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Research on the Teaching of Organic Chemistry Theory Courses for Non-Chemistry Majors in Higher Education Institutions

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Abstract: With the development of the era, the teaching achievements and teaching quality of Organic Chemistry theory for non-chemical majors in colleges and universities have been paid more attention by people from all walks of life. Therefore, the theoretical courses in the teaching process need to be adjusted in the trend of interdisciplinary integration to constantly meet the different learning needs of students. This paper mainly starts with the necessity of organic chemistry theory course teaching for non-chemistry majors in colleges and universities, analyzes the current teaching status of organic chemistry theory courses for non-chemistry majors in colleges and universities, and deeply analyzes the teaching path of organic chemistry theory course for non-chemistry majors in colleges and universities, hoping to provide some new teaching ideas for relevant teachers.

Keywords: Non-chemical majors; Organic chemistry; Theoretical courses; Instructional research

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1. Introduction

In the discipline system of higher education, Organic Chemistry is a core course for chemistry and chemical engineering majors, as well as an important basic course for non-chemical majors such as life sciences, materials sciences and environmental sciences. It mainly covers the basic knowledge of organic chemistry, chemical reaction mechanisms and chemical experiment skills. As the country exerts great importance on the development of interdisciplinary disciplines, more non-chemical majors have begun to consciously guide students to learn this course well. Through the study of this course, students will understand the types, structural characteristics and property differences of organic compounds, as well as the mechanism of interaction between different compounds, which will be of great help to students' future development in the cross-disciplinary field, so the teaching of Organic Chemistry is also highly valued. However, in the specific implementation process, colleges found that the whole course has many points of knowledge and a complex structure, which is not easy to master and apply, and it is easy to appear systematic and structural situation. Therefore, teachers need to further study the teaching content and

teaching mode of the organic chemistry theory course, with the main goal of improving students' learning effect and overall teaching quality, and constantly optimizing the corresponding teaching methods.

2. The necessity of organic chemistry theory course teaching for non-chemistry majors in colleges and universities

2.1. It is conducive to building a systematic knowledge structure for students

In the context of the rapid circulation and replacement of knowledge, interdisciplinary integration plays a very important role in promoting social progress and scientific and technological innovation [1]. Organic chemistry, as a subject with a wide range of basic fields, also occupies a very important proportion of non-chemistry majors. Therefore, providing more systematic and structured theoretical teaching for non-chemistry majors can not only broaden their disciplinary vision but also further cultivate their interdisciplinary thinking ability. In addition, by learning organic chemistry theory and other related courses, students can master the structure and properties of organic compounds and their derivatives, and further understand the relevant reaction mechanism. This knowledge structure can effectively train their structured thinking. Therefore, they have a certain chemical theoretical knowledge foundation in contact with subsequent polymer materials, complex biomolecules and environmental pollutants transformation processes [2]. In this way, it can also promote them to flexibly apply the knowledge they have learned and carry out comprehensive analysis in a targeted way when facing practical problems to improve their comprehensive quality.

2.2. It is conducive to optimizing the overall teaching method

With the continuous deepening of educational concepts, the current overall teaching methods in colleges and universities are no longer mainly dominated by traditional teacher-led teaching forms but are more inclined to carry out teaching activities through diversified, personalized and highly interactive teaching forms. The transformation of such teaching forms can not only conform to the development trend of the era, but it can also better meet the differentiated learning needs of different individual students [3]. On the one hand, optimizing teaching methods can improve the overall teaching quality. When carrying out organic chemistry theory courses, teachers can introduce a variety of advanced teaching modes such as inquiry learning and project learning to enrich students' learning experience and enable them to have stronger subjective initiative to participate in the learning process. At the same time, this kind of teaching mode can also improve students' practical ability and teamwork ability, and in the process, it can also make them optimize the application and control of the knowledge. At the same time, these teaching methods will also guide students to think independently and enable them to explore and conduct in-depth research for the corresponding learning tasks to verify the corresponding theoretical knowledge through their efforts to cultivate their innovative ability and problem-solving abilities [4]. On the other hand, multimedia technology and network resources can be used to continuously optimize the overall educational methods. In this way, the more complex knowledge in the course of organic chemistry theory can be presented to students in a more intuitive form, and finally, the abstract and complex knowledge points can be presented more vividly, to continuously improve students' learning interest and the overall teaching quality.

