

# *Research and Application of Information Platform in Blended Teaching of Mathematics Course under Internet Technology*

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**Abstract:** With the approaching of “Internet plus” era, and against the background that advanced education becomes more and more informational, blended teaching mode that includes both online teaching and offline teaching has been widely concerned by education circles. Based on the reality of mathematics course teaching, this paper combines modern information technology with practical teaching of mathematics course, uses information technology to develop practical teaching resources of mathematics course, and uses intelligent teaching tool such as Rain Classroom to explore the reform of online and offline blended teaching mode of mathematics course. This paper explores the teaching design of mathematics course based on the mixed teaching mode reform of the information teaching platform under the Internet technology, and applies it to the teaching of mathematics course, and obtains good teaching effect.

## **1. Introduction**

With the approaching of “Internet Plus” era, online education resources like MOOCs and “Icourse163”, develops a lot and more abundant, which brings great change on colleges and universities’ teaching method. MOOC is popular for its fragmentation of knowledge learning and flexibility etc., which also prompts colleges and universities teaching method’s reform. However, MOOC also has its limitations, for example, there’s no interaction, no feedback on learning results, and has high requirements on students’ autonomous learning ability etc. The traditional classroom teaching method is no longer suitable for current education and teaching in the era of knowledge explosion due to the defects of narrow knowledge scope and single form, so a blended teaching method is required.

It is an important goal of university teaching reform to integrate online resources such as MOOC

with the advantages of classroom teaching and adopt a hybrid teaching model combining online and offline teaching. Under the background of "Internet +", a hybrid teaching model combining online learning and classroom teaching has been launched in various universities by using micro-courses, MOOCs and network resources. However, the mixed teaching in various universities is relatively "chaotic" and random, and it does not form a model and scheme that is easy to promote and implement, and its execution is poor.

This paper will take the mathematics course as an example to discuss the mixed teaching mode based on the information teaching platform, and give the elements, methods and steps of the mixed teaching mode. The blended teaching model proposed in this paper can be extended to other subjects.

## **2. Theoretical Research on Blended Teaching**

### **2.1. The Concept of Blended Teaching**

Blended teaching is a teaching method that is taken under the guidance of various theories, taking teachers as the leading and learners as main the main body, using multi-media, text book, technologies, internet resources and informational platform to make traditional face-to-face teaching be combined with internet learning, thus to achieve the best teaching results[1, 2].

### **2.2. Elements of Blended Teaching**

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#### **2.2.1. Mixture of Teaching Environment**

Classroom teaching and online learning mixture is the most basic pattern. This is a mixture of face-to-face teaching and online learning guidance in the classroom, and online learning with the help of online course platform after class. Blended teaching combines the advantages of classroom teaching and students' online learning, and on the basis of giving full play to the leading role of teachers, students' personality development is respected and their dominant position is highlighted.

#### **2.2.2. Mixture of Learning Method**

Autonomous learning in blended teaching refers to the independent learning of individuals in traditional teaching, such as access, interview, investigation, and online learning of students' independent retrieval, acquisition and processing of information in the network; Cooperative learning refers to group discussion, communication cooperation and online topic exchange based on network, and cooperation of inquiry activities in traditional teaching environment. How to organize students to integrate autonomous learning and cooperative learning effectively has become the primary task of blended teaching.

#### **2.2.3. Mixture of Interaction Method**

Interaction in blended teaching not only includes the real time of face-to-face discussion between teachers and students, students and students in traditional classroom environment, but also includes

with the help of information technology conditions such as information online teaching platform discussion module, forum or other chat tools and other ways of asynchronous interaction.

#### 2.2.4. Mixture of Teaching Media

Teaching media is the carrier of teaching information's storage and delivery. Traditional teaching media like blackboard and classroom is convenient when using them to separate into groups, but is quite limited on the time and location. Compared with traditional teaching media, informational teaching platform is not restricted by time and location, which can be used high efficiently, and has high autonomy, but is hard to track [3]. That's why we need to mix traditional teaching media with international teaching media, only by doing this can they play their respective advantages and thus to achieve the teaching result to the best.

#### 2.2.5. Mixture of Teaching Evaluation

In blended teaching, we should pay attention to the diversity of evaluation subjects and evaluation forms, including teacher evaluation, student self-evaluation and student mutual evaluation [4]. In the evaluation method, we should adopt the combination of formative evaluation in each learning process and summative evaluation after the end of the course, paying attention to both the results and the process. Through this multiple evaluation, students can clearly understand themselves, and teachers can get timely feedback to improve teaching.

