# Research on the Reform of Online and Offline Mixed Wisdom Teaching of "Probability Theory and Mathematical Statistics"

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*Abstract:* This paper explores the teaching reform of probability theory and mathematical statistics courses under the blended smart teaching mode of online and offline integration. By interpreting the concept of smart teaching and comparing it with traditional teaching modes, the advantages and characteristics of blended smart teaching are proposed. The article focuses on introducing the application of this mode in curriculum design, utilization of learning resources, and optimization of teaching methods, aiming to provide new ideas and reference experiences for higher education teaching reform.

## 1. Introduction

With the continuous development and popularization of information technology, the field of education is also constantly exploring new teaching modes and methods. Probability theory and mathematical statistics, as important basic mathematics courses, occupy a significant position in higher education and are of great significance for cultivating students' abstract thinking, logical reasoning, and data analysis abilities. However, traditional classroom teaching models face many challenges in meeting students' individualized learning needs, stimulating students' interest in learning, and improving teaching efficiency.In response to these challenges, the education sector has begun to explore the blended smart teaching mode, which fully utilizes the advantages of information technology by combining traditional classroom teaching with online learning, realizing the sharing and interaction of teaching resources, and providing students with more flexible and diverse learning methods. Therefore, this paper aims to deeply study the teaching reform of probability theory and mathematical statistics courses, especially to explore the practice and effects of adopting the blended smart teaching mode[1].Through the comparative analysis of traditional teaching modes and smart teaching modes, this paper aims to reveal the advantages of smart teaching modes in curriculum design, utilization of learning resources, and innovation of teaching methods. Through specific cases and practical experience, it explores the impact of this teaching mode on students' learning effectiveness, teaching quality, and teaching efficiency, in order to provide new ideas and practical paths for higher education teaching reform.

## 2. Current Situation Analysis of Probability Theory and Mathematical Statistics Course Teaching

### 2.1 Limitations of Traditional Teaching Modes

Traditional teaching modes of probability theory and mathematical statistics courses have many limitations. Firstly, traditional teaching modes often revolve around the teacher, with the teacher leading the teaching in the classroom and students passively receiving knowledge, lacking student participation and interaction, and failing to stimulate students' interest and initiative in learning. In this mode, students often lack opportunities for practical hands-on experience, resulting in their understanding of probability and statistical theory remaining at the theoretical level, making it difficult for them to integrate the knowledge learned with practical problems, thus affecting their application ability and problem-solving skills. Secondly, traditional teaching modes focus on the impartation of theoretical knowledge, neglecting the cultivation of practical operation and problem-solving abilities. Students only passively receive teachers' explanations, lacking opportunities for active thinking and practical operations, resulting in a lack of understanding of the course and practical application abilities. Additionally, classroom time is limited in traditional teaching modes, and teaching content is constrained by time and space, making it difficult to meet students' individualized learning needs and the requirements for in-depth learning.In summary, traditional teaching modes in probability theory and mathematical statistics courses have many shortcomings, requiring exploration of new teaching modes and methods to improve teaching quality and effectiveness[2]. In response to these limitations, this study will explore the practice and effects of adopting the blended smart teaching mode, aiming to provide new ideas and practical paths for education and teaching reform.

### 2.2 Concept and Characteristics of Smart Teaching Mode

Smart teaching mode is a modern teaching mode based on the combination of information technology and educational theory, aiming to fully utilize digital, networked, and intelligent technologies to improve teaching efficiency and quality, and promote personalized learning and independent development of students. The core concept of smart teaching mode is to focus on students, guided by teachers, and stimulate students' interest in learning and cultivate students' innovative thinking and problem-solving abilities through innovative teaching design and diversified teaching methods[3].The smart teaching mode has several characteristics:Personalized learning: Smart teaching mode fully considers the learning characteristics and needs of each student, providing personalized learning paths and resource recommendations, tailoring learning plans for each student, and improving learning efficiency and effectiveness.Flexible learning environment: Smart teaching mode breaks through the time and space limitations of traditional classrooms. Students can access learning resources anytime and anywhere through online platforms, arrange learning time and locations autonomously, and improve learning flexibility and convenience. Multimedia teaching methods: Smart teaching mode utilizes multimedia technology to enrich teaching content, provide vivid and intuitive teaching resources with graphics and texts, and enhance students' learning experiences and depth of understanding. Interactive teaching design: Smart teaching mode emphasizes interaction and collaboration between students and teachers, as well as among students. Through online discussions, team projects, and other forms, it promotes cooperative communication among students and knowledge sharing, expanding students' perspectives. Real-time feedback and assessment: Smart teaching mode obtains timely feedback and information on students' learning situations through online assignments, exams, etc., providing data support for teachers to adjust teaching strategies and provide personalized guidance.

