

Practice and Application of Multi-element Teaching Method in the Bilingual Teaching of Pharmaceutics

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Abstract: The implementation of bilingual teaching in pharmaceutics can enable students to improve their professional English level based on professional knowledge, and it is an important means to help students to adapt to the trend of international development. However, the pharmaceutics course is highly comprehensive and has many knowledge points, the language barrier in bilingual teaching may further lead to the decline of students' ability to understand professional knowledge, and the traditional teaching methods are faced with severe challenges. In this study, flexible and diversified teaching methods have been implemented in classroom teaching, after-class review and assessment. Pharmaceutical talents have been trained with autonomous learning ability, teamwork spirit and professional English communication ability. In addition, ideal teaching results have been achieved through the teaching reform.

Keywords: Pharmaceutics; Bilingual Teaching; Classroom Teaching; Review after Class; Assessment Mode; Multi-element Teaching Method

1. Introduction

In the context of the pharmaceutical industry's globalization, pharmacy professionals should not only be able to adapt to the needs of local pharmacy work, but also have a worldwide perspective and the ability to connect with overseas colleagues [1]. As a result, higher education in pharmacy must create talents that are adept in both professional knowledge and a specific level of professional foreign language ability. Bilingual instruction in pharmacy courses can increase students' professional foreign language skills, laying the groundwork for them to continue their studies overseas after graduation, conduct scientific research,

and grasp industry dynamics and development. Therefore, the establishment of bilingual teaching in pharmacy is vital and extremely crucial.

Since 2019, the Pharmaceutics Department of the School of Pharmacy at Guangdong Pharmaceutical University has been in charge of teaching English in Pharmacy International Class (3+1 Undergraduate Dual Degree). Therefore, our department has taken advantage of the opportunity to offer undergraduate pharmaceutics courses bilingually. The pharmaceutics knowledge system is complex and includes many concepts, and the language barrier in bilingual training may reduce students' understanding of specialized information, offering serious challenges to typical teaching methodologies. Using previous experience with bilingual teaching in other areas [2-6], we evaluated alternative teaching strategies for bilingual pharmaceutics teaching (Figure 1).

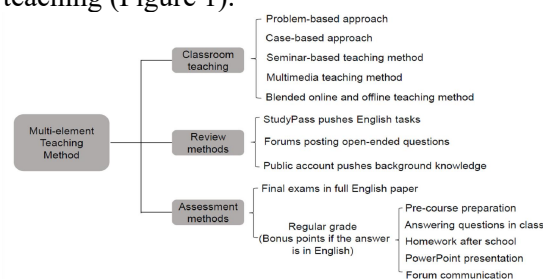


Figure 1 Construction Scheme of Multi-element Teaching Method in the Bilingual Teaching of Pharmaceutics

2. Preparation for Teaching

2.1 Selection of Textbooks

It is critical to select proper textbooks so that students may accurately acquire professional knowledge while also learning professional English for pharmaceutics. In the early stages of teaching, the main textbook is Ansel's Pharmaceutical Dosage Forms and Drug Delivery System, which is flawless in terms of

language, but it is pricey, clinically oriented, and does not correspond to our university's curriculum. Furthermore, comprehensive adoption of the original English textbook will cause reading difficulties for the students, which is detrimental to the absorption of professional knowledge [7, 8]. As a result, beginning with the academic year 2020-2021, the English textbook *Pharmaceutics* (People's Health Publishing House, edited by Shirui Mao) has been used as the main textbook. The Chinese textbook *Pharmaceutics* (People's Health Publishing House, edited by Liang Fang) serves as a complement. Because the contents of these two textbooks are nearly identical, they may be utilized as a Chinese-English textbook, making it easy for students to study in class as well as pre-study and review after class.

2.2 Course Preparation

The students of the international pharmacy class will study abroad in the first semester of their senior year. While the majority of them have passed IELTS and have a solid English foundation, they still have some difficulties in understanding professional English. Some students rely too much on Chinese textbooks, creating a mismatch between foreign language acquisition and professional knowledge, which is against the intended goal of bilingual teaching. To improve the effectiveness of bilingual education, teachers must prepare well before class [9, 10]. They will list the key specialized vocabulary with explanations in Chinese and English one to two weeks before the lesson and upload them to the resource area via Study Pass. At the same time, teachers will publish bilingual teaching materials on Study Pass, such as PPTs and teaching videos for the corresponding chapters, and remind students to conduct pre-study. If there is anything they don't understand after previewing, they can leave feedback on the Study Pass, and the teacher will collect it all and address questions in class. Through previewing, students will no longer be unfamiliar with the key vocabulary in the classroom and will have a better understanding of professional knowledge, which will help to improve classroom teaching effectiveness.

