

Research Article

Study of the Reform of College Mathematics Blended Teaching Supported by Intelligent Technology

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The rapid development of artificial intelligence, “Internet +,” big data, 5G, and other technologies in the twenty-first century has not only brought great changes to the field of education but also brought unprecedented opportunities and challenges to the reform and innovation of mathematics teaching. The use of intelligent technology to carry out the reform of college mathematics teaching in depth and effectively improve the quality of teaching has become a hot topic discussed by the majority of mathematics teachers. This paper carefully analyzes and sorts out the problems existing in the current intelligent college mathematics teaching and systematically studies the related theories and design principles of the blended teaching mode. The ideas and approaches of the reform of college mathematics blended teaching supported by intelligent technology are deeply discussed from the aspects of improving the level of teachers, setting up a blended teaching team supported by intelligent technology, optimizing the informatization construction of teaching environment and establishing rich teaching resources, building an online and offline classroom teaching system, personalized learning under the background of microclass and cloud class, cross-university blended learning in the network environment, and mathematics precision teaching evaluation and optimization using big data.

1. Introduction

In the twenty-first century, the rapid development of artificial intelligence, “Internet +,” big data, 5G, and other technologies has brought great changes to the field of education, leading to profound changes in higher education concepts, viewpoints, and education ecology [1]. Intellectualization of education leads the new direction of higher education development. Intellectualization of higher education is an effective way to promote the development of higher education and improve the quality of teaching and also brings unprecedented opportunities and challenges for the reform and innovation of mathematics teaching. In this context, the college mathematics blended teaching reform supported by intelligent technology arises at the historic moment. The blended teaching is a kind of teaching mode that combines traditional teaching and network learning with the support of intelligent technology and digital teaching platform [2, 3]. It not only inherits the advantages of the traditional classroom teaching mode of face-to-face interac-

tion but also makes full use of the convenient conditions provided by information means and effectively integrates the two, so that the teaching methods and teaching effects have been greatly improved [4]. It has changed the traditional teacher-centered teaching mode and transformed students’ learning mode and cognitive mode. Through teaching, guidance, monitoring, and other methods, teachers can improve students’ independent learning ability and cooperative learning ability, give full play to students’ initiative and creativity in learning, and enhance students’ comprehensive quality [5]. At present, the blended teaching mode supported by intelligent technology has gradually become a new teaching mode that can adapt to the existing teaching requirements and teaching environment [6].

Driven by intelligent technology, mathematics education has experienced two levels of progress. First, great changes have taken place in educational mode of thinking and operation [7, 8]. Teachers’ teaching methods, knowledge dissemination paths and update of students’ learning tools are all changing to

diversified and blended directions. Second, intelligent technology breaks the shackles of traditional mathematics classrooms, enables high-quality educational resources to be largely circulated and updated, greatly expands the scope of education, and promotes talent training. The integration of intelligent technology and mathematics blended teaching is an inevitable trend of the times.

In recent years, with the rapid development of education informatization and intelligence, the vast majority of colleges and universities have established network facilities, equipped with necessary equipment, software, and resources through relevant construction and measures [9]. In teaching, application, management, and other aspects, teachers, students, and leaders have a certain ability to use. The rapid development of intelligent technology has caused profound changes of mathematics teaching and learning. New teaching modes such as MOOC, microclass, flipped class, and learning app have appeared in college mathematics classes [10]. Students can use the Internet, computers and mobile phones to communicate, study, and live. Some colleges and universities have begun to implement the reform of blended mathematics teaching [11]. Combining intelligent technology and applying new teaching concepts, models, and methods, teachers can gradually form a space of “sharing, openness, and collaboration,” changing from “teaching knowledge as the center” to “cultivating ability and quality as the center”, cultivating students’ active learning desire and autonomous learning ability, and further improving teaching quality.

2. The Existing Problems

At present, some colleges and universities at home and abroad have explored the blended teaching mode and reformed the traditional teaching mode [12]. However, through investigation and research and interviews with teachers and students, combined with the actual situation of mathematics teaching at our university, the author has found the following problems.

