Education Reform and Development, 2025, Volume 7, Issue 5
https://ojs.bbwpublisher.com/index.php/ERD
Online ISSN: 2652-5372
Print ISSN: 2652-5364

Research on the Development and Application of an Undergraduate Organic Chemistry Micro-course based on Cloud Platform

Liping Zhang*

Jilin Business and Technology College, Changchun 130000, Jilin, China

**Author to whom correspondence should be addressed.*

Abstract: In the era of "Internet +", micro-courses have injected vitality into the teaching reform of organic chemistry courses in colleges and universities, which not only promotes the sharing of high-quality Internet education resources and the connection of industry and teaching content, but also optimizes the connection of teaching inside and outside the class to meet the personalized learning needs of students, so as to improve the quality of teaching. This paper expounds the necessity of developing organic chemistry micro-courses under the cloud platform, clarifies the principles for the development of organic chemistry micro-courses, and proposes to explain the cutting-edge scientific research results of the industry in micro-courses, record the organic chemistry experiment micro-courses, establish the micro-course resource base and collect the cloud platform micro-course data, in order to improve the development and application quality of undergraduate organic chemistry micro-courses.

Keywords: Cloud platform; Organic chemistry; Micro class; Development principles; Application path

Online publication: May 29, 2025

1. Introduction

Organic Chemistry is the core course for college chemistry, chemical engineering, biology and other majors. Relying on the Internet, the cloud platform provides a large number of high-quality courseware, experiment videos, and exercises for the course of Organic Chemistry, laying a good foundation for the development and application of micro-lessons. Organic chemistry teachers in colleges and universities should base on the cloud platform, adhere to the principles of individalization, serialization and systematization, develop micro-lessons according to the main and difficult points of teaching, record micro-lessons of organic chemistry experiments carefully, and dynamically explain the experimental steps of organic chemistry, strengthen students' memory of experimental steps and principles, and improve their experimental operation ability.

2. The necessity of the development of undergraduate organic chemistry micro-courses based on a cloud platform

2.1. It is conducive to promoting the docking of industry and subject teaching

The cloud platform has established an open and interactive online education system, offering educators access to a wealth of premium teaching materials. It also facilitates the incorporation of advanced scientific research findings, emerging technologies, and innovative materials in organic chemistry into bite-sized micro-lessons. This approach not only bridges the gap between industry advancements and academic instruction but also enhances curriculum content and fosters students' creative thinking [1]. Additionally, the concise nature of micro-lessons allows for the effective presentation of various organic chemistry modules, strengthening the linkage between key concepts. This helps students grasp essential organic chemistry principles, empowering them to apply this knowledge to real-world challenges, thereby improving their problem-solving skills and supporting their academic development while elevating the overall quality of talent cultivation [2].

2.2. It is beneficial for students to carry out personalized learning

In the cloud platform model, university organic chemistry instructors can design tailored and specialized micro-lessons for students based on the distinct features of majors, disciplines, and academic years. These micro-lessons, varying in themes and types, cater to students' learning requirements, enabling them to independently preview and review course materials. This approach assists students in overcoming learning obstacles and enhances their capacity for self-directed learning [3]. Furthermore, the enriched content and precise explanations within these micro-lessons allow students to repeatedly view them, helping to refine key learning points. This not only boosts their motivation for autonomous learning but also encourages deeper exploration into organic chemistry concepts and cutting-edge scientific research achievements, ultimately fostering students' innovation and scientific inquiry skills.

2.3. It is conducive to improving the teaching quality of courses

The integration of micro-courses with cloud platforms offers significant benefits for the innovation of teaching methods in organic chemistry experiments. This approach enables students to simulate and experience the organic chemistry lab environment online, assisting them in accurately remembering experimental procedures, enhancing their operational skills, and ultimately contributing to the improvement of overall teaching quality in Organic Chemistry. Instructors can utilize the cloud platform to upload and regularly update micro-course resources related to organic chemistry, thereby supporting students' self-directed online learning. Additionally, teachers can track students' learning progress and understanding of micro-course content, allowing for the development of more effective offline teaching strategies. By addressing students' knowledge gaps and helping them grasp key concepts, this method promotes a higher level of scientific learning quality, fostering a mutually beneficial scenario for both teaching and learning in Organic Chemistry classes [4].

