

# *Research on Mathematics Teaching Reform in Colleges and Universities under the Background of Educational Informatization*

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**Abstract:** The rapid development of information technology has brought advantages as well as challenges to the reform of college education and teaching. Because of the integration of information technology, not only the simple penetration of technology, it is a major change in educational thought, content and way, is the need for teachers to change from inside to outside. In this paper, the connotation of educational informatization and the significance of carrying out college mathematics education based on educational informatization are expounded, the current situation of college mathematics education under the background of educational informatization is analyzed, and how to carry out college mathematics education reform based on educational informatization is put forward.

## **1. Introduction**

For mathematics education in colleges and universities, the advancement of information technology is a major opportunity.

Under the condition of information technology, mathematics teachers in colleges and universities can use big data, artificial intelligence and other new technologies to combine with mathematics teaching, turn the complex into simple, difficult into easy, and enhance students' interest in classroom learning. For example, the intuitionistic nature of multimedia technology can make abstract mathematical knowledge more vivid and interesting. The interactive electronic whiteboard can provide a better platform for students' learning and communication. It can be seen that education informatization is a trend. Teachers should actively learn advanced technology, integrate information technology into mathematics classroom, and realize two-way interaction and communication between teachers and students, so as to promote the reform of mathematics education in colleges and universities.

## **2. The Connotation of Educational Informatization**

### **2.1. The Concept of Educational Informatization**

In fact, education informatization contains two meanings. The first one is to use information

technology to reform education. For example, the use of information technology to explore educational resources, innovation classroom, the use of information technology means to optimize the traditional teaching methods. The second is to integrate information literacy into educational objectives and cultivate informatization talents to meet social needs [1]. According to the teaching situation, the two connotations of educational informatization will be reflected in the actual classroom, the most core of which is the information in the field of teaching. That is, teachers should integrate scientific and technological teaching means, information education communication methods, modern teaching methods, to be able to use big data, multimedia, artificial intelligence and other modern technology, to achieve the reform of traditional education, the real implementation of quality education.

## **2.2. The Characteristics of Education Informatization**

From the perspective of technical attributes, educational informatization has the characteristics of multi-media, networking, digitalization and intelligence. Multimedia refers to the integration of information and media to achieve integration. Networking refers to the use of technology to break through the limitations of time and space, so that resources can be shared and people can communicate more easily. Digitalization means that information technology systems are more standard, reliable and equipped with simpler equipment. Intellectualization means that in the process of teaching, the system can replace manual processing of more complex tasks. From the perspective of educational attributes, educational informatization embodies the characteristics of openness. For example, it breaks the education-centered system and makes education more autonomous and social. It also reflects the shareability. With the help of technology, learners can share rich educational resources. In addition, it also embodies the characteristics of interactivity. That is, it can realize the mutual communication and learning between man and machine. In a word, education informatization makes the transmission of information more convenient and the quality of information education resources is higher.

## **3. The Significance of Mathematics Teaching in Colleges and Universities Based on Educational Informatization**

### **3.1. It is Beneficial to Enhance the Interest of College Students in Learning Mathematics**

The mathematical knowledge points involved in colleges and universities include functions, limits and continuities, differential functions of one variable, integral functions of one variable and so on. Functions, limits and continuities mainly investigate the students' comparison of infinitesimal order, the discussion of function continuity and other knowledge. Obviously, compared with the knowledge in high school, it has risen to a new level. If teachers blindly adopt the one-word teaching mode, it will inevitably affect students' interest in learning. Through the adoption of information technology presents the contents of teaching, such as the teaching media can include television, animation, sound and other resources, infiltration of this kind of resources in classroom, can alleviate the boring sex of mathematics learning, and to abstract function knowledge become more specific, students are more interested in participating in the classroom.