2.1. Inadequate Individual Guidance. The mathematics classroom teaching in the current blended teaching model is mostly taught in large classes with a large number of students [13]. During class, teachers cannot provide individual guidance. They usually explain and teach according to the original teaching plan, and all students are required to listen carefully. The usual teaching result is that the good students are dissatisfied, and the poor students are unable to keep up.

2.2. Problem of Ideas. Some mathematics teachers have formed their own fixed teaching methods and ideas through years of teaching practice. If there are problems with their teaching methods and ideas, it is usually difficult to make corresponding adjustments and improvements, especially major improvements. Although intelligent technology can help teachers improve teaching activities, most teachers are reluctant to make major optimizations and improvements, which makes it difficult to greatly improve teaching quality.

2.3. Emphasizing Technology Application and Neglecting Teaching Innovation. Although some achievements have been made in the application of intelligent technology in mathemat-

ics teaching, the current achievements are mainly reflected in improving the efficiency and convenience of teaching and learning. In the intelligent teaching, there is a problem of emphasizing technology application and neglecting teaching innovation.

2.4. Unsatisfactory Comprehensive Teaching Ability. The blended teaching of college mathematics requires teachers to fully master the teaching skills of network courses and skillfully operate the teaching software of PC and mobile terminals so as to organically integrate online and offline teaching to achieve the best teaching effect. At present, although some young teachers can proficiently operate a variety of software for teaching, they lack teaching experience and cannot fully maintain their advantages in teaching. Although some old teachers have rich teaching experience, their teaching software operation ability is not strong enough to meet the requirements of blended teaching practice [14].

2.5. Insufficient Effective Evaluation. For different colleges and universities, it is very important to accurately evaluate students’ academic performance and teachers’ teaching. The current intelligent evaluation methods mainly improve the efficiency and focus on the evaluation results, but lack of quantitative evaluation of teaching and learning methods and supporting conditions, and lack of effective research on the evaluation basis. The above problems hinder the effective implementation of blended teaching of college mathematics.

3. The Related Theories and Design Principles of Blended Teaching Reform of College Mathematics

3.1. Related Theories. The reform of college mathematics blended teaching should be implemented under the joint guidance of a variety of related theories. Specifically, the blended teaching theory includes humanistic learning theory, constructive learning theory, theory of mastering learning and teaching, and teaching interaction theory [15]. These theories provide effective methods and theoretical basis for the design, organization, construction, and implementation of blended mathematics teaching. Table 1 clearly shows what related theories include.

3.1.1. Humanistic Learning Theory. Humanistic learning theory is a student-centered teaching concept based on the theory of nature and humanity. The theory holds that students are the subjects of learning activities, and teachers should help students learn. The teaching goal is to develop students’ learning ability and achieve “meaningful learning.” Humanistic learning theory also believes that teachers should respect students’ opinions, treat students sincerely, become students’ friends, and guide them to carry out personalized teaching activities. In the blended teaching reform of college mathematics supported by intelligent technology, teachers should integrate traditional classroom teaching and student-centered online course resources, teach students in accordance with their aptitude, pay attention to all aspects of students’ learning process,

TABLE 1: Related Theories.

3.1 Related Theories
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3.1.1 Humanistic Learning Theory
3.1.2 Constructive Learning Theory
3.1.3 Theory of Mastering Learning and Teaching
3.1.4 Teaching Interaction Theory

provide them with personalized learning resources, and cultivate their ability to learn and solve problems.

3.1.2. Constructive Learning Theory. Constructivism believes that learning is the process of building knowledge based on original experience and knowledge with the help of others (including teachers and other learners) in a particular cultural and social context. In the blended teaching mode guided by constructivism theory, teachers should carry out targeted design in the composition of the entire curriculum, the organization of the classroom form, and the construction of the learning environment so as to maximize the initiative and enthusiasm of students' learning, pay attention to the development of students' individuality, and help students to accumulate knowledge to the greatest extent.