2.4. It is conducive to innovative course teaching methods

University organic chemistry instructors should proactively gather high-quality educational resources on cloud platforms. They should choose excellent presentations, experiment videos, and exercises that align with the textbook's key concepts, meticulously create micro-lessons, and utilize these micro-lessons to establish a "link" between in-class and out-of-class instruction. This helps to effectively connect pre-class, in-class, and post-class teaching, forming a closed-loop teaching model that supports innovative approaches in organic chemistry

education and enhances the course's teaching quality [5]. Furthermore, the cloud-based organic chemistry micro-course combines theoretical and experimental knowledge points, explaining them through textual effects, slow-motion replays, and mind maps. This approach better aligns with students' cognitive patterns, engages multiple senses, fosters an immersive learning environment, and ultimately establishes an efficient organic chemistry classroom.

3. Principles for the development of undergraduate organic chemistry micro-course

3.1. Principle of personalized teaching

University and college instructors in organic chemistry should embrace the principle of personalization when creating micro-lesson resources. Firstly, they need to design these micro-lessons by considering factors such as the students' major, textbook content, and learning capabilities. This approach caters to the diverse learning requirements of students across various academic stages and disciplines, thereby enhancing the overall quality of micro-lesson creation [6]. Secondly, educators should produce theme-specific micro-lessons aligned with the teaching material. By doing so, they can emphasize key video teaching points, define clear objectives for micro-lessons, enable students to independently search for relevant online resources, boost their enthusiasm for learning, reinforce their understanding of organic chemistry theory, experimental procedures, and other critical knowledge areas, and ultimately elevate both the efficiency and quality of their course studies.

3.2. The principle of systematization

The creation of an undergraduate "Organic Chemistry" micro-course using a cloud platform should follow a systematic approach and focus on establishing an "organic chemistry" micro-course platform. This platform can be divided into several functional modules, including micro-course assessment, learning progress tracking, and data analysis. These modules enable instructors to promptly obtain data such as the download rates of micro-lessons and student feedback, allowing them to adjust teaching materials dynamically and effectively leverage the benefits of micro-lessons in organic chemistry education. Furthermore, during the development of these micro-lessons, teachers should appropriately manage the connection between organic chemistry theory and laboratory instruction, clarifying the relationships among key concepts. This helps students enhance their overall knowledge framework and deepen their comprehension of specific topics, ultimately contributing to improved course quality [7].

3.3. Principle of serialization

College educators ought to perform an in-depth evaluation of the Organic Chemistry textbook's content, identify the core aspects of unit instruction, and subsequently develop micro-lessons centered on the critical and challenging elements of teaching. This approach supports the organization of teaching resources into series, promotes modular teaching strategies, and assists students in quickly grasping the essential concepts of each unit. It also enables them to understand the interrelation between organic chemistry principles and their practical applications across different domains. By enhancing students' specialized knowledge base, their overall competence can be effectively elevated [8]. At the same time, teachers should integrate cutting-edge scientific research results in the development process of micro-course, promote the connection between subject content and scientific research results, promote the connection of knowledge inside and outside the class, highlight the advantages of the design of micro-course, further stimulate students' interest in learning, to improve the quality

of digital teaching reform of Organic Chemistry.

4. The application path of undergraduate organic chemistry micro-course based on cloud platform

4.1. The micro-course will explain the cutting-edge scientific research achievements of the industry and expand the teaching content

Teachers should actively promote the connection between organic chemistry courses and industrial development, use micro-lessons to introduce cutting-edge scientific research achievements in the field of chemistry, and show the great achievements made by Chinese chemists. This not only broadens the scope of teaching content but also integrates ideological and political education. It helps nurture students' qualities, including promoting scientific thinking, striving for excellence, adhering to factual accuracy, a spirit of contribution, and patriotism. Furthermore, it fully utilizes the educational significance of the subject. First, Teachers can gather the latest scientific research advancements in organic chemistry from Platform B on Weibo, with an emphasis on the accomplishments of the Shanghai Institute of Organic Chemistry under the Chinese Academy of Sciences. These achievements include the synthesis of critical pharmaceutical intermediates and raw materials, drug development for tumors and neurodegenerative diseases, as well as the application of organic chemistry in addressing white pollution and energy transformation. This showcases the dedication of Chinese researchers in overcoming Western technological restrictions, promoting self-reliance, and striving for excellence in scientific exploration. It also serves as a positive role model for students, enhancing their ethical and moral standards [9]. Through the micro-class, students can learn about the cutting-edge scientific research achievements of organic chemistry, understand the application of organic chemistry in the fields of biopharmaceutical, aerospace and environmental governance, improve their own scientific research enthusiasm and innovation ability, and lay a good foundation for future employment. Secondly, Instructors have the opportunity to gather top-notch instructional videos on Organic Chemistry from the MOOC platform and engage in the "secondary creation" of these videos. This process aims to enhance the quality of micro-course development and design, foster an engaging teaching environment, and ignite students' enthusiasm for learning [10].

