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Research on the Innovative Teaching Practice of the Organic Chemistry Course in Turning Classroom Teaching Mode

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***Abstract*—In view of the shortcomings in the traditional teaching mode of the organic chemistry experimental course, the feasibility of applying the turning classroom teaching mode to the organic chemistry experiment course was analyzed. In the teaching practice, a questionnaire survey method was used to explore the teaching process design, content organization, implementation of teaching activities, the change of roles and roles of teachers and students as well as teaching effects from the perspective of empirical research. The results show that based on the new teaching model of turning classrooms, students' learning initiative and creativity can be improved, and students' chemical professional qualities can be enhanced, which has a strong practical significance.**

Keywords—Innovative Teaching Practice; Organic Chemistry Course; Turning Classroom; Teaching Mode

I. INTRODUCTION

"Turning Classroom" is the background of Bohai University in deepening the new classroom teaching reform era, based on the objectives of college talent training in the new era, combined with the advantages and disadvantages of traditional classroom teaching and the discussion about teaching mode in colleges and universities, and the problems existing in current classroom teaching in colleges and universities.[1] A new classroom teaching model centered on cultivating students' thinking ability, innovation ability and practical ability, has achieved good results in the pilot practice of the whole university and has begun to gradually promote the teaching process reforms of other universities in China. [2]

The university organic chemistry course is mainly for chemistry, chemical engineering, pharmaceuticals, bioengineering, biotechnology, gardening, agricultural facilities and other related majors. It is one of the professional basic experimental courses that complement the study of organic chemistry experiment courses. Students in the organic chemistry experiment course are conducive to their understanding and consolidation of the organic chemistry theory in class, and have a solid hands-on ability in organic chemistry experiments, operating common sense, and laboratory specifications, which will lay a solid foundation for future scientific research or experimental work. In order to change the shortcomings of "passive acceptance of the students" in traditional organic chemistry experiment teaching, and to achieve the goal of students' transformation from simple "knowledge accumulation" to "smart improvement", we are making full use of existing experimental teaching equipment and resources. In combination with modern information technology, the teaching reform of turning classroom teaching was carried out in an organic chemistry course for students majoring in applied chemistry. Practice shows that by adopting the new classroom teaching model, it is possible to effectively avoid the drawbacks of the "instillation" experimental teaching model that occurs in traditional organic experiment teaching, and greatly stimulate students' enthusiasm for learning organic chemistry experiments and in-depth scientific research.

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II. THE NECESSITY OF INNOVATIVE TEACHING PRACTICE IN ORGANIC CHEMISTRY COURSES

In the history of education, the relationship between teachers and students has always been a problem that educators have enthusiastically explored. In teaching, whether it is "teacher-centered" or "student-centered" is an important disagreement between traditional education ideas and modern education ideas. One of the main drawbacks of traditional teaching is the neglect of the emotional communication between teachers and students in the teaching process and the students' emotional activities. The process of teaching activities is a process of passive acceptance in the form of "teachers speaking and students listening". Therefore, by changing the traditional teacher-centered teaching model of "one-time teaching", "one-way teaching" and "full-filling teaching", we can fundamentally realize the transition from "teacher center" to "student-centered". To achieve this transformation, the key lies in the concept of teachers and the implementation of the curricula.

Teachers should first change from "speaking" to centering on "study" of students; change from single type, absolute authority type to multi-energy type, and behavior-led type; teaching activities should be changed from theoretical training to practical teaching; from demonstration the shift from teaching to applied teaching; shifting the focus of teaching to teaching methods, cultivating students' self-learning and creative abilities. Therefore, when teachers deal with teaching materials, they should integrate the content of the repetition or commonality in the textbooks, and put forward a self-study outline for the part that is suitable for students' self-learning,

leaving them to self-study. Today, vigorously promoting lifelong education and the cultivation of students' learning ability are of great significance.

The traditional knowledge-centered concept of the quality of education is centered on disciplines and places emphasizing too much on the purposeful function of knowledge in school education, which makes it almost the only purpose of school education. This kind of discipline-centered and knowledge-based education cannot meet the needs of future social development in the current social context. Therefore, in order to realize the transition from a "knowledge center" to a "capacity-based" approach, we must correctly handle the relationship between knowledge and competence.

The highest purpose of education is to develop students' abilities through knowledge education. It can be said that knowledge is not only the purpose of education, but also a means to promote students to develop in a "capacity-based" direction. Therefore, we must focus on cultivating students' abilities in classroom teaching, not just instilling knowledge. According to the university's personnel training objectives, from the perspective of training ability, it breaks through the content system of traditional textbooks and makes targeted adjustments to the content of teaching. If the content of olefins and alkynes is removed, they are combined into one chapter as unsaturated hydrocarbons. The organic compounds such as amino acids, proteins, nucleic acids and carbohydrates are combined into one chapter. First, commonality and characteristics are discussed.

"Acceptance education" is an education based on the acceptance and inheritance of knowledge; "Innovation education" is an education based on inheritance and the unity of inheritance and innovation for the purpose of innovation. To cultivate innovative talents, we must reform the education model of imparting knowledge, and establish a new teaching model that combines knowledge transfer with exploration and research.