3.1.3. Theory of Mastering Learning and Teaching. Theory of mastering learning means "advantage learning and proficiency learning", which means more than 95% of students can master what they have learned if they have enough learning conditions. The theory is intended to adjust the variables in the teaching process so that learners take different amounts of time to understand and master the learning content. The guiding role of theory of mastering learning and teaching on blended teaching mainly includes the following aspects: first, blended teaching requires some teaching tasks to be carried out after class, which means that students have more freedom and disposable time and can choose appropriate learning pace and methods. The mastery of knowledge can be judged by completing homework, watching videos of teachers, completing online tests, and self-learning. What is not mastered can be studied again. Second, teachers should set clear teaching goals for students so that students can learn in a clear direction. Finally, on the premise of mastering basic knowledge, teachers can let students choose more learning materials independently, which can not only solve the problem of some students not getting enough to eat but also avoid the phenomenon of "indigestion" caused by some students eating too much too fast.

3.1.4. Teaching Interaction Theory. Teaching interaction theory holds that teaching interaction aims to promote the communication and interaction between teachers and students and promote the smooth completion of teaching activities with the help of network technology. The effect of the theory on the construction of a blended teaching model is reflected in the following aspects: interaction is a very important step in blended teaching activities, and interaction should be the core in the process of constructing blended teaching. First, the interaction between teachers and students should follow the principles of

TABLE 2: Design Principles.

3.2 Design Principles
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3.2.1 Principle of Pertinence
3.2.2 Principle of Integration
3.2.3 Two-subject Principle
3.2.4 Principle of Openness
3.2.5 Principle of Cooperation

efficiency and convenience, and they can interact in real time during online and offline teaching and learning. Second, the interaction between teachers and students and the network platform specifically refers to the upload of teachers' course resources, the comfort of students' viewing, and the aesthetics of the page, that is, the humanized function of the platform.

3.2. Design Principles. Table 2 clearly shows what design principles include.

3.2.1. Principle of Pertinence. The blended teaching reform of college mathematics supported by intelligent technology must first follow the principle of pertinence:

- (1) The curriculum should be tailored to the realities of mathematics learning. College students are active in thinking and have a strong ability to accept new things, but they are easily affected by the external environment. Therefore, teachers should guide them correctly according to the characteristics of mathematics curriculum.
- (2) Mathematics teachers should conform to the development of the times and constantly enrich teaching resources according to the real needs. When designing courses, they should keep pace with the times, meet the needs of the new situation, and arouse students' emotional resonance and learning interest.
- (3) The blended teaching supported by intelligent technology should combine the intuitiveness of traditional classroom with the divergence of knowledge of network courses, so that different students can give full play to their subjective initiative and make progress.

3.2.2. Principle of Integration. Only when network teaching and traditional teaching are organically integrated can we achieve the best result of mathematics blended teaching. Network teaching can make up for the deficiency of traditional mathematics teaching to a certain extent, but cannot completely replace it. Face-to-face teaching and network teaching have the same ultimate teaching goal, and they complement and expand each other. Therefore, the design of network teaching should fully consider the process of traditional mathematics classroom teaching, and the two should be closely related.

3.2.3. Two-Subject Principle. For a long time, college mathematics teaching has been following the traditional teaching mode. In teaching activities, teachers play the leading role,

while the role of students as the main body of teaching is not fully paid attention to, so the teaching effect is not ideal. The blended teaching of college mathematics supported by intelligent technology is based on the dual role of teachers and students and organically integrates the subjective active role of students in learning activities and the leading role of teachers in teaching activities, which complement each other. The leading role of teachers runs through the entire teaching process. Students are no longer passively accepting knowledge, and their subjective initiative has been brought into play, which can effectively cultivate their self-learning ability and problem-solving ability.

3.2.4. Principle of Openness. According to the viewpoint of system theory, if a system is to maintain long-term stability, it must remain open. We should regard the blended teaching of college mathematics as a system, which should timely absorb new ideas and new information in the external environment, and keep it dynamic all the time. First, the blended teaching model of college mathematics should be open, including the opening of teaching methods and teaching hardware facilities. The blended teaching method supported by intelligent technology has diversified channels, and the channels for students to learn and teachers to teach are wider, which can promote efficient completion of mathematics learning. Second, the teaching content should be opened up. The teaching resources are no longer limited to the limited learning spaces such as fixed textbooks and libraries in the past, but should vigorously broaden the receiving source of information for students and extend to the Internet field. Thirdly, the teaching process should be open, and teaching methods should be changed from mechanical indoctrination to open, interactive, exploratory, democratic, and other forms.