### 3. Teaching design Based on Online and Offline Blended Teaching Mode

#### 3.1. Construction of Online Teaching Resources

Blended teaching is built based on the basis of mix learning theory, which contains two linkages online learning and classroom learning, and one of the essential conditions of online learning is the construction of online learning resources. Mixed mathematics courses teaching method divides teaching resource construction into three stages, which are before-class, in-class and after-class [5].

##### 3.1.1. Create Learning Guidance Plan

Learning guidance plan refers to the plan designed and published by teachers to guide students' independent learning before class and comprehensive learning in class and after class. It is the implementation plan designed by the teacher on the basis of analysis of the students' learning level and ability level, according to the characteristics of the teaching content, the degree of difficulty, the degree of mastery and other requirements. As show in Table 1, learning guidance plan.

*Table 1: Learning guidance plan.*

Elements	Effects
Learning content	Clear the learning content of each class, and divide it into before-class autonomous learning content, in-class learning content and after-class learning content.
Learning goal	Clear each class learning goals and requirements, and the learning goals are also divided into before-class learning goals, in-class learning goals and after-class learning goals, so that students

	learn more purposeful.
Learning task	The learning tasks of each class are divided into before-class preparation tasks, in-class learning tasks and after-class thinking tasks, so as to promote the completion of learning tasks in sections and to cultivate students' awareness of learning and work planning.
Guiding process	Clarify the learning sequence and steps of integrating before, in and after class are defined, which is conducive to students checking the completion of learning tasks and evaluating their learning situation.

The design of learning guidance plan focuses on "learning guidance" and "building a bridge between teaching and learning", which aims to highlight the dominant position of students, attach importance to the learning process of pre class preview, pre class autonomous learning, pre class detection, breakthrough of key and difficult points in class, after class consolidation, knowledge detection and in-depth thinking, and focus on cultivating students' learning ability and the ability to find and solve problems power. Its essence can be summarized as "leading plus subject, extra-curricular plus in class, textbook plus (guiding) learning plan, micro class plus detection, autonomy plus cooperation".

### 3.1.2. Record Micro-Lectures

The preparation of recording micro- lectures is to do well and find out the preliminary analysis. The main tasks include learning situation analysis, teaching goal analysis, teaching content analysis and environmental analysis. On the basis of the analysis of learning situation, teaching goal, teaching content and environment, the teaching content is carefully divided into pre-class learning content and classroom learning content, and the pre-class learning goal and classroom learning goal are set according to the teaching content.

### 3.1.3. Evaluate the Effect of Autonomous Learning.

According to the process, learning effect evaluation can be divided into three stages, which are before-class, in-class, and after-class. According to category, it can be divided into two aspects, which are knowledge level evaluation and ability level evaluation [6].

The evaluation of learning effect in the three stages: before-class, in-class and after-class is generally in the form of question testing. According to the different scope of learning content, appropriate test questions are set and released on the platform of Rain Classroom. Before class, examination questions designed to check the students' autonomous learning level, arrange appropriate quantity and difficulty test questions according to the self-learn content. In the class, the before-class learning content and classroom learning content are detected by means of online answer and online test, and the test questions of all teaching contents are released after class to test the students' knowledge level of this class.

Two aspects: knowledge level and ability level evaluation. The level of knowledge is generally realized through the online release of test questions or classroom questions in three stages before, during and after class. Ability level through the pre-class guide case and micro-class video layout classroom discussion questions, in the classroom release of thinking questions, or layout of after-class knowledge and ability development topics to organize classroom discussion exchanges

or online discussion exchanges, According to the students' communication and discussion, the ability to think, solve problems and transfer knowledge is analysed. As show in Table 2, evaluation of learning effect.

*Table2: Evaluation of learning effect.*

Three stages	Before-class	In-class		After-class	
Evaluative aspect	knowledge level	knowledge level	ability level	knowledge level	ability level
Release method	information platform	classroom	classroom	information platform	information platform
Evaluation form	test question	ask questions / test question	classroom deliberates	test question	online discussion

### 3.1.4. Design Discussion and Communication to Achieve the Goal of Ability Training

The prerequisite of online discussion and communication is the construction of discussion type problem resources. Discussion type problems are generally divided into three categories: before class, in class and after class. Among them, pre class problems and after class problems are released through Rain classroom and other platforms to organize students' online discussion. Pre class questions are generally set by teachers according to the content of autonomous learning before class. The topic content can be the deep expansion and comprehensive analysis of the pre class learning content, or the topic that can establish the relationship between the pre class learning content and the classroom learning content. After class problems can be the deep expansion of classroom learning content, or the practical application of classroom theoretical learning content and so on [7]. At the same time, it can provide the corresponding literature or MOOC and other reference materials, so as to cultivate students' autonomous learning ability and logical thinking ability.

