Construction of “Drug Chromatographic Analysis” Course Based on OBE Concept

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Abstract. Drug chromatography analysis is an important course in pharmaceutical related majors. This article adheres to the outcome based education (OBE) concept, student-centered, and explores the construction of a course on drug chromatography analysis. Guided by output oriented teaching objectives, through learning situation analysis, adopting a blended online and offline teaching method, integrating multi-dimensional teaching methods, deepening teaching content reform, and establishing diversified evaluation methods to reform the curriculum. The results provide a new and effective approach for the construction of drug chromatography analysis courses.

Keywords: Drug chromatographic analysis; teaching; education; reform.

1. Introduction

The OBE (Outcome based Education) educational philosophy is an educational model centered on expected learning outcomes, emphasizing student centeredness, highlighting student subjectivity, and focusing on the expected abilities that students acquire through the educational process [1]. Based on the OBE concept and centered on cultivating innovative pharmaceutical professionals, exploring and practicing the content, teaching methods, and evaluation methods of pharmaceutical related courses can improve the quality and effectiveness of pharmaceutical professional talent cultivation, promote the rapid development of pharmaceutical majors and disciplines, and lay the foundation for cultivating pharmaceutical innovative talents with both theoretical knowledge and practical skills [2]. As an important course in pharmaceutical related majors, drug chromatography analysis is mainly used to cultivate students' knowledge of drug quality control and mastery of drug analysis techniques. The construction of a drug chromatography analysis course based on the OBE concept is of great significance for the cultivation of pharmaceutical analysis talents in the new era.

2. Methods

2.1 Questionnaire investigation

The questionnaire function of the Learning Pass software is used to analyze the learning situation. The content of the questionnaire survey includes students' understanding of the knowledge taught in the course, their opinions and suggestions on the teaching method, their learning attitude, what knowledge and skills they possessed before studying drug chromatography analysis, and their interest in the course.

2.2 Revision of teaching syllabus

In the newly revised teaching syllabus, reset the course objectives. The course objective is to cultivate students with the concept of comprehensive quality control of drugs, the ability to correctly establish chromatographic analysis methods for in vitro and in vivo quality control of various drugs, and the ability to use chromatography and its combination technology to control the quality of drugs.
2.3 Reform of experimental methods

The virtual simulation experiment teaching project is a new experimental teaching model formed by deeply integrating educational information technology with traditional laboratory teaching[3]. Using a virtual experimental platform, modify the experimental content in the course to determine the ethanol content in traditional Chinese medicine using gas chromatography.

2.4 Research feedback teaching

Taking Guizhou Province's authentic medicinal materials as an example, relevant content such as quality control, pharmacokinetics research, and metabolomics research will be introduced into teaching and reflected in the assessment.

2.5 Online and offline blended learning

Interacting through learning resources and enhancing online learning through mobile phones, making the classroom truly interactive. Online learning involves a series of processes such as watching videos, completing tests, researching materials, and answering critical questions, with a focus on team and project learning[4,5]. Offline teaching: students answer questions, teachers provide feedback, classroom discussions, and knowledge expansion.

2.6 Reform of assessment methods

Assessment forms include tests, assignments, and exams. The exam includes an online mid-term exam and an offline final exam. Assessment includes process evaluation and summative examination. The content includes quality analysis of authentic medicinal materials in Guizhou Province and related questions on improving professional skills.

3. Results

3.1 Analysis of learning interests

Learning interest is an important driving force for active learning. Conduct interest surveys on students majoring in traditional Chinese medicine cultivation and identification, as well as traditional Chinese medicine resources and development, through the Learning Pass software. The results are shown in Fig. 1. It was found that the majority of students were interested in the course content.
3.2 Analysis of learning attitudes

The questionnaire survey function of the Learning Pass software was used to analyze students' learning attitudes, and the results are shown in Fig. 2. The course encourages students to engage in active learning through self-directed learning methods.