3. Current teaching status of organic chemistry theory courses for non-chemistry majors in colleges and universities

Under the background of the rapid development of science and technology, the demand for non-chemical majors

for organic chemistry knowledge and the requirement for relevant students' knowledge level are also gradually increasing. On the one hand, with the popularization of higher education, the interdisciplinary education mode is also deepening. Since organic chemistry is widely used in life science, materials science, environmental science, and other fields, more and more non-chemistry majors have begun to consciously guide students to learn this course [5]. At the same time, this course can also help students to deeply explore and understand more deep-seated problems in related professional fields. However, as a result, non-chemistry majors do not have a solid chemistry foundation when they face this course. Moreover, the organic chemistry theory course is more complicated, and it's the key and difficult points of knowledge and reaction mechanism are all very difficult for non-chemistry majors, which also brings great influence on teachers' teaching activities [6].

4. Analysis of teaching paths of organic chemistry theory courses for non-chemistry majors in colleges and universities

4.1. Determine the teaching objectives and adjust the knowledge structure

Determining teaching objectives and constructing knowledge overall knowledge as a whole are very important prerequisites in the teaching process of organic chemistry theory courses for non-chemistry majors. By ensuring the integrity and foresight of teaching objectives and knowledge structure, the study provides a clearer teaching direction and lays a foundation for students to build a systematic knowledge system. First of all, the teaching objective is to ensure the starting point and landing point of the general direction of teaching [7]. For non-chemistry students, the teaching of organic chemistry should not only ensure the degree of teaching of chemical theoretical knowledge, but also pay attention to its correspondence with students' professional knowledge, and the value and significance of relevant theoretical knowledge in practical application is also worthy of more attention. Therefore, the teaching goal should be linked with students' basic chemical concepts, ultimately enabling students to build a systematic knowledge system of organic chemistry. They need to have a certain level of cognition of basic theoretical knowledge such as structure and naming, and the laws and mechanisms of chemical reactions, and this knowledge should also have specific applications in their corresponding majors [8]. Only in this way can the teaching objectives be more in line with the learning needs and career development direction of non-chemistry majors. After determining the teaching objectives, course teachers need to adjust the knowledge structure for all the course content that students will be exposed to. The most important point is that teachers need to realize that non-chemistry majors have a weak chemistry foundation, so they should pay more attention to the practicability and foundation of knowledge in the selection of teaching content, and for the knowledge of advanced difficulty, they need to flexibly insert explanations according to the specific learning situation of students [9].

4.2. Integration of scientific research results to optimize teaching content

In the aspect of innovative teaching methods, teachers can integrate the latest scientific research results into the teaching process as teaching resources, and constantly optimize the corresponding teaching content on this basis. Traditional teaching materials mainly introduce the basic structure and related chemical properties of various organic compounds, and rarely integrate teaching in combination with the current chemical research process and research results, resulting in a certain lag in what students learn and a lack of novelty in what they learn. Students' learning thinking is easily restricted. As a result, the overall teaching results of organic chemistry theory courses are characterized by a lack of epochal features [10]. The latest scientific research achievements and

corresponding classic cases of organic synthetic chemistry are introduced and explained to students in detail, thus they can further understand the key direction of theoretical knowledge, to improve their learning enthusiasm and subjective initiative. Therefore, the integration of scientific research results into the organic chemistry theory class can promote the combination of course content and scientific research, truly making teaching and scientific research complement each other and promote each other, to constantly broaden students' horizons, and play a very positive role in cultivating their awareness of scientific research innovation and improving the teaching effect of the organic chemistry theory course [11]. In addition, scientific research results also play a certain role in improving textbook knowledge in the teaching process. The teaching and education used by some schools have a certain lag, which requires course teachers to dig deep into the knowledge content of each course when designing the whole teaching process, pay attention to the development trend of the whole industry to find the difference between it and the scientific research results found in the development of society, and timely display and supplement the teaching process to ensure the integrity of what students have learned [12]. By this means can imperceptibly cultivate students' interest in learning and enhance their awareness of scientific research innovation. In turn, this teaching form can also promote the development of the scientific research process and achieve a two-way promotion.

