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Reform of Inorganic and Analytical Chemistry Course Teaching Model in Biology Major under the New Situations

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Abstract: Inorganic and analytical chemistry is a compulsory basic course for students majoring in biology. The goal of this course is to provide them with the necessary chemical knowledge and experimental skills and to lay the foundation for the subsequent professional courses. This study explores the teaching model reform of inorganic and analytical chemistry teaching for non-chemistry majors according to the current situation, hoping to explore a suitable course teaching model for biology majors by optimizing teaching content, stimulating students' interest, and improving teaching methods.

Keywords: New situation; Teaching mode; Biology major; Inorganic and analytical chemistry

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1. Introduction

The first compulsory basic chemistry course for undergraduates majoring in biology is inorganic and analytical chemistry [1–2]. This course includes the basic theories and basic analytical methods of inorganic chemistry and analytical chemistry, aiming at building students' ability to choose appropriate analytical methods to solve problems according to practical problems. With the continuous emergence of new knowledge and technology and the rapid development of life science, chemistry plays an increasingly prominent role in life, study, and research, and plays a vital role in cultivating innovative biological science talents. Therefore, when it comes to the reform of the teaching mode of inorganic and analytical chemistry, there are several key points worth considering. Traditional classroom teaching methods may have limited students' learning effects, such as the lessons are too complicated for students to grasp in time [3–4]. Some new teaching means and methods can be considered to solve this problem, effectively mobilize students' enthusiasm for learning, and achieve good teaching results.

2. The main problems of inorganic and analytical chemistry courses in the background of biology major

2.1. Students' chemistry foundation varies greatly

The reform of the new college entrance examination is an important reform measure in China's education sector, aiming to promote the concept of quality education and the comprehensive and personalized development of students. For students majoring in biology, they may not be required to take chemistry courses in high school, leading to differences in students' basic chemistry knowledge understanding [5]. Schools in different regions may have differences in teaching content, teaching methods, and teacher quality, which also makes it difficult for students to find interest in learning in the traditional classroom teaching process, which adds great difficulty for the teachers to teach this course [5].

2.2. Lack of initiative of students

Inorganic and analytical chemistry is an important basic course with extensive and complex content, which is usually offered in the first semester of freshman year. When students just enter the university campus, they are easy to lose interest in learning the difficult courses, which leads to the weakening of their enthusiasm and initiative in learning, and cannot adapt to the learning environment well [5]. In addition, students have insufficient understanding and knowledge of the course and lack certain attention and motivation. This cognitive deviation leads to students' low input into the course, unable to give full play to their potential, and studying only to cope with the exam, without really understanding and mastering the core content of the course.

2.3. Fewer course hours

This course includes not only the teaching content of inorganic chemistry but also the knowledge of analytical chemistry [1, 6]. The course is very rich, involving a wide range of knowledge fields, such as basic concepts, principles, and technologies, but due to the limited teaching time, the teachers can only introduce the core content, unable to explain the details in depth. If the students do not do a full preview, they cannot keep up with the teacher's ideas and explanations in class, resulting in them not fully mastering the knowledge learned.

2.4. Boring class

This course mainly adopts the traditional classroom teaching model, which lacks interaction between teachers and students, so it is difficult to stimulate students' learning interest and enthusiasm. This teaching model cannot meet the individual learning needs of students, and it is difficult for students to actively think and explore with this teaching model [5]. The teachers try to teach in various forms such as group discussion and interaction, but there are still students who are not interested. In the long run, the lack of communication in the classroom and students' unwillingness to participate in the teaching process would result in poor classroom results and teaching quality. Therefore, a variety of modern teaching methods and various teaching techniques are used to guide students to learn by asking questions, thinking about problems, and solving problems. Teachers should integrate a variety of teaching resources, encourage students to actively participate in the classroom, and improve students' participation in the classroom and learning effect, to explore a set of student-centric, efficient, and feasible new classroom teaching models. Thus, this can stimulate students' thinking ability and innovative consciousness, cultivate their problem-solving ability and teamwork spirit, improve students' learning effect and participation, and lay a solid foundation for future development.

3. Innovation of teaching methods and means

With the development of information technology, video-based teaching has gradually become an important direction for the integration of information technology and teaching models [7]. Network resources have become the main way for college students to obtain knowledge in the new era [4]. The new Internet-based teaching breaks through the limitations of traditional teaching in terms of resources, distance, and scale, and pushes multimedia network teaching to the world. Digital technology can effectively serve classroom teaching, improve teaching efficiency, improve the quality of classroom teaching, and improve the personalized degree of teaching, the importance and value of the integration of information technology and education can be reflected, which is also a profound reform of information technology in the field of education.