3. Classroom Teaching

The bilingual teaching mode makes teaching

more difficult to some extent, so the teaching approach is very crucial. The use of problem-based, case-based, seminar-based, multimedia teaching, online and offline blended teaching, and other diverse teaching methods in the classroom can have a multiplying effect.

3.1 Problem-based Teaching Method

In the introduction process of the new course of bilingual *pharmaceutics* teaching with an English problem, it is beneficial for the teacher to seamlessly transition into the emphasis of teaching, as well as to increase students' passion for learning. For example, when teaching the sterilization and aseptic operation chapter, ask the question "How to evaluate the effect of sterilization?" to introduce the concept of " F_0 value". This question emphasizes the key word "sterilization" in the chapter and prompts students to consider the meaning of the F_0 value. The question of which sterilization process is more effective, "121°C for 15 minutes" or "115°C for 30 minutes" in moist heat sterilization, is further raised. This will allow students to try to understand the concept of F_0 value from the perspective of solving practical problems, so increasing their enthusiasm for active learning. When teaching the chapter of targeted preparations, the question "Why do you need targeted drug delivery systems?" triggers students to think about the difference between targeted preparations and conventional preparations. After teaching each chapter, the teacher will post pertinent questions in English on Study Pass, which students can respond in either English or Chinese, allowing students to summarize and organize the key points and challenges of each chapter in a timely and bilingual manner.

3.2 Case-based Teaching Method

Pharmaceutics is the primary subject for pharmacy-related degrees, distinguished by excellent synthesis and extensive knowledge coverage. To help students understand the course topic more thoroughly, case-based teaching approaches must be introduced. When teaching the chapter on injections, the "Xinfu incident" was brought up: on July 24, 2006, some patients in Xining, Qinghai Province, developed serious clinical adverse reactions such as chest tightness, palpitations, panic, anaphylactic shock, and so on. Other provinces

and areas later reported the discovery of severe clinical adverse responses, including chest tightness, palpitations, fear, and anaphylactic shock. Other provinces and regions followed suit, reporting similar incidents. There were a total of 11 deaths reported nationwide. The main cause of this adverse event was that the Xinfu injection was not sterilized in accordance with the permitted process parameters, resulting in a lower sterilization temperature, shorter duration, and increased cabinet loading capacity. The medication was sterilized at 105 °C for 30 minutes. However, the manufacturer took the liberty of decreasing the sterilization temperature to 100 to 104 °C and shortening the sterilization period to 1–4 minutes. The teacher directs the students in calculating the F_0 values before and after adjusting the process parameters using the formula. Students can have a better understanding of a concept and a greater appreciation for its significance by using practical examples. At the same time, students will be motivated to better understand the systematic theory and method of sterilizing technology. When teaching the chapter on delayed and controlled release preparations, students were given the example of "Lipusu": in January 2003, paclitaxel liposome (Lipusu) was approved for marketing in China. Lipusu is the world's first and only approved paclitaxel liposome, and it is a Chinese brand with fully independent intellectual property rights. Compared with Taxol, the traditional paclitaxel injection, Lipusu has much less adverse reactions and has a market share of 77.8% among the three major paclitaxel medicines, Lipusu, Taxol and Abraxane. Students are then guided to think about liposomes as a new type of drug carrier, including their functional properties, the materials used in their composition, and the techniques of preparation. Through the explanation of new drug R&D cases, the introduction of the course is well realized, allowing students to consider the benefits of the new preparation over the traditional preparation. Local brands with entirely independent intellectual property rights boost students' self-confidence in pharmacy, increase their enthusiasm in studying, and create the groundwork for future research into novel formulations.