3.2.5. Principle of Cooperation. Blended teaching supported by intelligent technology should also follow principle of cooperation. For students, cooperative learning is a positive and effective way of learning, which can produce new thinking in the collision of ideas, make in-depth and detailed exploration of problems, deepen the understanding of knowledge, and improve their ability of cooperation. For teachers, cooperative teaching means that in the teaching process, teachers should actively communicate with peers, consult experts, and vigorously carry out cooperative activities to improve their teaching level, cultivate students' self-learning ability, and provide support for their cooperative learning.

4. Specific Measures for the Reform of College Mathematics Blended Teaching Supported by Intelligent Technology

The reform of college mathematics blended teaching supported by intelligent technology should combine the traditional mathematics teaching mode, take the network course, the network teaching platform, and other carriers which are beneficial to the interaction between teachers and students as the intermediary, combine all kinds of excellent educational elements, realize the complementary advantages of resources, strive to improve the level of teachers, effectively link students' online and offline

learning, strive to mobilize students' learning enthusiasm, give full play to their subjective initiative, cultivate students' innovative application ability, and further improve the teaching quality [16] Table 3 clearly shows what specific measures for the reform of college mathematics blended teaching supported by intelligent technology include.

4.1. Improving the Level of Teachers. Teachers are the designers, guides, and implementers of mathematics teaching activities. They are responsible for teaching and educating people, imparting knowledge to students, and evaluating students' learning. They play a very important role in teaching. College mathematics teachers in the intelligent age should keep up with the times, change the old ideas, ways, and methods of mathematics education in time, and integrate advanced education and teaching ideas into mathematics teaching. Teachers should work hard to learn modern educational information technology, improve their information technology capabilities, master the network knowledge required for the blended teaching reform, use various hardware and software proficiently, flexibly use online and offline mathematics teaching methods, adhere to the principles of "self-study first and school training as a supplement" and "self-development + resource sharing," and make relevant teaching courseware based on the actual teaching situation in a targeted manner. Teachers should also arrange teaching content reasonably, organically combine offline classroom and online teaching, and communicate with each student online and offline as much as possible, to fully grasp the relevant situation of students, vigorously cultivate students' active learning consciousness and independent learning ability, and carry out teaching reform in depth.

4.2. Setting up a Blended Teaching Team Supported by Intelligent Technology. In order to do a good job in the reform of college mathematics blended teaching supported by intelligent technology, a mathematics teaching team of "interactive sharing, cooperating, and exploring together" should be set up [17]. Due to the intervention of intelligent technology, its convenience, speed, diversity and other characteristics have eased the situation that some teachers have few opportunities to communicate with students, and teachers have undertaken different tasks from the past. If teachers can communicate and cooperate well with each other in the critical period of teaching mode transformation, it will be more effective than going ahead in silence. The construction of teacher team should be formed in the process of interaction, sharing, and cooperation, with the aim of improving teaching quality. In the joint participation of the reform of college mathematics blended teaching, teachers should exchange experience with each other, exert collective wisdom, complement each other, discuss and solve problems, and create a cultural atmosphere of cohesion, cooperation, sharing, and innovation. At the same time, relevant experts are invited to provide theoretical and practical guidance, so as to smoothly realize the transition from traditional teaching mode to the blended mathematics teaching mode supported by intelligent technology.

4.3. Optimizing the Information-Based Teaching Environment and Establishing Rich Teaching Resources. In order to improve

TABLE 3: Specific Measures for the Reform of College Mathematics Blended Teaching Supported by Intelligent Technology.