![Fig. 2 Learning attitude survey results, A:diligence and progress, B:active learning, C:passive learning, D:lazy](image)

3.3 Analysis of course understanding level

Analyze students' understanding of the knowledge taught in the course through the questionnaire survey function of the Learning Pass software. The results showed that 6.9% of students fully understood the course, 51.7% of students were able to understand the knowledge points in the classroom, 27.6% of students were able to understand the course content after review, and 13.8% of students had a basic understanding of the course knowledge. No students expressed a lack of understanding of the content of the course on drug chromatography analysis.

3.4 Integrating scientific research into teaching

*Acorus tatarinowii* and *Rhizoma Gastrodiae* are authentic medicinal herbs in Guizhou. In the course of drug chromatography analysis, take these two medicinal materials as examples to explain the quality control of medicinal materials, pharmacokinetic research, and other content. Especially in the chapter on in vivo drug analysis, provide examples of the processing process of biological samples. Encouraging students to apply for and construct research projects is an important aspect of integrating research into teaching. Students can apply their knowledge to practice in innovation and entrepreneurship projects for college students. At present, the guiding students have presided over two scientific research projects, which respectively involve the research on the preparation process of in situ gel for *Acorus tatarinowii* nose and the research on the preparation process of *Campanumoea lancifolia* (Roxb.) Merr fruit enzyme, a unique resource in Guizhou. Students demonstrate great interest and initiative in learning during the construction of scientific research projects. Meanwhile, during the experiment, students can rethink the knowledge learned in the course of drug chromatography analysis and summarize it. As a highly practical course, integrating scientific research into teaching has profound significance in drug chromatography analysis. Meanwhile, through participation in scientific research projects, students can improve their experimental skills and innovative thinking.
3.5 The application of virtual simulation experiments

Using a virtual experimental platform, modify the experimental content in the course to determine the ethanol content in traditional Chinese medicine using gas chromatography (Fig. 3). The hybrid teaching mode that combines online and offline based on simulation platforms has become a focus of research and application in teaching modes[6]. Through a virtual simulation experimental platform online, problem oriented human-machine interaction is achieved to deepen understanding of corresponding accident scenarios and enhance experimental skills. The hybrid teaching mode based on virtual simulation platform, as the current mainstream teaching method, has certain advantages compared to other traditional education methods. Through virtual gas chromatography experiments, students can understand the structure and principle of gas chromatographs.

Fig. 3 Virtual simulation platform for gas chromatography

3.6 The construction of a course mind map

The main content of the drug chromatography analysis course is to use chromatography technology to control the quality of drugs. Before learning about drug quality control knowledge, one should first master drug standards. As a national drug standard, the content of the Chinese Pharmacopoeia is crucial for the control of drug safety and efficacy. The in vitro quality control of drugs mainly includes drug identification, inspection, and content determination. The identification of drugs refers to the determination of the authenticity of drugs, which is the primary task of drug quality control. The impurities in drugs mainly come from the production process and storage process of drugs. Whether impurities in drugs are reasonably and effectively controlled directly affects the controllability and safety of drug quality. The methods for determining drug content include titration analysis, spectroscopic analysis, chromatographic analysis, and biological analysis. Chromatographic analysis method is the preferred method for drug formulation analysis. Traditional Chinese medicine is a precious resource in our country, therefore traditional Chinese medicine analysis has become a part of the traditional Chinese medicine content in the course of drug chromatography analysis. If only chemical factors are considered and the changes in the body are ignored, the quality control of drugs is not comprehensive. The content of in vivo drug analysis mainly includes the absorption, metabolism, distribution, and excretion of drugs. Finally, the modern drug chromatography analysis section includes some cutting-edge technologies, such as high-performance liquid chromatography, chiral drug analysis technology, capillary electrophoresis technology, and chromatography-mass spectrometry technology. Drawing mind maps can help students gain an overall understanding of course knowledge, making it easier to form a knowledge framework and aid in memory retention. The mind map of the drug chromatography analysis course is shown in Fig. 4.
4. Conclusion

In summary, The construction of drug chromatography analysis courses based on OBE is particularly important for the cultivation of pharmaceutical talents in the new era. Based on the analysis of the system's learning situation, new course objectives are proposed, and a blended online and offline teaching method is adopted to integrate scientific research into teaching. By establishing a mind map to strengthen students' understanding of course content, it is an effective measure to improve teaching quality.

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References