## 2.3 Introduction to Blended Teaching Mode

Blended teaching mode, abbreviated as blended teaching, is a teaching mode that integrates traditional classroom teaching and online distance teaching. In this mode, teaching activities include both face-to-face classroom teaching and online learning based on network platforms. Blended teaching fully utilizes the advantages of information technology by providing rich learning resources and tools through online platforms, enabling students to access course content, complete assignments, and participate in discussions anytime and anywhere. Meanwhile, classroom teaching remains an indispensable part, used to promote interaction between teachers and students, practical operations, and problem-solving.The core concept of blended teaching mode combines traditional teaching with modern educational technology, aiming to improve teaching effectiveness and learning experience. Its characteristics include flexibility and convenience, allowing students to choose learning time and locations according to their own schedules, no longer constrained by the time and location of traditional classrooms, thus improving learning flexibility and convenience. In addition, personalized learning is also an important feature of blended teaching, allowing students to choose learning paths and resources suitable for their own learning progress and needs, achieving personalized learning.Blended teaching mode also emphasizes interactive teaching, combining online platforms with classroom teaching to enable real-time interaction and communication between students and teachers, sharing viewpoints and solving problems, thereby enhancing learning effectiveness. Furthermore, blended teaching mode realizes real-time monitoring and assessment of students' learning situations through online assignments, quizzes, and discussions, providing teachers with timely feedback and guidance. Additionally, resource sharing and openness are also characteristics of blended teaching, allowing teachers and students to share various teaching resources and experiences, enriching learning content and expanding learning space.In summary, blended teaching mode is an innovative teaching mode that integrates traditional teaching with modern educational technology, featuring flexibility, personalization, interactivity, and comprehensive assessment, bringing new opportunities for educational teaching development[4].

## 3. Design and Practice of Blended Smart Teaching

## 3.1. Curriculum Design and Teaching Objectives

The design and practice of blended smart teaching should start from curriculum design and teaching objectives. When designing courses, it is necessary to fully consider the core content and learning focus of probability theory and mathematical statistics courses, and combine the characteristics of smart teaching mode to make reasonable course arrangements. Teaching objectives should be clear, including mastery of conceptual knowledge as well as the cultivation of practical operation and problem-solving abilities. By deeply analyzing students' needs and the characteristics of the course, teaching objectives should be determined, and the knowledge and skills that students should master should be clarified. For the characteristics of probability theory and mathematical statistics courses, curriculum design should fully consider the combination of theory and practice. The course content can be divided into several modules, including basic theoretical knowledge, example analysis, and case studies, covering topics such as probability distributions, statistical inference, and regression analysis. At the same time, course design should also fully utilize the advantages of smart teaching mode, design online learning resources and classroom teaching segments, combine practical cases and data analysis, stimulate students' interest in learning, and improve teaching effectiveness.Teaching objectives should be clear and designed in conjunction with course content and students' actual needs[5]. In addition to imparting the basic theoretical knowledge of probability theory and mathematical statistics, attention should also be

paid to the cultivation of students' data analysis abilities, problem-solving abilities, and innovative thinking. By designing a variety of teaching activities and assessment methods, students should be guided to actively participate in learning, achieving a level of understanding and application of knowledge. At the same time, teaching objectives should also consider students' personalized needs and learning differences, tailoring personalized learning plans for each student to achieve personalized and differentiated education and teaching. In summary, the design and practice of blended smart teaching need to start from curriculum design and teaching objectives, fully considering the characteristics of probability theory and mathematical statistics courses and students' needs, designing reasonable course structures and teaching activities, promoting students' comprehensive development and ability improvement.

## 3.2. Development and Utilization of Learning Resources

In the design and practice of blended smart teaching, the development and utilization of learning resources are crucial. Firstly, based on the characteristics and teaching objectives of probability theory and mathematical statistics courses, diverse learning resources need to be developed, including video explanations, teaching slides, online exercises, case analyses, etc., to meet students' different learning styles and needs. These learning resources should be rich in content and diverse in form, serving as auxiliary materials for pre-class preview and post-class review, as well as support and extension for classroom teaching. Secondly, the development of learning resources should focus on the quality and effectiveness of teaching content. Teachers can use modern technology and professional software tools to design exquisite and vivid teaching slides, making abstract concepts and theories concrete and understandable through forms such as graphics and animations, thereby improving students' learning effectiveness. At the same time, teachers can develop online exercises and case studies to promote students' thinking training and skill improvement through practical problem-solving. Additionally, the utilization of learning resources should be flexible and diverse, combining the advantages of blended teaching mode to fully leverage various resources' roles. Students can access learning resources anytime and anywhere through online platforms, autonomously choose learning time and paths, achieving personalized learning. In classroom teaching segments, teachers can use multimedia devices and interactive tools to guide students in discussing and exploring teaching content together, promoting interaction between teachers and students and knowledge sharing. By combining online and offline teaching modes, fully utilizing various learning resources, teaching effectiveness and learning experience can be improved. In summary, the development and utilization of learning resources are important components of blended smart teaching, with significant implications for achieving teaching objectives and improving teaching effectiveness. Teachers should design and develop diversified learning resources carefully based on the characteristics of the course and teaching objectives, guiding students to actively utilize them, achieving personalized learning and comprehensive development.