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- 4.1 Improving the Level of Teachers
 - 4.2 Setting up a Blended Teaching Team Supported by Intelligent Technology
 - 4.3 Optimizing the Information-based Teaching Environment and Establishing Rich Teaching Resources
 - 4.4 Building an Online and Offline Classroom Teaching System
 - 4.5 Personalized Learning in the Context of Micro Class and Cloud Class
 - 4.6 Cross-university Blended Learning in the Network Environment
 - 4.7 Mathematics Precision Teaching Evaluation and Optimization Using Big Data
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the quality of mathematics teaching, colleges and universities should vigorously strengthen the construction of network facilities, optimize the information-based teaching environment, improve online teaching and learning platforms, enrich students' online learning resources, and allocate specialized personnel to manage and maintain relevant facilities. Online teaching is an important part of blended mathematics teaching, and online course teaching resources provide support for it. The quantity and quality of teaching resources directly affect the effect of teaching. Teachers should record videos and make courseware according to the requirements of college mathematics courses. They can also select excellent mathematics teaching resources on the Internet for integration and editing and make PPT courseware, microvideos, homework, and examination questions suitable for students to make full preparations for online teaching. The following points should be paid attention to during production: first, let students fully understand and master key and difficult points of learning. Second, design suitable teaching content and materials, with enlightening and guiding questions, to cultivate students' self-learning ability. Thirdly, the teaching videos should be interspersed with explanations of some knowledge points and questions and answers between teachers and students to guide students to think positively and improve their ability to find and solve problems.

4.4. Building an Online and Offline Classroom Teaching System. The blended teaching of college mathematics supported by intelligent technology can reconstruct the classroom teaching system by combining online and offline teaching [18]. In online teaching, teachers can explain relevant teaching contents to students and let them watch relevant teaching videos and cases, and students can master basic knowledge through online learning. For the preclass tasks and online learning contents that students do not fully understand, they can be solved through offline teaching, checking and filling omissions, and carefully setting up related activities. Teachers should guide students to carry out active discussions so that they can master the key points and difficulties in learning, fully understand the content of knowledge learned online, and improve their learning ability, flexible application ability and problem-solving ability. At the same time, teachers need to make great efforts to transform the classroom teaching system from a single to a diversified direction, adopt theoretical teaching, interactive discussion, problem solving, and other forms to make the blended teaching more lively, enhance the appeal

of the classroom teaching atmosphere, and improve students' ability to digest and absorb knowledge.

4.5. Personalized Learning in the Context of Microclass and Cloud Class. In traditional mathematics classroom teaching, teachers can only carry out mathematics teaching according to the teaching mode suitable for the majority of students, and students cannot carry out personalized learning. When students encounter difficulties after class, they cannot get timely help from teachers, which is a problem that needs to be solved in the blended teaching reform of college mathematics supported by intelligent technology. Intelligence technology, "Internet +," big data, and other technologies should be used to build the effective mathematics teaching mode supporting students' personalized learning, which can take the following forms.

4.5.1. Mathematics Learning in the Context of Microlessons. Mathematics learning under the background of microclass is to record knowledge content into microvideo, so that students can conduct personalized learning through microvideo before class. Through the above learning, the study of basic knowledge is basically completed, so that students have more time in class, with the help of teachers, to think deeply, learn cooperatively, and solve more difficult and complex problems. Mathematics learning under the background of microclass is composed of preclass preview, inspiration, and guidance, cooperative learning, joint exploration and induction, and summary. Preclass preview refers to students' personalized learning through microclass. The main task of this stage is to make students master the basic knowledge of the lesson and then listen to the lecture carefully according to their own actual situation. In class, the teacher should first analyze the situation of students' personalized learning before class and explain common problems. Teachers can use multimedia technology to inspire and guide, and provide support for cooperative learning and in-depth inquiry. Problems are solved, and key points and difficulties are mastered through teacher-student interaction, student-student interaction, and cooperative exploration. Finally, the teacher should make a summary, and the students will gradually master the contents systematically and completely with the guidance of the teacher and the help of other students [19].

