Literacy

4.1. Likeness Analysis

The preference of the students in the two classes for organic chemistry courses was investigated, and the results are shown in Table 1.

Table 1. Preference survey results

Degree	Experiment group		Control group	
	Number	Proportion	Number	Proportion
Like very much	16	32%	8	16%
Like	18	36%	12	24%
General	9	18%	15	30%
Dislike	5	10%	9	18%
Dislike very much	2	4%	6	12%

It can be seen from Table 1 and Figure 1 that the students in the experimental class obviously prefer the organic chemistry course, while the students in the control group are obviously not as fond of the organic course as in the experimental group. There are 34 students in the experimental group who like (including very) organic chemistry, more than half of the class, accounting for 68%. There are only 7 people who dislike and dislike very much, accounting for 14%. Attitudes indicate that there are generally 9 people, accounting for 18%. In the control group, there were 15 students who disliked and disliked organic chemistry very much, which accounted for 30% of the class. There were 15 students who expressed general attitudes, which accounted for 30%. There are only 20 students who like and like organic chemistry very much,

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accounting for 40%. It shows that the organic chemistry modular course teaching based on the core chemistry of chemistry is more attractive to students and can increase students' interest in organic chemistry courses.

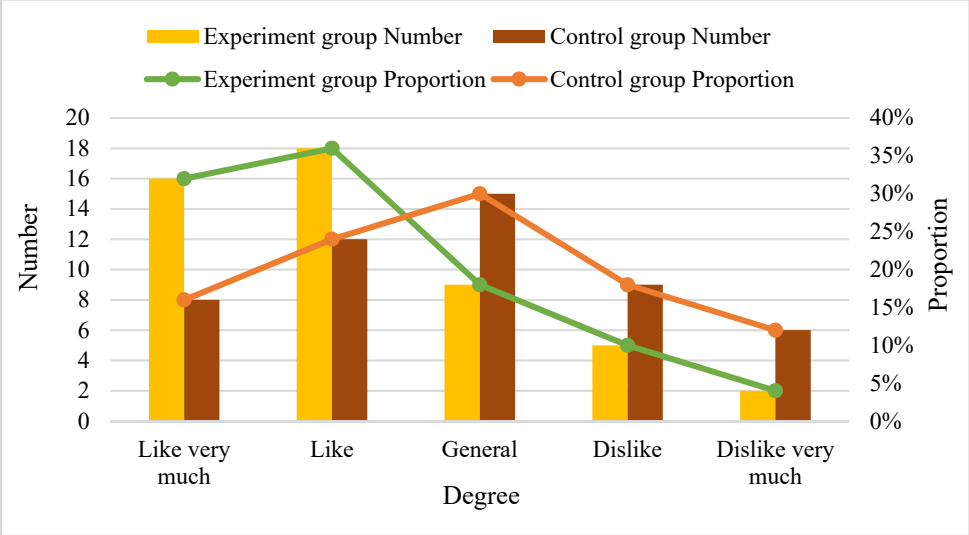

Figure 1. Preference survey results

4.2. Exam Results

The examination questions mainly use practical case questions to examine students. The first semester midterm exam is used as a pretest, and the second semester final exam is used as a post-test.

Table 2. Test score

	Experiment group		Control group	
	X1	X2	X1	X2
Minimum	49.00	54.00	50.00	49.00
Maximum	94.00	95.00	95.00	96.00
Mean	76.34	82.31	76.54	77.68
Std. Deviation	13.43	8.51	12.35	11.64

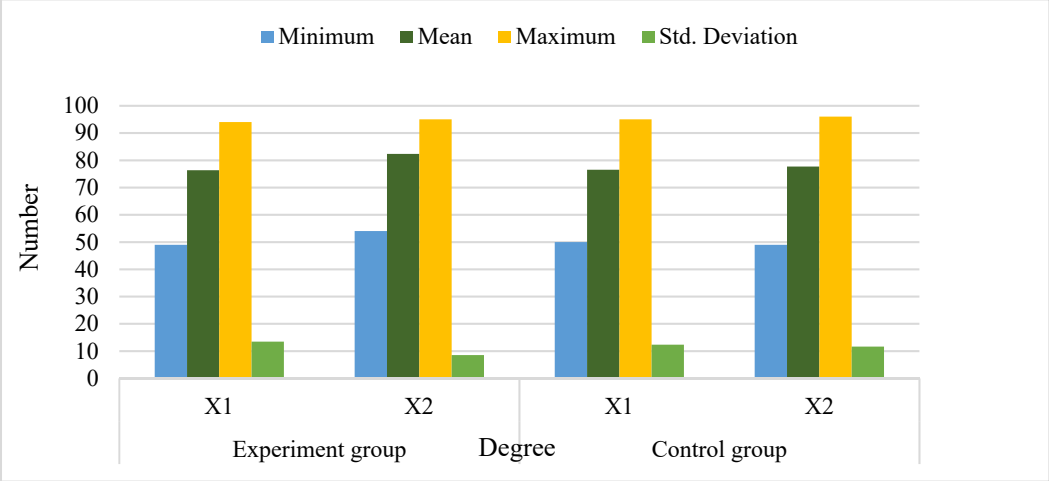

Figure 2. Test score

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It can be seen from Table 2 and Figure 2 that in the pretest (X1), the average scores of the experimental class and the control class are not significantly different (76.34, 76.54), and the passing rates are 85.71% and 88.24%, respectively. In the post-test (X2), the average academic performance of the experimental class was improved by 5 (82.31-77.68) points more than that of the control class, and the teaching effect was significant. In the pretest, the differences in the scores of the two classes in all aspects were not very large, and the average score was almost the same. The passing rate and the excellent rate were also the same. However, after a semester, the students in the experimental class had significantly improved their scores, the average score, and the passing rate. Both are significantly higher than those in the control class, which shows that students' academic performance is closely related to the change of teaching methods—modular teaching based on the core of chemistry literacy.

5. Conclusions

The application of the modular teaching model based on the core chemistry of chemistry in the organic chemistry course greatly improves the enthusiasm and initiative of students in learning, and to a large extent their ability to operate and solve practical problems, and obtain more satisfactory experiments effect. After a year of research and experimentation, it can be concluded that the existing problems in the teaching of organic chemistry should be improved initially. Modular teaching has changed the traditional teaching mode of knowledge transfer as the main and teacher-centered. Through the modular arrangement of course materials and flexible teaching design mode, it has solved the in-applicability of the teaching content that appeared in the teaching of organic chemistry courses in the past. Problems such as single teaching evaluation method and inaccurate role positioning of teachers and students. This teaching mode improves students' learning interest and learning enthusiasm. In the process of implementing modular teaching, the teaching goal of each module is to cultivate students' special skills, and the acquisition of knowledge is mainly based on students' hands-on operation, and the short teaching period of each course module improves students' classroom interest. This teaching mode also cultivates students' hands-on ability and innovation ability. Students can immediately verify the theoretical knowledge learned in the classroom in actual operation, and each course module is composed of multiple small tasks. Under the guidance of the teacher, students find problems, formulate solutions, and finally in practice operations Solve the problem and complete the task. Students have improved their hands-on ability and innovation ability through continuous practice.

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