In addition to classroom teaching, online discussion and exchange aims to provide students with interactive, mutual learning and mutual assistance learning carriers such as problem discussion, experience sharing, problem solving and learning exchange through online learning platform. It is an extension of traditional classroom teaching, is a full integration of text, pictures, audio, video and other multimedia information with stronger penetration and attraction of the virtual classroom, it breaks through the time and space constraints, can realize the interaction between teachers and students at any time and timely guidance, enhance the timeliness and influence of teaching.

### 3.2. Design of Offline Teaching Activities

With the advent of the Internet plus era, many online learning platforms have emerged, such as learning and Rain Classroom. Although teaching platform has many advantages such as breakthrough time and space constraints, online classroom teaching is still unable to replace online education because of the effectiveness and face-to-face characteristics of communication. Therefore, blended teaching mode came into being. In the blended teaching mode, with the diversification of online teaching activities, teaching methods and teaching resources, the design of

teaching activities is particularly important for the traditional classroom teaching to reflect students' subjectivity, enthusiasm and creativity.

### **3.2.1. Flipped Classroom-Students Summarize Knowledge Points**

Before class, teachers should make clear which content is the main part of the course, which is suitable for teaching in the classroom, and which content is the key and difficult point of classroom teaching that cannot be carried out in time. They need to use flipped classroom and micro curriculum mode, and place it in the pre class teaching. Classroom teaching adopts the mode of combining theory with practice. Flipped classroom needs front-end analysis, including students' demand analysis, knowledge point analysis and available resource analysis. On this basis, specific and subtle teaching objectives can be separated [8, 9].

According to the results of the front-end analysis, teachers release text, PPT, video and material teaching resources such as learning guidance plan, micro lesson video, teaching courseware and test questions in the online teaching platform before class, so as to promote students' autonomous learning, which provides a foundation for the flipped classroom type of blended teaching in offline classroom teaching. In classroom teaching, teachers need to effectively integrate the traditional classroom teaching and online autonomous learning, boldly carry out classroom flipping, focus on the problem-based or task driven teaching method, and guide students to summarize the learning content before class.

### **3.2.2. In-class Testing-Online Learning Testing Evaluation**

The effect of independent learning before class can be evaluated by classroom testing, interactive communication, questionnaire and other methods. The evaluation of learning effect is an effective method and means to examine the knowledge level and ability level of students before class. Although the test questions of preview content have been published in the online learning task before class, the online test results are not reliable to a certain extent, so the face-to-face test in class is still indispensable. In classroom teaching, teachers should set up certain classroom exercises according to the pre-class learning content, which can take different forms according to the different types and purposes of exam questions. For example, in the form of individual closed-book questions, each student's knowledge level is tested. Or in the form of a group, students with different learning levels are divided into a group, so that the group forms a situation of mutual help, and cultivate students' team consciousness. It can also be in the form of publishing research topics and organizing students' collective discussion, so as to analyse students' ability of knowledge transfer and so on.

### **3.2.3. Classroom Discussion-Consolidation and Extension of Online Learning**

In order to further improve the ability and level of students and realize deep teaching, it is very necessary to set up seminar teaching activities in classroom teaching. The topic of class discussion can be released by teachers in the video or courseware of micro class before class, so that students can prepare in advance for class discussion. It can be the common difficult problems of students in autonomous learning content before class, or it can be the expansion and extension of teaching content and so on. In organizing classroom discussion activities, teachers should strengthen the

interaction between teachers and students, students and students, create an effective learning environment for students, and let students master effective learning methods in the process of communication and discussion. At the same time, in order to avoid students losing their way in the process of inquiry learning, teachers need to properly guide students' discussion and exchange.

#### **3.2.4. Setting Group Task-Strengthen Student's Team Awareness**

In the current talent training needs, team consciousness is one of the necessary qualities. In classroom teaching, teachers should pay attention to infiltrate team consciousness through the design of teaching activities, and choose effective entry points and combination points. By flipping the classroom, readjusting offline and online time, the decision to learn can be transferred from teachers to students. The teaching mode of flipping classroom moves the teaching in the ordinary classroom to the extracurricular. In the classroom, students can become active implementers of learning by setting up group tasks, group achievement assessment, discussion, team cooperation and so on [10]. Students' engineering practice ability, communication and teamwork ability can be well trained in class, strengthen students' team consciousness, enhance students' understanding of team role and team value, and cultivate team spirit.