### **3.2. It is Conducive to the Innovation of Traditional Mathematics Teaching Methods**

Under the background of exam-oriented education, Chinese teachers mainly adopt the teaching method of filling the classroom when carrying out teaching. For example, teachers explain in class based on the teaching content, and the interaction between teachers and students is relatively small.

In such a class, students blindly take notes and listen to the teacher's explanation, which makes it difficult to improve their thinking and ability in mathematics learning [2]. However, under the background of educational informatization, the development of mathematics teaching in colleges and universities actually requires teachers to change the traditional teaching concept. With the help of information technology to optimize the traditional teaching method, can really establish the student-oriented college mathematics classroom. For example, before teaching, college mathematics teachers should be good at using information technology to create pre-class preview activities for students. In the classroom, we should use information technology to explain difficult knowledge, so that students can really participate in the exploration of new knowledge, and cultivate students' core quality of mathematics.

### **3.3. It is Conducive to Improving the Ability of College Students to Learn Mathematics**

With the continuous progress of The Times, education has also ushered in significant reforms. Especially after the double reduction and the new curriculum was put forward, teachers at all stages began to innovate traditional teaching methods in order to implement the goals of education. In the new era, the goal of education is not only to transfer students' basic knowledge, but more importantly to cultivate students' abilities behind the knowledge. As for the course of mathematics, it is mainly to cultivate students' ability of mathematical thinking, mathematical inquiry, mathematical modeling and so on. In college mathematics teaching, the integration of educational information technology can not only enrich the content of classroom teaching, improve students' interest in learning, but also take the initiative to guide students to explore in the classroom, which virtually improves the ability of college students to learn mathematics.

### **3.4. It is Beneficial to Improve the Quality of Mathematics Teaching in Colleges and Universities**

College mathematics is the upgrade of high school mathematics, both the difficulty and learning requirements are further improved. In the face of such teaching content, teachers must grasp the characteristics of college students and reasonably design classroom teaching plans. Educational informatization is the combination of education and information technology, and it is an important means to change the traditional one-word teaching method. By integrating information technology into college mathematics, rich educational resources can be introduced, abstract knowledge can be transformed into concrete knowledge, difficult knowledge can be transformed into simple knowledge, and students' confidence in learning mathematics can be improved. It is very beneficial to both teachers' teaching and students' learning.

## **4. Current Situation of Mathematics Teaching in Colleges and Universities Under the Background of Educational Informatization**

### **4.1. Teachers' Cognition of Educational Informatization is Unclear**

Many teachers believe that educational informatization is to integrate some information technology into mathematics classroom, which is actually one-sided. The real education informatization is the thorough transformation of teachers' thinking, teaching methods and other fields. For example, teachers should be aware of the necessity of information technology into college mathematics classroom, based on the content of teaching, reasonable choice of information technology, at the same time, information technology should be used to enhance students' interest in learning mathematics knowledge, enhance the effective interaction between teachers and students in

the classroom [3]. But in the actual college mathematics classroom, when teachers integrate information technology, they mainly use multimedia technology to present the corresponding knowledge. Simply reading information technology courseware does not really give play to the role of educational informatization in the classroom. In fact, it has a lot to do with teachers' unclear cognition of education informatization and their thoughts have not really changed.

#### **4.2. Teachers Ignore the Emotional Communication between Teachers and Students**

College mathematics teaching is not only the classroom of knowledge transfer, but also the classroom of emotional communication between teachers and students. Teachers should be able to dig the corresponding information through the students' eyes and expressions in the classroom, and the students will also get the corresponding inspiration and encouragement from the teachers' expressions and gestures. But in the actual information education link, many teachers will use information technology, as a cold equipment, teachers hold the mouse, facing the computer, completely forget that the purpose of education in the classroom is not only to present the teaching content, more is to use teaching equipment to achieve knowledge exchange between teachers and students. If students blindly face the screen without emotion, how can they think deeply and analyze.

