Research on Application of Interactive Teaching Platform in the Teaching of Higher Mathematics Course

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Keywords: Interactive Teaching Platform, Higher Mathematics, Teaching Reform, Classroom Interaction, Independent Learning

Abstract: With the rapid development of modern information technology, the application of interactive teaching platforms in higher education is becoming increasingly widespread. In response to the problems of single teaching methods, low student participation, and high learning difficulty in traditional higher mathematics teaching, this study explores the practical application of interactive teaching platforms in higher mathematics course. Based on the analysis of the core difficulties and reform needs in higher mathematics teaching, an innovative teaching model is proposed that integrates pre-class preview, classroom interaction, and post-class exercises is proposed to enhance students' learning interest and self-learning ability. This model uses information technology to optimize the teaching process, provide diversified learning resources, enhance teacher-student interaction, and promote students' understanding and application of mathematical concepts. Interactive teaching platforms can not only improve teaching efficiency, but also cultivate students' self-learning ability and mathematical thinking, providing valuable reference for the reform of higher mathematics teaching.

1. Introduction

Against the backdrop of rapid development of information technology, digital teaching models have been widely applied in higher education. In recent years, new teaching methods such as online learning and smart classrooms have gradually penetrated into various courses, promoting the transformation of traditional teaching models. The emergence of interactive teaching platforms enables teachers to organize and manage teaching resources more efficiently and conveniently, while also providing students with conditions for self-directed learning, interactive exercises, and knowledge testing [1-3]. Especially in higher mathematics course, due to their strong theoretical nature and complex logical reasoning, interactive teaching platforms play a positive role in improving student learning outcomes, enhancing classroom interaction, and optimizing teaching evaluations. As an important public foundational course in university, the teaching quality of advanced mathematics directly affects students' mathematical literacy and is also directly related to the study of subsequent professional courses. However, current higher mathematics teaching still

faces many challenges. Firstly, the traditional teaching mode is mainly based on teacher lectures, and students mainly rely on listening and note taking to acquire knowledge in the classroom. There is less classroom interaction, and students find it difficult to fully express their understanding and questions during the learning process. This passive receptive learning approach can easily lead to a decrease in students' interest in learning, thereby affecting learning outcomes. Secondly, the content of higher mathematics is abstract, involving a large number of formula derivations and applications. Without effective guidance, some students may easily develop a fear of difficulty, which in turn affects their learning initiative and persistence [4-7]. It is difficult for teachers to grasp the learning situation of each student in real time during the teaching process, and teaching feedback mainly relies on exam scores, making it difficult to adjust teaching strategies in a timely manner. Therefore, how to use information technology to improve classroom interaction and enhance students' self-learning ability has become a key issue in the reform of higher mathematics teaching.

The application of interactive teaching platforms provides a new approach and means for the reform of higher mathematics teaching. Through interactive features such as online resource sharing, classroom interaction, intelligent exercises, and real-time feedback, more possibilities have been provided for teaching interaction between teachers and students. Students can use the platform for self-directed learning, online testing, and error analysis, while teachers can use the platform to understand students' learning progress and focus on explaining weak areas. This approach not only enhances students' classroom participation, but also helps them develop good study habits through pre class preparation and post class review, thereby improving overall learning outcomes. This study aims to explore the application mode of interactive teaching platforms in the teaching of higher mathematics courses, and provide practical basis for the reform of higher mathematics teaching.

2. Teaching Difficulties and Reform Needs of Higher Mathematics Course

2.1. Main Difficulties in Teaching Higher Mathematics Course

As a highly theoretical public foundational course, higher mathematics faces many difficulties in its teaching process, which directly affects students' learning outcomes and teachers' teaching efficiency. Firstly, higher mathematics has strong abstraction, involving concepts such as limits, calculus, differential equations, etc. These contents require students to possess strong logical reasoning and spatial imagination abilities. However, for some students, abstract concepts are difficult to understand intuitively, which can easily lead to a decrease in learning interest, thereby affecting learning progress and effectiveness. Many students, when learning the concept of limits, often feel confused about the definition due to the inability to intuitively understand the process of a function approaching a certain point, which in turn affects their subsequent study of calculus. Secondly, the knowledge system of higher mathematics is vast, with strong logical connections between knowledge points, and interconnected knowledge before and after. If students fail to master solid foundational knowledge in a certain stage, subsequent learning will become even more difficult, and it is easy to form a vicious cycle of "learning harder and harder". The study of calculus needs to be based on fundamental concepts such as functions and limits, and the weakness of these foundations may affect the understanding and application of integral and differential equations. Therefore, how to help students establish clear logical structures in a complex knowledge system is an urgent problem to be solved in teaching.

The traditional teaching mode of higher mathematics still relies mainly on teacher lectures, with low student participation in the classroom. Due to the lengthy process of mathematical deduction and calculation, teachers often need to occupy a considerable amount of classroom time for formula derivation and example explanation. Students can only passively receive knowledge and find it

difficult to actively think and participate in interaction. This teaching method not only reduces students' learning initiative, but also makes it difficult for teachers to grasp students' learning situation in real time, resulting in insufficient teaching pertinence and effectiveness.