4.2. Record videos of organic chemistry experiments to guide students to learn independently

Instructors in organic chemistry should proactively gather high-quality educational materials from internet platforms, utilize these resources to create micro-lessons, document organic chemistry experiment instructions and operation videos, gain a dynamic understanding of the steps involved in organic chemistry experiments, and upload these micro-lessons to cloud-based platforms. This allows students to review the organic chemistry experimental content using the micro-lessons, thereby establishing a solid foundation for subsequent laboratory instruction. Initially, educators should examine the content of the Organic Chemistry textbook, identify the key and challenging aspects of experimental teaching, gather pertinent experimental videos from MOOC platforms, edit these high-quality videos together, thoroughly comprehend the experimental equipment, procedures, operational steps, and associated knowledge points, and then share the micro-lessons on the cloud platform so that students can prepare in advance based on these lessons [11]. Through micro-lessons, students can explore experimental phenomena and principles, digital experimental operation steps, and review the teaching content related to experiments.

Secondly, teachers can use micro-lessons to carry out experimental teaching, adjust the video playback speed, combine the video to explain the assembly method of experimental equipment and experimental operation steps, guide students to reason experimental phenomena and experimental conclusions, and improve their thinking ability and scientific spirit. Students can make suggestions on experimental operations regarding micro-lessons, accurately connect experimental devices, record experimental data and experimental phenomena, scientifically demonstrate experimental conclusions, and improve experimental operation ability. Furthermore, instructors have the opportunity to capture videos of students performing experiments and utilize these recordings as teaching materials for organic chemistry lab sessions. This approach not only expands the range of experimental teaching resources but also invites students to evaluate their peers' experimental techniques depicted in the videos. By motivating students to identify issues within these visual aids, they become more actively engaged in classroom discussions, ultimately enhancing the overall effectiveness of organic chemistry laboratory instruction [12].

4.3. Make organic chemistry teaching cases and establish micro-class resource library

Teachers actively develop high-quality teaching resources on major Internet teaching platforms, establish micro-lesson teaching resource banks, which are divided into modules such as theoretical knowledge, experiment guidelines, experiment operation videos, inquiry experiments, application cases, etc., and timely update micro-lesson resources in each module to meet students' personalized learning needs, thus stimulating their enthusiasm for independent learning. Instructors have the ability to gather and consolidate top-notch course materials from platforms such as Super Science Xitom, MOOC, and Rain Class. They can independently create interdisciplinary micro-courses, elucidating the overlap and fusion of knowledge between organic chemistry and biology, as well as materials science and pharmacy. By incorporating scientific research findings and real-world application examples from the domain of organic chemistry into their explanations, teachers can guide students through cross-disciplinary education, thereby enhancing their overall skills [13]. Furthermore, educators can consistently refresh the micro-course resources on cloud platforms, engage in active online communication with students, promptly address inquiries related to micro-course content, experimental techniques, and assignments, and encourage learners to autonomously review materials after class. This approach facilitates a seamless integration of in-class and out-of-class instruction, ultimately enhancing the teaching quality of Organic Chemistry [14]. In summary, instructors should utilize micro-lessons effectively, leverage them to bridge in-class and out-of-class learning, provide tailored micro-lessons for students, and maintain online interactions, thereby fully realizing the benefits of micro-lessons and improving their overall application outcomes.

4.4. Summarize the cloud platform micro-course data and optimize the micro-course teaching plan

First, University and college instructors of organic chemistry should proactively gather cloud micro-course data, including metrics such as download counts, likes, comments, student satisfaction ratings, and popular online discussions. By analyzing this information, teachers can assess students' understanding of organic chemistry concepts, identify issues in the creation and implementation of micro-courses, and make evidence-based adjustments to the content and teaching approaches of these courses. This process ultimately aims to enhance the overall quality of course instruction. Second, Teachers can distribute questionnaires via the WeChat platform, allowing them to identify the challenges students face in learning organic chemistry, previewing micro-lessons, and conducting experiment practices. By assessing the instructional requirements for organic chemistry micro-

lessons, a comprehensive micro-class teaching framework can be established, ultimately enhancing the overall teaching effectiveness of organic chemistry micro-lessons [15]. For instance, educators can create and distribute micro-course materials based on questionnaire results, offer tailored suggestions and feedback to students, direct them toward online self-directed learning and discussions, and promptly address their questions and uncertainties. This approach not only enhances students' self-learning capabilities but also elevates the instructional quality of the Organic Chemistry micro-course.

