Research of Online and Offline Blended Teaching of College Mathematics

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Abstract

The traditional teaching model faces significant challenges in the era of information technology, while the blended learning model that integrates information technology and educational instruction has become an undeniable trend. Blended learning, which combines online and offline elements, can achieve complementary advantages to a greater extent, effectively enhancing the quality of teaching and promoting students' competence. This article explores the blended learning model, using higher mathematics courses as an example.

Keywords: College Mathematics; Online and Offline ;Blended Teaching

1.Introduction

With the rapid development of information technology and the widespread use of the internet, online education has gradually emerged in the field of education. Particularly in higher education, the application of online teaching models has become a trend. However, traditional face-to-face teaching still possesses its unique advantages, such as interactive communication and practical hands-on experiences. In this context, we begin to contemplate how to organically integrate online and offline teaching, deeply incorporate information technology into curriculum instruction, and enhance the quality of teaching.

Blended learning is a teaching approach that combines online and offline elements. It extends the traditional classroom teaching to the cyberspace by leveraging online teaching platforms and information technology. It utilizes advanced teaching tools and online resources to facilitate online teaching. This blended learning approach allows for the effective integration of different learning theories, technological methods, and application modes, achieving complementary advantages. It can effectively enhance the quality of teaching and promote students' competence.

To better utilize the advantages of blended learning and improve the effectiveness and quality of university mathematics education, this article will explore how to effectively apply the blended learning model to the teaching of university mathematics core courses.

2.Current Status of College Mathematics Education

College mathematics is a fundamental course in higher education, mainly including advanced mathematics, linear algebra, probability theory, and mathematical statistics. As a foundational course, college mathematics plays an important role in developing students' mathematical literacy and thinking abilities. By studying university mathematics, students can master the basic concepts, methods, and skills of mathematics, laying a solid foundation for further professional courses and scientific research.

(1)Teaching Content

Firstly, the current teaching content of university mathematics courses still follows the content of textbooks, which lags behind in terms of knowledge application, selection of example backgrounds, and updates. It fails to timely reflect the latest developments in the discipline and is disconnected from practical life and information from various aspects. Secondly, the application and introduction of practical cases in teaching content are not sufficient, which fails to stimulate students' interest and motivation for learning. Students find it difficult to apply abstract mathematical concepts and theories to practical problems and lack an integrated understanding of mathematics with other disciplines.

(2)Outdated Teaching Methods

Traditional university mathematics teaching often revolves around the teacher, adopting a one-way teaching method where the teacher simply imparts mathematical knowledge and students passively receive it. This teaching method lacks interaction and participation, limiting students' active learning and the development of their thinking abilities. Furthermore, traditional teaching focuses on theoretical knowledge transfer, often neglecting the practical application of mathematics. As a result, students struggle to apply the mathematical knowledge they have learned to real-world problems, lacking the ability to solve practical problems. Traditional teaching also lacks heuristic teaching, emphasizing computation and algorithmic procedures while neglecting the inspiration and cultivation of problem-solving skills and thinking. Additionally, traditional teaching lacks personalized instruction, failing to fully consider students' individual differences and learning needs. Students may feel confused or lose interest due to the uniformity of teaching content and pace.

(3)Differences from Secondary School Mathematics

There are significant differences between university mathematics and secondary school mathematics in terms of teaching content, methods, difficulty, and objectives. When students encounter university mathematics, they may experience discomfort and learning difficulties. In terms of teaching methods and content, secondary school mathematics focuses on foundational knowledge education and application, while university mathematics emphasizes in-depth research and application of mathematical theory. This difference can lead to difficulties for students in learning university mathematics. In terms of difficulty, secondary school mathematics is relatively simple, mainly involving basic calculations and applications, while university mathematics is more complex and abstract, requiring deeper thinking and deduction. In terms of objectives, secondary school education emphasizes the mastery of basic concepts and basic operations.

(4) Single assessment and evaluation methods

Exam scores remain the main evaluation method, which mainly focuses on testing students' memorization and mechanical computational abilities of knowledge points, neglecting the cultivation of students' understanding and application abilities of mathematical concepts. This method easily leads students to only focus on memorization and exam preparation, while neglecting the cultivation of mathematical thinking and problem-solving abilities. At the same time, it does not consider students' individual differences and developmental needs, which may not fully reflect students' learning achievements.

(5) Lack of information technology means

Traditional teaching methods and textbooks are difficult to adapt to the needs of information technology teaching, and cannot fully utilize the rich resources and interactivity provided by modern technology. Some higher mathematics teachers are unfamiliar with the use and application of information technology teaching methods, lacking relevant training and support, which prevents teachers from fully utilizing information technology means to improve teaching effectiveness and students' learning motivation.

3.Online and Offline Blended Teaching

Blended learning refers to a teaching model that combines online and offline components with the support of modern information technology. In this model, teachers provide online learning resources such as instructional videos and PowerPoint presentations on an online platform, and students independently study these resources outside of class. During offline class time, teachers focus on explaining key and difficult topics based on students' feedback and answering their questions, facilitating better mastery of the knowledge. Blended learning shifts the delivery of course content to outside of class (online), allowing students to learn key knowledge through online videos and use class time (offline) for digestion and absorption of the knowledge. This teaching model changes the arrangement of classroom content and time allocation, as well as the roles of teachers and students, clarifying the student's central position in the teaching activities.