4.5.2. Systematic Review Guided by Excellent Teachers and Supported by Information Technology. After traditional mathematics class, students are generally unable to find a good

teacher for guidance if they encounter difficulties in unit, chapter, or staged review, while the quality of review directly affects the quality of students' mathematics learning. The solution to this problem is that the review guidance of excellent teachers can be provided to students in the form of cloud lessons through Internet technology, which not only facilitates students' review but also improves the quality of teaching. In the construction of cloud class review mode under the guidance of excellent teachers, personalized review mode suitable for different students should be studied according to different situations and needs. The curriculum system should be carefully honed, and a personalized review course that focuses on relevant test questions and effectively improves students' comprehensive level of mathematics should be constructed. In addition, mathematics teachers can also use modern information methods such as WeChat and QQ to answer students' questions in a timely manner and solve problems for them.

4.6. Cross-University Blended Learning in the Network Environment. Due to the limitations of teaching conditions such as teachers and equipment, no college or university can meet the individualized learning needs of all students. The solution to this problem is through mutual cooperation, different colleges and universities working together to provide excellent educational services for students. Different colleges and universities should give full play to their own strengths and advantages, integrate the characteristic courses of relevant institutions, and develop general courses, specialized courses, and interest courses with different characteristics. Artificial intelligence, the Internet, big data, and other technical means should be effectively used to give full play to the advantages of teachers in different colleges and universities. In consideration of time and space, students can choose suitable learning methods and contents to complete their learning tasks according to their own needs and carry out personalized learning, regardless of whether the course is taught by their own teachers. The course can be taught by teachers from their own college or university or jointly taught by teachers from their own college or university and other ones or taught by famous teachers from other colleges or universities alone [20].

Cross-university blended learning is a new type of educational layout built on the basis of cooperation, aiming at a win-win situation and pursuing characteristic or high-quality educational services, and has made new breakthroughs in educational resources, learning forms, and organizational structures. Through the reorganization of teaching resources, adjustment of teaching, learning form, structure, etc., the traditional learning methods and content are changed, so that students can learn and master knowledge with half the effort in the network environment of cross-university blended learning and further improve the efficiency of teaching and learning.

4.7. Mathematics Precision Teaching Evaluation and Optimization Using Big Data. Mathematics precision teaching evaluation and optimization using big data is to carefully analyze the situation and the way of mathematics learning of college students, accurately formulate mathematics teaching and learning objectives, reasonably design the teaching pro-

cess, and select appropriate teaching resources and tools to carry out mathematics teaching activities with the support of big data. In the implementation of mathematics teaching activities, teachers should be able to accurately understand the students' learning style and results, accurately grasp the students' mathematics learning situation, and then carry out appropriate intervention to adjust teaching and learning. Based on the results of teaching and learning, accurate data can be obtained to achieve accurate evaluation of mathematics teaching.

Mathematics precision teaching evaluation and optimization using big data should be able to accurately and timely understand and master the learning methods and results of college students and establish the data files of students' mathematical learning. Before class, mathematics teachers should be able to use big data, accurately analyze, understand, and master the mathematics learning situation of the whole class and individual students, understand and master the overall learning rules of students, and select the way and path suitable for students to learn together. During class, teachers should timely understand and master students' mathematics learning situation based on the data of students' learning performance and results, adjust teaching, and recommend methods and paths suitable for students' personalized mathematics learning. After class, teachers should find out the existing problems based on the data and situation of students' mathematics learning, provide targeted resources for students' personalized mathematics learning, and arrange appropriate mathematics tests and training to help students improve their learning and raise their mathematical level.

5. Conclusion

In summary, the blended teaching mode of college mathematics supported by intelligent technology is a teaching mode that conforms to the new situation. It broadens the methods and paths of mathematics teaching and learning, enriches the content of mathematics teaching, optimizes students' learning strategies, and focuses on mobilizing students' enthusiasm for learning and cultivates students' information-based learning ability and the ability to discover and solve problems. Through the combination of network teaching platform, microclass, cloud class, WeChat, QQ, and other forms of information technology with mathematics classroom teaching, college mathematics teaching has been improved, and the innovation and development of mathematics teaching model has been promoted. Therefore, this new teaching mode is worthy of in-depth research and vigorous promotion, and it can provide useful reference and help for the reform of mathematics teaching in other colleges and universities.

Data Availability

This article does not cover data research. No data were used to support this study.

Conflicts of Interest

The author declares that there are no conflicts of interest in the manuscript.

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