2.2. The Necessity of Teaching Reform in Higher Mathematics Courses

In response to the above issues, the reform of higher mathematics teaching is imperative, with the core goal of enhancing students' learning initiative and classroom participation, and improving the overall teaching quality. Firstly, the key to teaching reform lies in promoting students' self-directed learning and improving learning efficiency. The learning of higher mathematics not only relies on classroom lectures, but also requires a lot of post class exercises and deep thinking. The traditional teaching model often focuses on teachers imparting knowledge unilaterally, while neglecting students' ability to explore independently. By introducing appropriate teaching methods and technological means, students can efficiently grasp knowledge in pre class preparation, classroom learning, and post class review, and gradually cultivate independent thinking and self-learning abilities. Secondly, the development of information technology provides new opportunities for teaching reform, and combining information technology to enhance classroom interaction can effectively improve the shortcomings of traditional teaching models. With the help of interactive teaching platforms, teachers carry out real-time testing, online interactive Q&A and other activities in the classroom to enhance students' sense of participation. At the same time, students can independently complete exercises and view learning reports through an interactive teaching platform, making the learning process more intuitive and efficient. The intervention of information technology not only optimizes the teaching process, but also provides personalized learning support, improving students' learning outcomes. Finally, achieving individualized teaching and improving teaching quality are important goals of teaching reform. Due to significant differences in students' mathematical foundations and acceptance abilities, a unified teaching schedule often fails to meet the needs of all students. Through data analysis and intelligent recommendations, teachers utilize interactive teaching platforms to provide personalized learning resources for students of different learning levels, enabling each student to learn efficiently at their own pace. This precise teaching method helps to improve the overall teaching quality and avoid learning gaps caused by individual differences.

2.3. The Role of Interactive Teaching Platform in Teaching Reform

The application of interactive teaching platforms provides effective technical support for the reform of higher mathematics teaching, mainly reflected in the following aspects:

Firstly, interactive teaching platforms can promote classroom interaction and enhance students' sense of participation. Traditional mathematics classrooms are mainly taught by teachers, while interactive teaching platforms transform classroom teaching from a one-way teaching mode to a two-way interactive mode through functions such as real-time testing, online discussions, and interactive Q&A. Students actively participate in class through answering questions, discussions, and other methods, while teachers adjust teaching strategies based on students' feedback to improve the pertinence of teaching.

Secondly, the interactive teaching platform provides real-time feedback to help students grasp knowledge points in a timely manner. In traditional teaching, students usually need to wait until homework correction is completed before receiving feedback, while interactive teaching platforms can use intelligent exercises and automatic correction functions to enable students to quickly understand their own learning situation and receive targeted learning suggestions. After students complete their exercises, the system can automatically analyse their error types, recommend

relevant knowledge points for explanation or similar exercises, help students identify and fill in gaps, and thus improve learning efficiency.

Finally, the interactive teaching platform supports personalized learning and enhances students' mathematical application abilities. Based on students' learning data, the platform can provide personalized learning paths and resource recommendations for students with different foundations, making the learning process more flexible. Students with weaker foundations can obtain more basic exercises and detailed explanations, while advanced students can challenge more difficult application problems or explore expanded content. This personalized teaching model not only improves students' learning efficiency, but also helps cultivate their mathematical thinking ability and practical application ability.

The key to the reform of higher mathematics teaching lies in enhancing students' self-learning ability and classroom participation, and the introduction of interactive teaching platforms provides new ideas and means for teaching reform. By utilizing information technology reasonably, optimizing teaching modes, effectively alleviating the difficulties of higher mathematics teaching, and improving teaching quality and learning effectiveness. Higher vocational colleges are increasing their support for information-based teaching and promoting the application of interactive teaching platforms in mathematics education, in order to achieve more efficient and scientific teaching goals.

3. Application of Interactive Teaching Platform in Teaching Higher Mathematics

3.1. Overview of Interactive Teaching Platform

Jiudou Interactive Teaching Platform is an intelligent teaching tool based on information technology, aimed at improving teaching quality and optimizing students' learning experience through digital means. Compared to traditional teaching methods, this platform integrates intelligent homework, classroom interaction, data analysis, and other functions to provide flexible and efficient teaching support for teachers and students, promoting innovation and optimization of teaching modes.

Firstly, the Jiudou platform has intelligent homework and evaluation functions, which can provide automatically graded homework and tests. Based on data analysis of students' knowledge mastery, it accurately identifies weak links, pushes personalized learning resources to students, and improves the pertinence and learning efficiency of review. Secondly, the classroom interactive function supports real-time answering questions, online discussions, etc. Students can participate in classroom learning through mobile devices, improving the interactivity and fun of the classroom, and enhancing learning initiative. The data analysis capability of the platform can record students' learning behaviour, and teachers can understand students' learning progress and knowledge mastery based on learning data, adjust teaching strategies, and achieve precise teaching.