#### **3.2.5. Raising Problems-Cultivate Students' Awareness of Problems**

Whether students have a strong sense of problem and whether they can find problems and ask questions, to a great extent, depends on how teachers guide students to find problems and whether they often encourage students to ask questions boldly. In the online classroom teaching, teachers can take the exchange and interaction of autonomous learning content in the front line of class as the starting point, and encourage students to put forward their doubts, experiences and gains in the autonomous learning of knowledge content before class. In the whole process of communication, teachers should create a good classroom atmosphere, and truly achieve the "six permits": allowing students to ask questions freely; allowing students to argue freely; allowing unclear questions to be mentioned again; allowing incomplete additions; allowing teachers to criticize when they are wrong; allowing them to reserve their own opinions. Only in this way can students' psychological barriers be eliminated and students dare to ask questions and form problem consciousness.

#### **3.2.6. Ask Questions after Class-Achieve the Goal of In-depth Study**

In order to cultivate students' autonomous learning ability and realize the depth and dimension expansion of knowledge and ability, teachers need to be able to boldly let go in teaching. In the arrangement of classroom teaching content, teachers need to be "willing" to leave blank, not to do everything. According to the characteristics of the teaching content, it can be divided into three parts: before class, in class and after class. Before class content production micro video release, ask students to learn independently; after class learning content for students to check their own information after class self-study. If students have difficulties in self-study, they can be guided to discuss with each other and form a situation of students' own exploration. Teachers only play an auxiliary role in promoting students' autonomous learning. In addition, at the end of each teaching, in order to deepen students' understanding of knowledge, teachers can put forward higher level after class thinking problems, achieve the goal of in-depth learning, and cultivate students' autonomous



learning ability.

*Table 3: Evaluation of learning effect.*

Questionnaire Topics	Options and Their Proportions				
	Totally agree	Agree	Remain Neutral	Disagree	Strongly Disagree
I think it's easier to learn in blended teaching.	26.47%	35.29%	27.94%	7.35%	2.94%
I can master knowledge better under blended teaching mode.	30.88%	32.35%	23.53%	10.29%	2.94%
I think blended teaching can stimulate my enthusiasm and initiative in learning.	34.38%	37.5%	23.44%	1.56%	3.13%
I think blended teaching improves my ability to analyze and solve problems.	32.5%	30%	34.38%	1.56%	1.56%
I prefer the blended teaching mode to the traditional class.	30.88%	36.76%	26.47%	1.47%	4.41%

#### 4. Conclusions

Online and offline blended teaching based on information-based teaching platform is a burgeoning teaching mode, which can effectively improve students' learning enthusiasm and initiative, improve students' ability to analyze and solve problems, and meet students' needs for personalized learning, autonomous learning and mobile learning, as shown in Table 3. The data in Table 3 are the data obtained from the questionnaire we sent to the students through the information teaching platform. However, due to the allocation of students' spare time, the segmentation of teaching content and other reasons, it needs continuous practice and improvement to achieve the optimal teaching effect.

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#### References

- [1] Hongjian Liao, Qianwei Zhang. *Construction and evaluation of blended teaching readiness index in colleges and universities [J]. e-Education Research, 2019(3): 59-67.*
- [2] Ce Zhang, Dianhui Chu, Songlin Gu, et al. *Research and practice of blending teaching based on "MOOC + SPOC + Flipped Classroom" for Software Engineering [J]. 2018(12): 108-113.*
- [3] Linqun Zhang. *Exploration and practice of blended teaching model of Statistics [J]. Higher Education of Sciences, 2021(1): 54~59.*
- [4] Nannan Sun, Fuwei Zhao, Zhichao Zhao. *College Physics curriculum design based on "Rain*



- Classroom” hybrid teaching [J]. Journal of Hebei University of Water Resources and Electric Engineering, 2020, 30(4): 76~78.*
- [5] Zhang Haiying. *An analysis of the construction and application of digital teaching resources in colleges and universities [J], Journal of Zunyi Normal University, 2019, 21(6): 128-132.*
- [6] Zixian Wang, Guofu Ma, Taihang Liu, et al. *Research on teaching quality evaluation of blended teaching model[J]. Shanghai Journal of Educational Evaluation, 2018(1): 37-40.*
- [7] Chu Dan, Xie Jian. *Blended Study Design of training of high order thinking ability [J], Heilongjiang Science, 2021, 12(3): 100-101.*
- [8] Jing Ma, Xibin Han, Jiangang Cheng. *Research on activities design of blended instruction to promote student engagement [J]. Tsinghua Journal of Education, 2018, 39(3): 67-75, 92.*
- [9] Chengyang Li, Zitang Gao. *Research on blended teaching mode of Investment course based on OBE Concept, 2019 9th International Conference on Management, Education and Information [c], 2019: 307-312.*
- [10] Hongyan Li. *Online and Offline Gold Course of Ideological and Political Course in Police Colleges and Universities [J]. Journal of Sichuan Police College, 2021, 33(1): 114~120.*