4.3. Optimize the teaching mode by combining online and offline teaching

4.3.1. Online teaching content

With the rapid development of information technology, online teaching is increasingly widely used in the field of education. Teachers can use the combination of online and offline methods to integrate the knowledge content learned in offline class with online teaching. As an extension of offline class, online teaching can further improve the learning effect of students [13]. Therefore, the design of online teaching and the utilization and rationality of resources appear to be more important, which will also have a certain impact on the implementation effect of blended teaching. For example, online teaching can be carried out from the following aspects:

(1) In terms of teaching resources, integrating high-quality online Organic Chemistry course videos, including classic experiment demonstrations, molecular structure animation, reaction mechanism animation, etc., can make abstract organic chemistry knowledge more intuitive. At the same time, it provides a wealth of electronic textbooks, scanning versions of reference books, and other materials to facilitate students to consult at any time.

(2) Live teaching can be combined with recording and broadcasting, and students can interact in real-time during live broadcasting to answer their questions. Recording and broadcasting are convenient for students to review the key and difficult content.

(3) Set up an online group discussion area to discuss organic reaction mechanisms, compound synthesis routes, etc., to stimulate students' thinking.

(4) Add project-based assessment, such as asking students to design the synthesis scheme of organic compounds and display and explain it online. Through the completion of online tasks and classroom performance, it will also help teachers to comprehensively evaluate students' achievements.

These online teaching measures are expected to improve the teaching effect of Organic Chemistry and enable students to better grasp the knowledge of this important subject in a virtual online environment [14].

4.3.2. Offline teaching content

In the past, offline teaching of organic chemistry theory courses for non-chemistry majors in colleges and

universities would focus more on teacher explanation, and students would carry out classroom teaching mainly by listening to the lecture and taking notes to receive information. This form of classroom teaching can improve students' cognitive level to a certain extent, but it also has obvious defects. On the one hand, it lacks the necessary experiment and interaction links, and students cannot deepen their understanding of knowledge through personal experience. On the other hand, the interaction between teachers and students is poor, and it is difficult for students to get timely and effective guidance and communication when they encounter problems. Taken together, these factors make it difficult for students to truly understand what they have learned [15]. Therefore, teachers should pay attention to the combination of theory and practice, and increase the proportion of experimental operation and case analysis in online classes. For example, teachers can add some experiments such as substance identification and structural analysis to offline teaching, and take this as the main task to guide students to master experimental skills in hands-on practice and deepen their understanding of the basic principles of Organic Chemistry. This form can not only improve students' participation in classes but also promote communication and feedback between teachers and students to continuously optimize the teaching effect.

5. Conclusion

Under the background of the rapid development of the current era, the theoretical knowledge course of Organic Chemistry offered by non-chemistry majors in colleges and universities is also facing the urgent need to keep pace with the era. This requires that the course must constantly optimize its teaching content so that it can keep up with the development of the frontier of the subject, and timely the latest scientific research results and new subject knowledge skillfully integrated into the daily classroom teaching. At the same time, the continuous improvement of teaching methods is crucial. It is necessary to actively change traditional teaching concepts, always adhere to the student-oriented principle, and accurately determine the teaching objectives that meet the actual needs and development of students. In addition, colleges should fully combine online and offline teaching forms with their respective advantages to create a diversified and comprehensive teaching model. Through such comprehensive reform, it can continuously cultivate students' awareness of organic chemistry, stimulate their learning interest in organic chemistry, and encourage them to explore relevant knowledge more actively to effectively improve their independent learning ability. Finally, to achieve the goal of improving the comprehensive quality of students, so that students can better adapt to the requirements of the development of the era for talents.

Disclosure statement

The authors declare no conflict of interest.

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