#### **4.3. Teachers Use Information Technology in A Single Way**

In college mathematics classroom, teachers often use the information technology teaching method is multimedia teaching method, that is, before the class teachers will sort out the teaching content, and put the sorted teaching materials in the multimedia. In the classroom, when the teacher explains the knowledge, the multimedia resources will be opened, and the students can watch. In fact, there is no problem in such classes, but the key point is that teachers ignore how to use multimedia educational resources. For example, some teachers simply read courseware in class, and analyze some conceptual knowledge by themselves, while students have no opportunity to participate in it. When some teachers use multimedia, they will insert some fancy pictures. These pictures can not enhance students' interest in learning, but will affect students' concentration[4]. In addition, mathematics teachers in colleges and universities use multimedia technology more frequently and ignore the application of new educational information technology such as micro-class teaching and flipped classroom teaching, which will also affect the quality of mathematics classroom teaching in colleges and universities.

#### **4.4. Teachers' Ability to Use Information Technology is Insufficient**

There is no doubt about the professional quality and ability of college mathematics teachers, and their achievements in the field of mathematics are obvious to all. However, the development period of information technology in our country is relatively short, especially the integration with the education sector, has not reached a deep stage, so many teachers of information technology understanding is erroneous. At the same time, the use of some advanced information technology is not very well understood, which will affect the quality of college mathematics teaching reform.

## **5. The Reform Strategy of Mathematics Teaching In Colleges and Universities under the Background of Educational Informatization**

### **5.1. Teachers Should Actively Change the Traditional Educational Concept and Establish the Correct Educational Concept**

With the rapid development of society, higher education is constantly reformed. One of the goals of the reform is to change from the traditional teacher-centered teaching mode to the student-centered teaching mode. Under the background of information education, there are many shortcomings in college mathematics teaching innovation, especially in the teachers' concept has not really changed, which also affects the application of information technology in college mathematics classroom.

First of all, teachers should re-establish the relationship between teachers and students. With the development of information technology, teachers are no longer the exclusive owner of information, and students have many ways to obtain information. It is no longer limited to the traditional teachers and books, so the role of teachers is not so important compared with the traditional ones. Therefore, teachers should change from knowledge transfer to the organizer of students' learning, the designer of teaching resources, and the auxiliary of students' learning. Only in this way can we establish the subject status of students in the classroom, and can we really implement the core quality of students' mathematics. Secondly, teachers should fully respect and care for students [5]. As far as college students are concerned, they are in the development stage. At this stage, they will be tempted by various aspects of society, and their focus on study will become worse. Based on this, teachers should pay attention to the status of every student in time. For some students who are not focused enough in class, they can chat with these students in private, so as to shorten the distance between teachers and students. Finally, teachers should use their spare time to learn more advanced information technology means, understand the use of some technical software, and think about how to combine technology and teaching content, so as to enhance students' interest in learning advanced mathematics. In short, only teachers establish the correct concept of education, active learning of modern technology, continuous innovation of teaching methods, can point out the direction for the reform of college mathematics teaching.

### **5.2. The Pre-Class Preview Based on Micro-Class Design can Cultivate Students' Habits of Independent Learning**

Micro-class is an embodiment of the combination of information technology and education. Its core composition is classroom teaching video, and it also includes a series of teaching design courseware and reflection related to the teaching topic. It is a way of using information technology to present fragmented learning content to students according to their cognitive laws. The characteristic of micro-class teaching is that the teaching content is less and the teaching time is relatively short, usually about five to eight minutes, but the teaching theme is very prominent and the content is very specific, which can better improve students' interest in learning mathematics. In college mathematics classroom, teachers can also incorporate such teaching methods to encourage students to preview before class and develop a good habit of independent learning.

For example, when learning the extreme value of multivariate function, teachers can design three self-learning contents for students by using micro class. In the first micro class, teachers show students some cases in life, such as a teacher cutting cloth, he is thinking about how to cut cloth to ensure the most economical. A technical operator is designing a cup.

