Application of the Smart Vocational Education Cloud Platform in Pharmaceutical Chemistry Teaching

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Abstract: This paper explores the application of the Smart Vocational Education Cloud Platform in pharmaceutical chemistry teaching, focusing on reforms in student analysis, textbook selection, construction of learning resource libraries, utilization of teaching modules, and post-class evaluation. The implementation of these reforms has enhanced students' self-learning ability, practical skills, exploratory and analytical abilities, as well as communication and teamwork skills, proving valuable in the pharmaceutical chemistry classroom.

Keywords: Smart Vocational Education, Pharmaceutical Chemistry, Cloud Platform, Teaching Reform

1. Introduction

Smart Vocational Education is a powerful online education platform developed in recent years, incorporating rich teaching resources, advanced teaching technologies, and convenient teaching management functions. Whether for theoretical knowledge or practical operations, Smart Vocational Education offers abundant resources that enable students to learn more flexibly and autonomously, thus improving learning outcomes.

Pharmaceutical chemistry is an interdisciplinary subject that encompasses the study of chemical drugs from various aspects, including chemical structure, preparation methods, physicochemical properties, structure-activity relationships, biological effects, metabolism in the body, and chemical changes during formulation and storage. Additionally, it includes the pathways and methods for new drug development. Based on chemistry, pharmaceutical chemistry integrates biochemistry, pharmacology, pharmacokinetics, and computer science, while closely interacting with pharmaceutics, drug analysis, chemical pharmaceutical technology, drug design, and pharmaceutical management. These disciplines collectively form this crucial applied science, playing a significant role in the field of pharmacy[1].

Since the outbreak of COVID-19 at the end of 2019, pharmaceutical chemistry courses have adopted a blended online and offline teaching approach. The use of the Smart Vocational Education Cloud Platform allows teachers to monitor students' learning progress in real-time, dynamically analyze their grasp of knowledge points, and greatly assist in achieving diverse teaching methods in the future.

2. Analysis of Teaching Objects and Textbook Selection

This study targets second-year students in the pharmaceutical production technology program at our college, covering a 48-hour course combining theoretical teaching and in-class experiments. The teaching process fully considers students' existing knowledge and skills, cognitive and practical abilities, and learning characteristics, aiming to integrate the concept of "job, course, competition, and certification" throughout the teaching process. Based on the national practicing pharmacist exam syllabus and the characteristics of the main work areas for graduates of the pharmaceutical profession, the course structure is determined: focusing on commonly used drugs and representative drugs of various types, supplemented by other related content. The chosen textbook is the fourth edition of "Pharmaceutical Chemistry," edited by Liu Wenjuan and published by China Medical Science Press, which is rich in content and detailed in case analysis, suitable for student learning.

3. Construction of Learning Resource Library

Overall, the Smart Vocational Education Cloud Platform's teaching model is based on "big data." This data-driven teaching resource profoundly impacts education, promoting the transition from a single-

dimensional to a multi-dimensional teaching process[2]. Utilizing these resources in a blended teaching approach benefits both students and teachers significantly.

The course resource library includes 68 reference video resources, 134 self-made courseware (document) resources, 389 total exercises, and 62 interactive topics, currently only open to faculty and students of our college. The details of the course resources are shown in Table 1.

Table 1: Pharmaceutical Chemistry Course Resource Information

Course Materials and Learning Information		Quantity
Video Resources	Total Quantity	68
Self-made Courseware (Documents)	Quantity	134
Assignments	Total Number of Exercises	389
	total Number of Activities	8
	Number of Participants	234
Number of Online and Offline Activities	Number of Teacher Task Releases	20
	Interactive Topics (Quick Response, Thematic Discussions, etc.)	62
	Student Participation Rate	86.23
Class Information	Total Number of Classes	6

3.1 Overview of Teaching Resources

3.1.1 Video Resources

The video resources are sourced from China MOOCs and other platforms such as Youku and Douyin. According to the analysis of students' learning preferences, most students show a strong interest in visual and auditory stimuli. Thus, videos have become a primary medium for them to acquire knowledge. For example, in the section on antihypertensive drugs, there are four video resources, including two videos explaining the pathogenesis, a video lecture from China Pharmaceutical University's Medicinal Chemistry MOOC, and a video on the dangers of hypertension.