3.3 Seminar-based Teaching Method

To encourage students' initiative in learning, some chapters are taught in seminar mode, in which students are divided into groups, search for literature on specific topics, prepare PPTs, and then explain them in class while accepting questions from other students and comments from teacher. After teaching the chapter on solid dosage forms, students were allowed to choose a marketed solid preparation for research; after teaching the chapter on injectables, each student was allowed to independently select a marketed injection for research. Through the investigation, students have a more comprehensive understanding of drug dosage form design, preparation process, and clinical applications. Students can also freely explore, mutual cooperation, and cultivate the spirit of teamwork. Furthermore, through the lectures on stage, students can experience the fun of lecturing, which not only deepens the understanding of basic knowledge, but also cultivates the students' self-study. Seminar-style teaching encourages students to "use what they have learned", which is better suited to igniting students' interest and deepening their investigation and pursuit of knowledge.

3.4 Multimedia Teaching Method

Pharmaceutics knowledge points are scattered, and multimedia courseware all for English further increase the learning difficulty, so the visualization of multimedia teaching is critical. The courseware can include more arrangements for flow charts, flash, video, and other content. When teaching the chapter on targeted preparations, the author first showed students classic clips from the film "I am not the God of Medicine" and began with imatinib (Gleevec) to introduce the concept of targeted drugs, and then introduced the concept of targeted preparations, which was a very good way to realize the course's introduction. When teaching injections, students are shown a live video of vitamin injection preparation to help them remember the technique.

3.5 Online and Offline Blended Teaching Method

The online teaching platform is built on the Superstar online teaching platform. Teaching PPTs and exercise libraries are uploaded to the online platform to create an effective

personalized learning environment. The excellent teaching videos on the Mooc website of Chinese universities are selected and recommended to students, so that students can use their spare time to do pre-study and post-study, and can better master the knowledge points that are difficult to understand in the full English classroom, which can help to improve the students' learning efficiency. The online teaching platform can improve communication between teachers and students by allowing students to contact teachers at any time to solve any problems they may be experiencing via the Study Pass. Teachers make full use of the limited offline hours to maximize the teaching effect while also introducing some research results on the frontiers of pharmaceuticals in order to increase classroom teaching interest.

4. Reviewing Method

The typical lecture teaching approach in the university classroom requires students to memorize knowledge points and notes while passively accepting the knowledge supplied by teachers. As a result, students lack subjective initiative, which is detrimental to skill development. As a result, teachers should take the lead position and use a variety of approaches so that students can learn to review independently and on time. After each chapter of the course, teachers use Study Pass to push the chapter's English practice questions to encourage students to review their basic knowledge. Some open questions on the teaching subject are presented in the Study Pass forum, and students are encouraged to actively discuss them in order to improve their innovative thinking skills through the collision of diverse students' ideas. Use the public account "pharmacy classroom" to share some background knowledge. For example, before teaching the chapter of modern Chinese medicine preparation, push the background knowledge of ancient classic traditional Chinese medicine preparation such as pills, dans, creams and dispersions, so that the students can realize the important part of the motherland's medical heritage and stimulate patriotism of the students. Before teaching the chapter of ointment, push the formulation and preparation process of erythromycin ointment and Qingliang oil, which are commonly used in life, in order to attract students through real-

life examples and cultivate the ability of the students to connect theory with practice. It enhances students' enthusiasm in learning pharmaceuticals, strengthens the growth of students' habit of reviewing after class, and fosters interaction and communication between professors and students outside class.

5. Assessment Methods

We abandon the practice of evaluating students solely on the basis of curriculum and textbook knowledge, instead increasing the process assessment, increasing the proportion of the usual grade in the comprehensive assessment. The final examination is in full English paper, which mainly examines the students' mastery of professional knowledge, and the usual grades are obtained through pre-study, classroom questions and answers, PPT presentations, and post-course assignments, which are graded according to the students' participation and performance. Furthermore, in order to enhance students' motivation to learn professional foreign languages, students who use English to answer questions or give presentations will be given extra points.

6. Conclusions

The key to bilingual teaching is to strike a balance between foreign language learning and professional learning. As a result, bilingual teaching should be more active in terms of extensive communication between teachers and students, and teachers should communicate with students before and after class in order to appropriately adjust the proportion of English and Chinese used in classroom lectures based on the degree of difficulty of the professional knowledge and student feedback. A student-centered teaching ideology should be established, diverse teaching methods should be used to improve learning outcomes, and a bilingual teaching mode that is consistent with international advanced teaching concepts should be actively pursued.

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