Human beings engaged in any innovative activities cannot be separated from the accumulation of certain knowledge. Mastering knowledge is an important goal of human education. "Accepting education" is an education aimed at learning and mastering the rich civilization achievements accumulated in human society for thousands of years. It is a kind of knowledge education oriented to the past and based on inheritance. This type of education is the educational foundation and logical starting point proposed by China's innovation education. Therefore, in university studies, we must follow the principle of integrity and treat all kinds of knowledge as interrelated wholes. In the teaching of organic chemistry, students are required to systematically study the structure, nature, mutual transformation and internal relations of various types of organic compounds, so that students have a more systematic and comprehensive understanding of the content of organic chemistry, master the basic theory of organic chemistry, basic knowledge and basic skills. For example, on the basis of molecular structure, students are instructed to infer the nature of compounds, characteristic reactions, reaction history, preparation methods, etc., to understand the new scientific achievements and new developments related to the course; to improve students' ability to analyze problems and solve problems; to cultivate students innovative spirit and practical ability. It will lay the necessary foundation for learning the follow-up courses and further mastering new scientific and technological achievements. Therefore, innovation education is not a negation of "acceptance education" but an inheritance and development of "acceptance education.

III. The Content of Turning Classroom

Constructivism believes that knowledge is not learned through the direct teaching of teachers, but learners use the help of others, namely, teachers or learning collaborators in certain situations to use existing learning materials and prior knowledge and experience. The process of actively participation is constructing a new knowledge system, and ultimately the formation of a new personal knowledge system. Constructivist learning theory emphasizes the dynamics of knowledge in the view of knowledge. Knowledge is not an absolute final standard. Students can reconstruct the relationship between old and new knowledge based on their existing knowledge and experience background. The student's view emphasizes the initiative of the learner and believes that learning is not a simple transfer of knowledge from the teacher to the student. The student is not a passive receiver of information, but is the subject of information processing. It is the active constructor of the knowledge system. Students use their existing learning materials, knowledge and experience explain new knowledge, new phenomena, and new connections, so as to form personal learning significance. In addition, constructivism emphasizes the collaborative nature of learning. Learners need teachers' guidance, help, and cooperation with other learners. Teachers are the promoters and collaborators who help learners construct knowledge connections, and collaborate to collect and organize learners' data. The formulation and verification of problems and the final construction of learning results all have important roles.

"Transformation" is the transfer of classroom teaching ideas and teaching methods, including the "transition" of classroom teaching, from the traditional classroom teaching of imparting knowledge as a center to training students' thinking skills, innovation abilities, and practical hands-on skills. The "competence"-centered classroom teaching encourages students not only to bury themselves in the knowledge of books, but also to focus on the reflection, innovation, and application testing of knowledge. The "transfer" of classroom teaching methods refers to the traditional duck-feeding and indoctrination methods. Inspired by inquiry methods and discussion methods, teachers are no longer "in one voice", emphasizing the active construction of student learning; the "transformation" of classroom teaching has changed from being a teacher to being a student and teachers being a student.

"Movement" is the classroom teaching requirement and teaching goal, including the teacher-student relationship with students, through the grouping or other forms of collaborative research to achieve "interaction", to achieve the purpose of students mastering and understanding knowledge; guide students to "brain" thinking and "hands-on" practice, and then achieve the purpose of learning to use knowledge.

There are first class and second class points in classrooms that turn classrooms. The first classroom is divided into 6:4 proportions of the curriculum schedule, 60% of the hours are used for classroom instruction, and 40% of the hours are used to train students' individual learning ability. The second classroom divides the classroom teaching time of the first classroom according to the ratio of 6:4. 60% of the time is spent on teachers' fine explanations and answers to the knowledge. 40% of the time is spent on teacher-students, students-students interactive communication and students practice.

TABLE I. COMPARISON BETWEEN VARIOUS ELEMENTS OF TRADITIONAL CLASSROOMS AND TURNING CLASSROOMS

Teaching mode	Traditional classroom	Turning classroom
Teaching form	Classroom explanation + post-class consolidation exercises	Pre-learning + classroom inquiry interaction + after-class use
role of student	Passive learner	Active inquiry questioned
role of teacher	Knowledge imparter and classroom leader	Learning guide, promoter, and service provider
Study before class	Prep or not	Search data, reading materials
Classroom content	Knowledge explanation and teaching	Explain key difficulties, interactive exploration and actual use

IV. THE CHARACTERIZATION OF TURNING CLASSROOM

Whether it is in class or after class, turning classrooms places the comprehensive ability of students in the first place and the center, leaving enough extracurricular and class time and space for students. Teachers are more likely to act as mentors and guides. The role of the teacher is to stimulate students' interest in learning and help students form a good learning motivation. Students can choose their own interests, hobbies and personalities according to the situation they have created. They can choose to study new issues or find solutions to problems, supplement and correct one-sided understanding, and acquire new knowledge. The correct connection of old knowledge and independent construction of a more complete knowledge system should be developed, so as to achieve the goal of cultivating students' independent thinking ability, innovation ability and practical ability, reflecting the characteristics of the student's subjectivity.