Through the Wisdom Vocational Education Cloud Platform, teachers can comprehensively monitor the video-watching progress of students within the same class. Most students complete the video-watching assignments well. This allows teachers to implement differentiated instruction based on students' completion status during classroom teaching. Therefore, video resources have become the second-largest component of the course material after document resources. As shown in Figure 1.
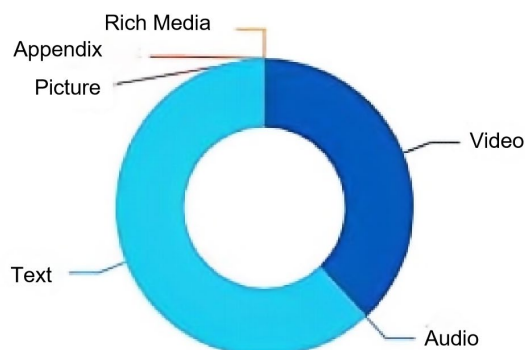

Figure 1: Proportion of Resources in the "Medicinal Chemistry" Course

3.1.2 Self-made Courseware (Document) Resources

This section does not include video resources but focuses on providing original courseware, covering PPT presentations, case documents, and in-depth analyses of key knowledge points. For specific topics, online video cases can be used as an introductory tool to stimulate students' interest. This is followed by the analysis of organic chemical structures, combining the synthesis routes, physical and chemical properties of drugs with their mechanisms of action, aiding in the understanding of difficult points. Additionally, supplemental content such as pharmaceutical professional public accounts and clinical rational drug use is pushed to students to help them deepen their memory beyond classroom theory, accumulating experience for exams like pharmaceutical technician and national professional pharmacist certificates.

3.2 Homework and Question Bank Resources

Based on the students' actual situations, the types of assignments are varied, including question bank assignments, group assignments, and social practice assignments.

Question bank assignments mainly consist of objective questions aimed at consolidating declarative knowledge. To build a high-quality course question bank, content from the National Licensed Pharmacist Examination is introduced. Some questions in the question bank are directly selected from the national licensed pharmacist exam questions, particularly focusing on the pharmaceutical professional knowledge section. This provides a solid foundation and preparation for students to take the licensed pharmacist exam in the future. After each chapter, a mock exam is conducted, including single-choice questions, matching questions, and multiple-choice questions. The difficulty of the exam is appropriately adjusted, with a time limit of 15 minutes and the number of questions ranging from 20 to 50, randomly selected by the system from the question bank. Figure 2 shows the completion status of question bank assignments for a certain class in this course.
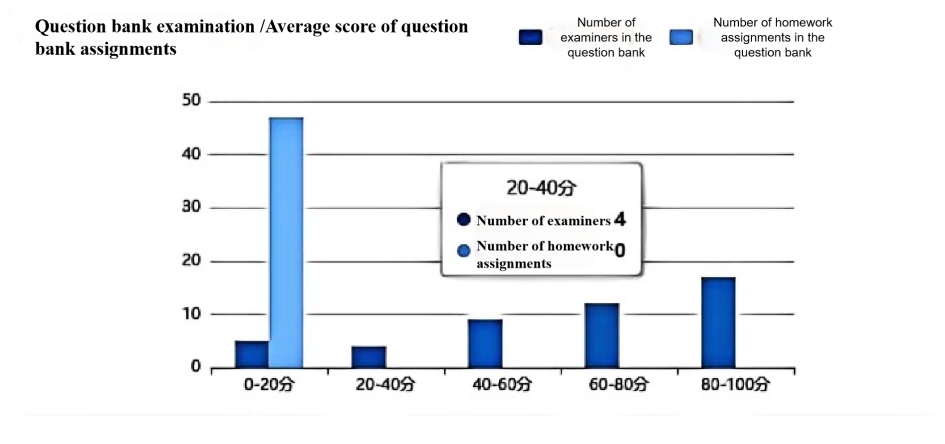