5. Conclusion

In short, micro-class teaching under the cloud platform has become a hot spot in the reform of Organic Chemistry curriculum in colleges and universities, which is conducive to promoting the sharing of high-quality teaching resources, meeting the personalized learning needs of students, thereby stimulating their enthusiasm for independent learning, allowing them to actively participate in classroom interaction and extracurricular comprehensive practice, and further improving the quality of course teaching. Teachers should explain the cutting-edge scientific research achievements of the industry in micro-classes, expand the teaching content, cultivate students' scientific research spirit and patriotic feelings, and promote the ideological and political construction of the curriculum; Record videos of organic chemistry experiments to guide students to learn independently and improve their comprehensive ability. In addition, teachers should make organic chemistry teaching cases, set up a micro-class resource bank, and construct a personalized micro-class teaching system; Summarize the cloud platform micro-course data, optimize the micro-course teaching plan, and comprehensively improve the teaching quality of Organic Chemistry.

Funding

This paper is the research result of Jilin Province Education Science planning project "Development and Application of Organic Chemistry Micro-course for applied undergraduate students based on Cloud Platform" (Project number: GH23486)

Disclosure statement

The author declares no conflict of interest.

References

[1] Yang Y, Luo X, Huang N, 2019, Design and Practice of Hybrid Flipped Classroom Teaching: A Case Study of Organic Chemistry. Chemical Fiber and Textile Technology, 53(11): 249–251.

[2] Gao Y, Zhao J, 2023, Exploration and Practice of Building a "Modular Micro Course" Textbook for Basic Organic Chemistry. University Chemistry, 38(6): 104–109.

[3] Wu M, 2022, Teaching Design of Organic Chemistry Micro-Course Based on PBL Teaching Model – A Case Study of Chirality and Enantioisomerism. Fujian Textile Industry, 2022(11): 41–43.

[4] Zhang X, Li B, Gong Z, 2020, Measures of Applying "Micro Lesson" and "Flipped Classroom" to Biochemistry Teaching. Chemical Engineering Design Communication, 48(10): 207–209.

[5] Fu H, 2022, Application Research of Modern Information Technology in the Teaching of Basic Organic Chemistry, thesis, Tianshui Normal University.

[6] Su Y, Wang J, Chen Y, et al., 2022, Development of Medical Organic Chemistry Micro-Course and Its Application on Superstar Platform. Basic Medical Education, 24(3): 201–203.

[7] Miao T, Zhao J, 2021, Reform of Organic Chemistry Teaching System Based on Flipped Classroom Teaching Model. Journal of Shangqiu Normal University, 37(12): 95–98.

[8] Miao P, Chai L, 2021, Application Status of Micro-Class in Organic Chemistry Teaching Reform of Pharmaceutical Major. Health Vocational Education, 39(18): 55–56.

[9] Chen M, Zhou Q, 2021, Discussion on the Design of Organic Chemistry Microcourse – Taking Bimolecular Nucleophilic Substitution Reaction as an Example. Yunnan Chemical Industry, 48(9): 187–189.

[10] Zhou X, Liu P, Zhang C, et al., 2021, Application of Microlesson in Organic Chemistry Experiment Teaching: A Case Study of the Preparation of Acetylsalicylic Acid. Shandong Chemical Industry, 50(17): 237–238.

[11] Liu C, 2021, Research on the Application of Micro-Lesson in Organic Chemistry Experiment Teaching. Chemical Industry Time, 35(7): 53–54.

[12] Wu P, 2021, Research on Organic Chemistry Online and Offline Mixed Teaching Model Based on Three Classes. China Educational Technology Equipment, 2021(12): 45–47.

[13] Li Q, Shao J, Shi C, et al., 2021, Exploration and Practice of Online Teaching of Organic Chemistry Experiment. China Educational Informatization, 2021(12): 52–55.

[14] Zhou X, Sun Y, Long D, 2019, Experimental Teaching Reform of Organic Chemistry Under the Combination of Micro-Class and Flipped Classroom. Shandong Chemical Industry, 50(7): 211–213.

[15] Hao L, Yang B, Liu D, 2021, Application of Mixed Teaching Model in Organic Chemistry Experiment Teaching of Pharmacy Major in Higher Vocational Colleges. Careers, 2021(4): 54–55.