In higher mathematics teaching, the multiple functions of the Jiudou interactive teaching platform can effectively compensate for the shortcomings of traditional teaching. Teachers use the visual learning tools provided by the platform, such as mathematical formula editors and dynamic function image displays, to help students understand abstract mathematical concepts. Through online question banks and intelligent recommendation systems, personalized exercise content is provided for students at different stages of learning to consolidate their knowledge points. These functions not only improve students' learning efficiency, but also provide strong support for teachers' classroom management and teaching evaluation.

3.2. Teaching Application Mode of Interactive Teaching Platform

The effective application of the Jiudou interactive teaching platform should run through the entire teaching process, including pre-class preview, classroom interaction, and post-class exercises, forming a complete teaching loop to enhance teaching effectiveness.

(1) Pre-class preview: Provide diverse learning resources to enhance self-directed learning ability

Before formal teaching, teachers use the Jiudou platform to upload and integrate various teaching resources, including electronic courseware, teaching videos, preview tests, mathematical formula derivation animations, typical examples and analysis, etc., to help students engage in self-directed learning before class. In order to improve the pertinence of previewing, teachers can record short videos covering basic concepts of calculus, such as the concept of limits, the geometric meaning of derivatives, and the application of integrals. Combined with online quizzes, students can complete corresponding test questions after watching the videos to test their previewing effect. The learning data analysis function of Jiudou platform can record students' learning behavior, such as video viewing duration, test accuracy, etc., providing data support for teachers to explain key and difficult points in a targeted manner in the classroom. If the test results show that most students have difficulties in applying the differentiation rule, teachers can focus on explaining relevant examples in class and arrange targeted exercises to ensure that students can truly master the knowledge points. This pre class preparation method not only cultivates students' self-learning ability, but also makes classroom teaching more precise and efficient.

(2) Classroom Interaction: Diversified Interactive Modes to Enhance Learning Participation

In the classroom teaching process, the Jiudou platform provides rich interactive functions, enabling students to actively participate in learning, improve classroom participation and learning interest. After explaining a mathematical concept, teachers can release classroom quizzes in real-time through the platform. Students can use mobile devices such as smartphones and tablets to answer online. The system will instantly calculate the answer situation and generate visual data, such as accuracy distribution and common error analysis, to facilitate teachers to quickly adjust their teaching strategies. When explaining the concept of partial derivatives, the teacher sets up a visual image of the function, allowing students to select the correct partial derivative expression through a test and view the analysis in real time to deepen their understanding. The platform also supports functions such as bullet screen discussions, interactive Q&A, and voting surveys. Students can ask questions at any time in class, and teachers can provide targeted answers, creating a good interactive atmosphere. When teaching curve integration, teachers can initiate classroom discussions and allow students to express their opinions on the necessary and sufficient conditions for curve integration to be independent of paths, promoting thinking collisions and communication among students. This diverse interactive mode can not only enhance students' classroom focus, but also help them grasp knowledge points faster and improve their learning initiative.

(3) Post-class exercises: Intelligent grading and precise feedback to strengthen knowledge mastery

After class, students use the Jiudou platform to complete online assignments, tests, and personalized exercises. The system automatically corrects and provides detailed explanations to help students identify and fill in gaps, and consolidate their learned knowledge. In order to improve the pertinence of review, the platform analyzes each student's weak links based on learning data and pushes personalized exercise questions. If a student has a high error rate in sequence limit problems, the system will automatically recommend similar exercises and provide detailed problem-solving steps and related video explanations to help them strengthen their training and gradually improve their problem-solving abilities.

At the same time, teachers use the Jiudou platform to view the overall completion status of

homework in the class, analyse students' mastery of different knowledge points, and provide concentrated explanations for common problems. If multiple students make calculation errors during Taylor's unfolding process, the teacher can summarize the common errors of the students before the next class and provide targeted explanations and exercises in class. Teachers can also use the platform's error analysis function to encourage students to establish personal error sets, review them regularly, and further consolidate their knowledge points.

Through this complete teaching model, the interactive teaching platform can effectively support the learning of higher mathematics courses, break the traditional one-way teaching mode, and make the teaching process more systematic, interactive, and intelligent. The pre class preview section enhances students' self-learning ability, classroom interaction enhances the fun and participation of learning, and post class exercises combined with intelligent grading and precise feedback improve the mastery of knowledge. This mode not only optimizes the teaching quality, but also effectively improves the learning experience of students, helps students better master the core knowledge of higher mathematics, and cultivates autonomous learning and thinking ability.

4. Conclusions

This study introduces the application of interactive teaching platform in the teaching of higher mathematics course, and analyses how the interactive teaching platform optimizes the teaching mode, improves students' learning interest and self-learning ability. The interactive teaching platform effectively overcomes the difficulties in teaching higher mathematics. Through pre-class preview, classroom interaction, and post-class exercises, it improves students' comprehension ability and learning efficiency, strengthens their initiative and personalized learning experience. The intelligent homework system, real-time classroom interaction, personalized learning resource recommendation, and data analysis functions of the interactive teaching platform provide more scientific and efficient support for the teaching and learning of higher mathematics.

Acknowledgements

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