3.1. Optimize the teaching method based on the biological background

Teachers can make full use of laboratory resources, conduct recorded teaching, and combine the characteristics of biology majors so that students can understand chemical principles and experimental techniques in a variety of ways and deepen their understanding and interest in curriculum knowledge [8]. For the knowledge already learned in middle school, they can take the form of a flipped classroom, and ask students to prepare presentations of no more than 5 minutes in advance to explain and present in class, encourage students to participate in interactive and group cooperative learning, and stimulate students' thinking, communication and cooperation ability. In addition, when explaining knowledge related to the biology major, it is necessary to point out the importance of this knowledge and attract students' attention [5]. For example, when explaining the basic knowledge of chemical reaction rate, some charts, diagrams, animations, and other auxiliary tools are used to help students understand chemical concepts and processes [9]. For example, the catalytic reaction of enzymes is further introduced to understand the characteristics and regulatory mechanisms of enzyme-catalyzed reactions in organisms. The theoretical knowledge of inorganic and analytical chemistry is closely linked with biology to provide basic and theoretical support for students to understand professional courses such as the interaction between organisms, signal transmission, drug design, and protein engineering.

3.2. Improve teaching methods to stimulate students' interest

By stimulating and mobilizing the enthusiasm of students, teachers can effectively enhance students' cognition of the course and interest in learning by making students clear about the teaching objectives, key and difficult knowledge, and effective learning methods [10]. The introduction period is effectively integrated into the mind map of the whole course so that students know and understand what knowledge and skills will be learned in the course and have a clear plan and expectation for future study [11]. Teachers can share some interesting practical cases and applications in class to demonstrate the importance of chemistry in everyday life, such as "What is the hard residue in the kettle at home? How do I remove it? What is the cleaning process?", "What is the main ingredient in common stomach medicines? How does the medicine relieve stomach pain?", and other common knowledge in life. Teachers can effectively integrate real situations, stories, or problems as introductions so that students can learn goals and stimulate learning interest. Multimedia teaching is mostly adopted in modern classrooms. Teachers ask students to collect relevant materials, such as short stories, videos, and so on, in advance to understand the teaching content to be carried out in this class. In class, certain charts and images, application examples and cases, experiments and demonstrations, group discussions, interaction, creative gamification learning, and other methods are used. By transforming boring theoretical knowledge into a more attractive and acceptable form, students' learning interest and active initiative can be stimulated, thus improving students' understanding and retention of knowledge, and promoting participation and exploration in the learning

process.

With the promotion of "Internet +" by digitization and informatization, smart classrooms have become an innovative result of the integration of emerging technologies and education. Through the integration of advanced technologies such as multimedia technology, cloud computing, and big data analysis, many new teaching models such as MOOC, flipped classrooms, rain classrooms, and other platforms have sprung up and been widely used [12–13]. The efficient combination of these teaching models provides teachers and students with more flexible and rich learning experiences. Teachers can quickly create interactive classes through mobile phones or tablet computers, share teaching resources, courseware, and exercises in time, and collect students' answers and feedback for immediate assessment. It can also realize that the student side can simultaneously study the lesson from the teacher's perspective, highlight the knowledge that they do not understand, and use the platform to express their opinions and doubts, so the teacher can give immediate feedback to improve the teaching quality [5]. Compared with the traditional classroom, the micro-class model has a complete design and presentation, which provides personalized learning services for learners. It is a teaching model of student-oriented video-based hybrid learning that integrates information technology, which can effectively stimulate students' interest in learning, improve students' participation and enthusiasm in class, and thus promote the development of curriculum teaching reform [14].

Micro-class combines teaching theories and emphasizes the student-centric design principle from three levels of audio-visual communication, teaching ideas, and psychological feelings [15]. It supplements traditional classroom teaching, provides students with an extracurricular review, checks for omissions and makes up for deficiencies, flipped classroom, and offers new knowledge to meet students' personalized learning needs. The basic process is as follows: teachers assign learning tasks; group members divide their work to collect data; presentations or videos are prepared; lecture in class; student communication and discussion; teachers answer questions face to face; summary by group members; summary by the teacher [14]. This teaching method can not only promote the cooperative communication and teamwork ability of group members but also change the role of students from passive acceptance to active exploration of knowledge.

3.3. Comprehensive assessment

The comprehensive curriculum assessment and evaluation system also follows the principle of being student-centric, which can stimulate students' interest and enthusiasm in learning at various stages, including before class, during class, and after class. The traditional assessment mainly focuses on the final examination results, ignoring the process assessment and evaluation of students' learning. Therefore, the comprehensive assessment is the current mainstream assessment way. The final examination score accounts for 50%, and the process assessment score accounts for 50%, including the assessment of preview (5%), attendance (5%), answering questions (10%), homework (10%), and staged examination (20%). This comprehensive evaluation system can evaluate students more objectively, fairly, and impartially, which helps to improve the quality of teaching.

4. Concluding remarks

Freshmen need to cultivate their learning interests, self-learning ability, and learning habits when they just enter the campus. As a key basic course for biology majors, the theoretical knowledge of this course is abstract and complex, and the teaching hours are relatively short. Therefore, the teachers should adapt to the professional background needs to ensure that offline teaching and online personalized learning complement each other and the integration of teaching and discussion. This can further improve the participation of students in the learning process, from the teaching content, teaching model, teaching methods, and other aspects of the course teaching

reform and exploration, thus mobilizing the enthusiasm of students and improving the quality of teaching and teaching effect. Teachers should constantly explore and improve the teaching model of inorganic and analytical chemistry course theory teaching in the biology major background by introducing the "Internet +" teaching method and constantly promoting the discipline construction to enhance student's learning interest and stimulate their learning enthusiasm.

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