The advantages of blended learning include:

Flexibility: Students can choose when and where to study based on their own schedule and location, no longer restricted by traditional classroom teaching time and location. This flexibility makes learning more convenient and autonomous.

Personalized learning: Online platforms can provide personalized learning resources and feedback based on students' learning situations and needs. Students can learn at their own pace and according to their abilities, improving learning outcomes.

Interactivity: Online platforms can provide various interactive features, such as online discussions, assignment feedback, and real-time Q&A. Students can communicate and interact with teachers and other students, promoting learning outcomes and motivation.

Diverse resources: Online platforms can offer a wealth of learning resources, such as instructional videos, e-books, and online exercises. Students can choose suitable learning resources based on their needs, enhancing learning outcomes.

As a fundamental course, college mathematics plays an important role in cultivating students' mathematical literacy and thinking abilities. Blended learning can provide more flexible and personalized learning methods, improving teaching effectiveness and students' abilities for self-directed learning, collaboration, communication, and innovation. In higher mathematics education, the use of online platforms to provide rich learning resources and interactive features can greatly enhance the effectiveness of teaching.

4.Implementation plan for blended learning mode

This article takes college mathematics courses as an example and designs an implementation plan for blended learning mode.

(1)Selection of teaching platform

The online teaching platform "Xuexitong" is chosen for college mathematics teaching. This platform provides rich teaching video resources and features such as assignments, quizzes, and learning analytics. Xuexitong offers teaching demonstration packages that can be copied for the entire course or modified by adding or deleting videos. It also allows teachers to upload their own videos, providing flexibility and convenience. The assignment feature allows students to submit their work and receive feedback from teachers, and it is also convenient for storage. Quiz questions can be reasonably set based on the teaching syllabus and students' proficiency levels. Learning analytics can monitor students' learning progress in real-time and provide early warnings for those who have not completed tasks or have low grades.

(2) Preparation of teaching resources

Teachers prepare teaching videos, PowerPoint presentations, relevant cases, and background materials based on the teaching requirements of the specific topic. These materials are uploaded to the online platform "Xuexitong." The online preview tasks and requirements for the upcoming class are announced on Xuexitong, clearly defining the key knowledge points and questions for the teaching task. Additionally, exercises covering prerequisite knowledge, case problems, and learning reflections are designed based on the topic. Tests are also published on Xuexitong to assess students' learning outcomes.

(3) Pre-class online preview and feedback:

Online preview: Students independently arrange their time outside of class to engage in online learning activities, such as watching videos, reviewing PowerPoint presentations, studying cases, and background materials. They should allocate time for self-study and research to address questions and problems from the videos and assignments.

Online discussions: Discussion forums or forums are set up on the online teaching platform, allowing students to participate in discussions and ask questions before class. Teachers respond promptly and provide answers to their inquiries.

Preview feedback: Online quizzes or surveys are designed to assess and provide feedback on students' preview performance, helping them understand their own learning situations.

(4) In-class offline teaching

Teaching fundamental knowledge: Based on the questions and feedback from students' online learning, teachers provide centralized explanations in the classroom, guiding students to understand and master the knowledge.

Teaching applied knowledge: Teachers design practical application questions based on the course content, group students, and assign tasks to promote collaboration within the groups, helping students better understand and master the knowledge.

(5) Post-class expansion and evaluation

Online expansion learning: Provide online learning resources such as recommended readings, study videos, and online courses for students to expand their learning after class.

Assignment: Assignments are posted on the online teaching platform, and students complete and submit them within the specified time frame. Teachers provide feedback and evaluations on the assignments.

Personalized tutoring: Provide personalized tutoring and guidance based on students' learning situations, helping them solve problems and confusion in their learning.

Teaching evaluation: Design appropriate teaching evaluation methods such as online quizzes and assignment evaluations to assess students' learning outcomes and teaching effectiveness. At the same time, provide timely feedback and suggestions to help students improve their learning methods and outcomes.

(6) Reflection and optimization

Teachers reflect on their teaching, summarize the teaching effectiveness and student feedback, and identify problems and shortcomings. Based on the teaching reflection and student feedback, teachers adjust and optimize the teaching content, methods, and resources to improve teaching effectiveness.

5.Conclusions

The traditional teaching model faces significant challenges in the era of information technology, thus the blended learning model, combining online and offline elements, has become an undeniable trend. However, designing and implementing a blended learning model for a course is not an easy task. It requires continuous exploration and practice to find the optimal balance between online and offline teaching methods, in order to maximize the effectiveness of instruction. Through blended learning, we can better impart knowledge, help students internalize

it, and apply it to real-life situations. Therefore, active exploration and practice are necessary to achieve the best outcomes in teaching.

Conflicts of Interest

All authors disclosed no relevant relationships.

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