Figure 2: Participation and Completion of Question Bank Assignments for a Certain Class in the Medicinal Chemistry Course

3.2.1 Group Assignments

Group assignments focus on case analysis, with students working in groups and encouraged to use online resources, libraries, and other sources to find answers. For example, in the antibiotics chapter, students were assigned a topic discussion on the harms of antibiotic abuse. The students showed high enthusiasm, with each group submitting a literature review report of over 200 words. This approach achieved excellent results, especially during online teaching periods.

3.2.2 Social Practice Assignments

Social practice assignments emphasize extracurricular expansion, where teachers propose questions and guide students to collect information and engage in practical activities. For instance, students were asked to investigate the different types of Vitamin B, their structural similarities and differences, by visiting pharmacies or participating in on-campus pharmacy simulations. The submission results indicated that the completion rate of this social practice assignment exceeded expectations. In some classes, over 80% of students actively completed the task. This practice model not only significantly increased the enthusiasm of both teachers and students but also markedly enhanced student engagement in classroom learning, laying a solid foundation for further improvement in teaching quality.

4. Utilization of Teaching Modules

4.1 Pre-class

After setting up the course and enrolling students, pre-class preparations can begin. This involves importing various necessary resources, links, and exercises into the course design for easy access. Before class, teachers assign pre-study tasks, providing a variety of course resources and clearly requiring students to preview the material, watch instructional videos and presentations, and participate in thematic discussions, as shown in Figure 3. After assigning these tasks, teachers can directly check the completion status of pre-study tasks on the platform and award scores based on the quality of student performance, which will contribute to the final assessment.
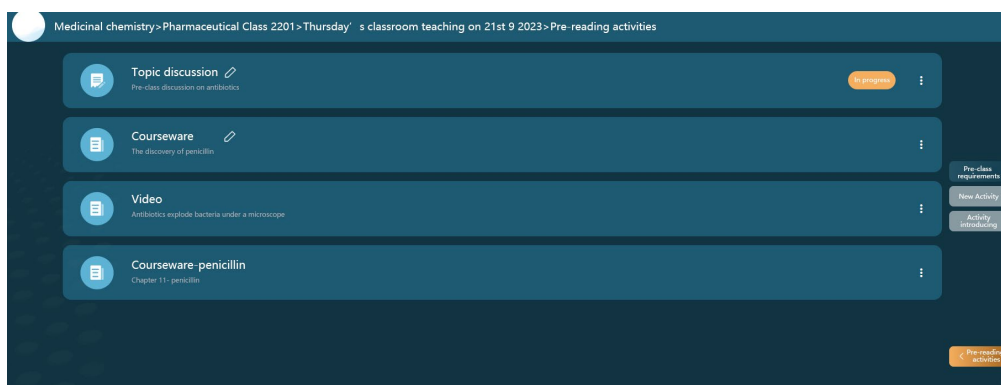

Figure 3: Pre-class Assignment for a Specific Lesson

4.2 In-class

Modules such as attendance check, voting, questioning, discussion, group PK, and quizzes are specifically applied during the course implementation. The attendance check records students' daily attendance, serving as an essential reference for their regular grades and ensuring class attendance. The questioning module selects students randomly or assigns them to answer questions, enhancing classroom interaction and maintaining order while guiding students to stay focused. Interactive sessions like discussions, voting, and group PK stimulate students' enthusiasm and increase their participation. The quiz module is popular among teachers and students as it allows immediate assessment of students' grasp of the lesson content, helping to reinforce what they have learned. The entire interactive segment is designed to last within five minutes, after which the teacher provides feedback and summaries before proceeding with in-depth explanations and assigning corresponding homework before the class ends.

By effectively using the Intelligent Vocational Education Platform, teachers can pay more attention to students at all levels, especially those who are more introverted or temporarily lagging in academic performance [3]. This platform offers timely and targeted guidance and assistance, fostering effective communication between teachers and students and promoting the improvement of teaching quality and comprehensive student development.