## 3.3. Optimization and Innovation of Teaching Methods

In the design and practice of blended smart teaching, the optimization and innovation of teaching methods are key aspects. Traditional teaching methods often focus on teachers, emphasizing knowledge impartation, lacking student participation and interaction, and failing to stimulate students' interest and initiative in learning. Therefore, it is necessary to combine the characteristics of blended teaching mode to optimize and innovate teaching methods, maximizing teaching effectiveness. Firstly, the optimization of teaching methods should focus on making students the main focus, stimulating students' interest and initiative in learning. Teachers can use heuristic teaching methods, inquiry-based learning, etc., to guide students to actively participate in classroom

discussions and problem-solving, cultivating their analytical and problem-solving abilities. At the same time, teachers can design diversified learning tasks and projects through online platforms, promoting practical operations and teamwork, enhancing students' comprehensive abilities and innovative thinking. Secondly, the innovation of teaching methods should focus on exploring the depth and practical application of teaching content. For the characteristics of probability theory and mathematical statistics courses, teachers can combine practical cases and data analysis, designing problem-driven learning tasks, guiding students to apply the knowledge learned to solve practical problems. Additionally, teachers can utilize online simulation experiments and data visualization tools to help students understand abstract concepts and theories, improving their data analysis and reasoning abilities.Furthermore, the optimization and innovation of teaching methods should also focus on the evaluation and feedback of the teaching process. Teachers can understand students' learning situations in a timely manner through online quizzes and assignments, adjusting teaching strategies and providing personalized guidance accordingly. Meanwhile, teachers can continuously improve teaching methods and course design based on student feedback and evaluations, achieving continuous optimization of the teaching process.In summary, the optimization and innovation of teaching methods are important components of blended smart teaching, with significant implications for improving teaching effectiveness and student learning experience. Teachers should flexibly use various teaching methods based on the characteristics of the course and students' needs, guiding students to actively participate in learning and achieving personalized and differentiated education and teachingp[6].

## 4. Factors of Influence and Countermeasures Discussion

### 4.1. Student Engagement and Autonomy

Student engagement and autonomy are important factors influencing the effectiveness of blended smart teaching both online and offline. In traditional classroom teaching, teachers can directly supervise students' learning progress and participation, whereas in blended teaching, students require more autonomy and motivation for learning. Therefore, improving student engagement and autonomy becomes a key issue.Firstly, to enhance student engagement, teachers can adopt various strategies. During classroom teaching, teachers can stimulate students' interest and initiative through interactive teaching, group discussions, case analysis, etc., increasing opportunities for students to participate in classroom discussions and activities. In online learning segments, teachers can set up online discussions and team cooperation projects to guide students to actively participate in learning, sharing viewpoints, and exchanging experiences.Secondly, to enhance students' autonomy in learning, teachers can design personalized learning tasks and projects. By setting open-ended learning tasks and problems, students are encouraged to think independently and explore, cultivating their problem-solving and innovative thinking abilities. Additionally, teachers can provide a variety of learning resources and tools, such as online courseware, video explanations, exercise practices, etc., allowing students to choose learning content and pathways according to their own needs and interests, achieving personalized learning.Furthermore, improving student engagement and autonomy also requires support and guidance from schools and educational institutions. Schools can cultivate students' teamwork and leadership skills by organizing academic exchanges and practical activities. Educational institutions can provide teacher training and teaching resource support, helping teachers master teaching methods and skills, and design and implement effective blended teaching programs.In summary, enhancing student engagement and autonomy is a key task of blended smart teaching both online and offline. Teachers should adopt various strategies to guide students to actively participate in learning, cultivate their autonomy, and foster innovative thinking, achieving a win-win situation in education and teaching[7].