Turning classrooms have subverted traditional indoctrination methods taught by teachers. Students are the main body of the classroom and teaching process. They do not passively learn and receive new knowledge any longer, but actively think about it, raise new issues, and explain new phenomena. Therefore, compared with the traditional lesson preparation process, the proportion of teachers in preparing textbooks, students as well as teaching methods for their teaching has changed a lot. In turning classrooms, teachers need to have enough classroom teaching presuppositions and wisdom in the face of students' questions and possible emergencies. At this time, only the teachers who have profound academic professional qualities, a solid theoretical foundation for teaching, and the knowledge can give satisfied answers to students' doubts and problems. In the teacher-student interaction and student-student interactive classroom teaching situation, students can achieve their own learning goals. Teachers can also be well trained in teaching and learning, and both the teachers and students can work together to build good mutual influence and mutual promotion of interpersonal relationships.

In the teaching of turning classrooms, under the guidance of teachers, students can choose their own learning methods according to their own interests, hobbies and personalities. This basically achieves students' independent learning and personalized learning, which are conducive to mobilizing the active learning of students and inspiring them. Students form good learning motivation, improve learning efficiency, and actively respond to new phenomena and new problems they encounter, thereby enhancing the learning outcomes. The teacher can also grasp the student's learning progress and learning level as a whole based on the feedback and questions raised by the students after class, further develop targeted and effective teaching, truly solve doubts and difficulties in student learning, and guide and correct students one-sidedly. The recognition will improve the students' learning effect and help them build the knowledge system of self-directed learning.

V. THE INNOVATIVE TEACHING PRACTICE OF THE ORGANIC CHEMISTRY COURSE IN TURNING CLASSROOM TEACHING MODE

Teachers carefully design learning-related materials, formulate teaching objectives and tasks, and construct learning files such as micro-video, audio, PPT, and text. Students are required to make full use of the Internet and other resources to read and inquire, and guide students to conduct in-depth pre-class autonomy.

The self-study before class is the key to turning the classroom. Success depends on whether the classroom activities can proceed smoothly. Students perform in-depth self-study before class according to teaching objectives and tasks. According to the requirements, one by one, they can interpret the content of the study and mark the difficult points, in this way, the students can discuss with each other or ask the headmasters. The doubts that cannot be solved will be sent back to the teacher through QQ, We-Chat, email, and other ways to obtain timely answers. This will help students to choose their own learning time and achieve personalized learning. Teachers can effectively adjust and formulate experimental teaching plans, goals, and schedules in real time. In this way, the traditional "perfusion" experimental teaching model has achieved reversal, and has achieved self-directed learning and transformation from "teacher indoctrination to student acceptance" to "self-learning by students—discovery problems—teachers guide problem solving". In classroom teaching mode, classroom activities are a process of internalization of knowledge. In the classroom, the teacher goes deep into the middle of the students, organizes students to conduct collaborative explorations, group discussions, and complete homework assignments to provide students with targeted guidance. Through self-study, students take the initiative to enroll in the class or the teacher randomly selects students to lecture on the platform. They give lectures on the principle and mechanism of the preparation, demonstrate the installation of the reaction device, and other students listen carefully to the speech and ask questions interactively. It is also possible for other students to get on the platform to make

corrections and comments, and to correct existing problems. After a full range of interaction between students, they can find out the problem and solve the key difficulties or problems, and finally the teacher is supposed to review, sum up, enhance the students' self-study knowledge before class to deepen and consolidate students' knowledge.

Next, the student installs the device according to the correct operation and conducts the experiment. Through teacher-student role interchange and full-scale interaction, students can fluently implement all the steps of the experiment, greatly improving students' hands-on ability and efficiency, and deepening their impressions. Basically, teachers do not need to repeatedly emphasize experimental considerations, and students can concentrate more. In the recording of experimental phenomena and the study of problems, the teachers discussed and directed the students for new problems, guided students to think positively, proposed better improvement programs, and encouraged students to carry out experimental design verification in the second classroom. After the end of the experiment, teachers responded to the questions with more feedback, led the students to sum up, and sort out the learning objectives and tasks.

After class, students learn how to use knowledge. On the one hand, the problem design under the teacher's class should be closely related to the content of the classroom professor, and it should focus on the key and difficult points of knowledge, so that students can purposely preview new knowledge and inspire students to think critically. Continuously strengthen students' practical hands-on and thinking skills that they need for real life, focusing on the overall development of students. On the other hand, in extra-curricular classrooms, teachers should teach students according to their aptitude, pay attention to the individual differences of students, meet the needs of different students and answer questions for students so that each student can achieve innovation and personality development. Students can innovate their own learning framework in order to deepen their understanding of knowledge.

VI. SUMMARY

To sum up, it is necessary to strengthen the reform and construction of university organic chemistry curricula. As an educator, it is important for us to update concepts, construct a reasonable course teaching content system, and attach great importance to the cultivation of abilities in the teaching process. Only in this way can we effectively improve the quality of curriculum teaching, and ultimately achieve the cultivating goal of higher education, and cultivating qualified high-technology talents for the country's economic construction.

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