4.3 Post-class

The post-class teaching of the Intelligent Vocational Education platform serves as a comprehensive evaluation of students' learning outcomes, helping students consolidate classroom knowledge and providing teachers with direct feedback on students' learning status. The post-class teaching on the platform offers evidence for subsequent adjustments and optimizations of teaching strategies. Teachers can flexibly use functions like courseware review, assignment discussion, online testing, student evaluations, and self-assessment to comprehensively grasp teaching effects.[4]

After using the Intelligent Vocational Education platform, it was found that students' learning modes had changed significantly. They are no longer limited to classroom learning but can choose the time and place to learn theoretical knowledge and content based on their needs, utilizing shared online resources. This approach breaks the constraints of traditional teaching models on students' learning progress [4-5]. However, teachers should remain vigilant in this change, ensuring not to overly rely on informational teaching methods while acquiring students' learning information. Whether in classroom teaching or post-

class tutoring, teachers should actively engage in face-to-face communication with students [6], continuously evaluating and providing feedback on classroom teaching. Collecting student opinions, addressing potential issues and negative phenomena, and promptly making diagnoses and improvements are essential to ensure teaching quality and effectiveness.

5. Post-class Evaluation

One distinctive feature of the Intelligent Vocational Education platform is the post-class evaluation module, which stands out for its real-time, intuitive, and simple characteristics. This mechanism allows teachers to score and provide written feedback on each student's classroom performance, while students can also evaluate teachers post-class with star ratings and written descriptions. After the course ends, teachers can customize assessment weightings based on courseware learning, classroom activities, homework, and tests, incorporating students' daily classroom performance into the overall course assessment. The system automatically calculates student grades based on the coefficients and weightings set by teachers, ensuring the objectivity and comprehensiveness of the evaluation results.[5]

6. Summary

Utilizing the "Intelligent Vocational Education" platform for educational reform can effectively enhance students' interest in learning and comprehensively improve their overall quality. Implementing information technology in teaching reforms can direct students' attention towards classroom teaching, adding vibrancy and enjoyment to the class. Additionally, it significantly strengthens interaction and communication between teachers and students, boosting teaching efficiency and quality.[6]

In summary, adopting advanced cloud platform technology can markedly enhance the learning experience for students, an aspect often overlooked in traditional teaching methods. In traditional teaching models, students may face learning difficulties due to subjective or objective factors. However, cloud platform technology, through innovative learning approaches, makes learning more engaging and extends it beyond the classroom, enabling anytime, anywhere teaching and learning. This innovation addresses previous shortcomings, providing students with excellent learning conditions.

Acknowledgement

References

[1] Yu Weiguo. Medicinal Chemistry [M]. Third Edition. Henan: Henan Science and Technology Press, 2022.
[2] Zhang Jing, Weng Tao, Wei Yinping. Application of the Intelligent Vocational Education Cloud Platform in Clinical Pharmacology Teaching [J]. Pharmaceutical Education, 2021, 37(5): 63-66.
[3] Gao Zhenyu, Xiang Min. Reflections on Introducing Mobile Cloud Teaching into the "Basic Pharmaceutical Services" Course for Vocational Pharmacy Majors [J]. Examination Weekly, 2017(73): 16-18.
[4] Wang Laizhi, Deng Changchun, Yuan Liang, et al. Reform and Practice of the Flipped Classroom Teaching Model Based on Cloud Learning Platform [J]. Laboratory Research and Exploration, 2018, 37(8): 234-237-249.
[5] Qiu Chunrong. Constructing a Learning Environment for Vocational Education Integrating Cloud and Physical Classrooms [J]. Vocational and Technical Education, 2018, 39(2): 49-54.
[6] Wang Qiang, Huang Wen, Zhou Weixiao. Application of Cloud Classroom in Anesthesiology Teaching [J]. Guangxi Medicine, 2018, 40(4): 484-485.