## 4.2. Teacher Role Transformation and Teaching Support

In blended smart teaching both online and offline, the role of teachers undergoes significant transformation. In traditional teaching models, teachers mainly act as knowledge disseminators and learning supervisors, playing a leading role in the classroom. However, in blended teaching, teachers need to assume more roles as guides and supporters, guiding students to actively participate in learning and providing learning support and guidance.Firstly, the role of teachers in blended teaching shifts to become student-centered educators. Teachers are no longer just knowledge transmitters but collaborators with students in exploring and constructing knowledge together. Teachers should design diversified teaching activities and learning tasks according to students' learning needs and interests, stimulating students' interest and initiative in learning, and promoting their autonomous learning and capacity development.Secondly, teachers play the role of learning supporters in blended teaching. Teachers should provide necessary learning support and guidance to students, helping them solve problems and difficulties encountered in learning. During classroom teaching, teachers can help students clarify their thoughts and solve problems through questioning and guidance. In online learning segments, teachers can answer students' questions and provide solutions through online discussions and Q&A platforms.Additionally, teaching support also requires support and cooperation from schools and educational institutions. Schools can provide teacher training and teaching resource support to help teachers master blended teaching methods and skills and design and implement effective teaching programs[8]. Educational institutions can establish sound teaching management and evaluation systems, evaluate and provide feedback on teachers' teaching practices, promote the improvement of teaching levels, and ensure teaching quality.In summary, teacher role transformation and teaching support are critical issues in blended smart teaching both online and offline. Teachers need to adapt to new teaching roles, guide students to actively participate in learning, provide learning support and guidance, achieving a win-win situation in education and teaching. Meanwhile, schools and educational institutions need to provide corresponding support and cooperation, jointly promoting the development and practice of blended teaching.

## 4.3. Selection and Use of Technological Platforms

In blended smart teaching both online and offline, the selection and use of technological platforms are crucial for teaching effectiveness. Suitable technological platforms can provide a variety of teaching functions and tools, supporting teachers in conducting online teaching and students in autonomous learning. Therefore, educational institutions and teachers need to carefully consider choosing technological platforms that meet their own needs and make rational use of their functions and resources.Firstly, educational institutions and teachers need to consider the functionality and applicability of platforms when selecting technological platforms. Technological platforms should have rich teaching functions, such as online classrooms, video conferences, interactive whiteboards, assignment management, learning resource libraries, etc., to meet the diverse needs of teachers and students. Meanwhile, the usability and stability of the platform are also important factors to consider, and teachers and students should be able to use the platform easily and smoothly, ensuring the smooth progress of teaching activities.Secondly, educational institutions and teachers need to consider the security and confidentiality of platforms when selecting technological platforms. Due to the involvement of teaching content and student information, technological platforms should have strict data protection and privacy mechanisms to ensure the security and stability of the teaching process. Meanwhile, educational institutions and teachers also need to pay attention to platform service support and after-sales service, promptly resolving faults and issues, ensuring the normal conduct of teaching activities.Additionally,

educational institutions and teachers can consider using a combination of multiple technological platforms to fully leverage the advantages of various platforms. For example, combining online education platforms and social media platforms to provide rich learning resources and communication channels; or combining video conferencing platforms and online assignment platforms to effectively integrate classroom teaching and student assessment. Through flexible and diverse selection and use of technological platforms, teachers can better conduct blended teaching, improving teaching effectiveness and student learning experience.In summary, the selection and use of technological platforms are crucial aspects of blended smart teaching both online and offline. Educational institutions and teachers should carefully consider factors such as platform functionality, security, and service support, choose technological platforms that meet their own needs, and make rational use of their functions and resources, promoting innovation and development in education and teaching.

## 5. Conclusion

The design and practice of blended smart teaching models for probability theory and mathematical statistics courses, both online and offline, aim to improve teaching efficiency and quality, and promote personalized learning and autonomous development by fully leveraging the advantages of modern information technology. In this paper, we have discussed the design principles and characteristics of blended teaching models, analyzed specific practices in course design, development and utilization of learning resources, optimization and innovation of teaching methods, among others. Additionally, we have explored influencing factors and countermeasures, including student engagement and autonomy, teacher role transformation and teaching support, selection and use of technological platforms, and other issues.Through research and analysis in this paper, we can draw the following conclusions:Firstly, blended smart teaching models can effectively improve teaching effectiveness and student learning experience. By designing courses and teaching methods rationally, fully utilizing diversified learning resources and technological platforms, guiding students to actively participate in learning, and improving their autonomy and problem-solving abilities. Secondly, teachers play an important role in blended teaching and need to adapt to new teaching concepts and methods, guiding students to actively participate in learning, and providing necessary learning support and guidance. Meanwhile, schools and educational management departments need to provide teachers with corresponding training and support, promoting the development and practice of blended teaching. Finally, the selection and use of technological platforms have a significant impact on the effectiveness of blended smart teaching. Educational institutions and teachers should carefully consider factors such as platform functionality, security, and service support, choose technological platforms that meet their own needs, and make rational use of their functions and resources, promoting innovation and development in education and teaching. In conclusion, the design and practice of blended smart teaching models for probability theory and mathematical statistics courses, both online and offline, are of great significance for improving teaching effectiveness and student learning experience. It is hoped that the research and analysis in this paper can provide new ideas and practical experience for higher education teaching reform, promoting continuous innovation and development in education and teaching.

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