He is thinking about how to design the volume of the cup so that it can hold a lot of water. In the second micro-lesson video, the teacher explained that extreme values not only exist in books, but

also in our life. In addition to what was introduced in the first video, it is also necessary to empty the shopping cart to minimize the cost and maximize the discount. To achieve the highest performance at work and other events [6]. Similar events in this respect, from a mathematical point of view, can often be summarized as a problem related to the maximum and minimum values of a function. In the third micro-lecture video, please preview the textbook and think about what extreme values are, which situations can be applied to extreme values in life, and whether there are necessary conditions for extreme values. With the help of information technology, micro lesson materials for pre-class preview are designed for students. Students can log on to relevant platforms to complete the preview tasks assigned by teachers and understand the knowledge they need to learn in class. At the same time, it is also conducive to cultivate students' interest and ability to learn knowledge independently.

### **5.3. The Teaching based on Multimedia Technology can Cultivate Students' Interest in Learning Advanced Mathematics**

Many universities are still in the process of development, and there is no perfect information teaching platform. However, multimedia equipment is relatively common in colleges and universities, and it is also a teaching method often used by teachers. For example, with the help of PPT to make electronic teaching plans, Matlab can be used to draw more accurate two-dimensional and three-dimensional graphics, but also the content of the teaching can be arbitrarily enlarged and reduced, can create interesting teaching situation for students, let students' various senses in the classroom to be active, improve the absorption rate of knowledge [7]. If the teacher can fully master the multimedia technology means, reasonable penetration in the classroom, it is bound to enhance the intuitive teaching content, vividness, to achieve a better teaching effect. Extreme values, for example, derive their concept from the problem of the largest (smallest) value in mathematics. According to the law of maximum value, defined in some bounded, closed region above each continuous function, all reach its maximum (minimum) value, the solution is, want to judge where, reach the maximum (minimum) value. If we say that the maximum point is not a boundary point, then it must be an interior point. When analyzing the necessary conditions for the existence of extreme values, teachers can show the image of binary functions for students with the help of multimedia. If the function  $A = f(x, y)$  is equal to  $(x_0, y_0)$  with partial derivatives and at the point  $(x_0, y_0)$  can be obtained at the point where the partial derivative is zero:  $f_x(x_0, y_0) = 0, f_y(x_0, y_0) = 0$ . From the image, students can clearly analyze the maximum value of binary function, and then rewind back to the maximum value of unary function, the existence of the situation, and then use the premise of the existence of the maximum value of unary function, present the extreme value of multivariate function, the necessary conditions for its existence. Through the graph can clearly present the extreme value problem, leading to the necessary conditions for the existence of the extreme value. Of course, in this part, students can also draw graphs independently, and present the results through the way of casting the screen, and analyze the drawing graphs of different students, so as to draw out the key content of teaching.

### **5.4. Based on the Interactive Electronic Whiteboard Technology, Cultivate Students' Mathematical Inquiry Ability**

Interactive electronic whiteboard is a very important step in the history of whiteboard development. It realizes the two-way interaction between whiteboard and computer, presenter and audience. For example, the interactive electronic whiteboard can be connected with the computer for real-time communication of information, and can also use the projector to cast the contents of the computer on the electronic whiteboard in time. Only a specific point ratio can be directly

operated to edit and save files. In short, interactive whiteboard technology can be arbitrary writing, painting, photography, can also achieve remote teaching.

In college mathematics teaching, teachers can use the advantages of interactive electronic whiteboard technology to carry out teaching. For example, the luminance, color and shape of the spotlight can be used to present the key mathematical knowledge and content, so as to improve students' interest in learning and attention. With the mobile function of the whiteboard, teachers can accurately move the displayed content by simply tapping or swiping the screen. They can also directly click the whiteboard and drag and drop the contents of the whiteboard [8]. In the classroom, teachers can reasonably use the mobile function of whiteboard according to the actual situation of college students and the teaching content to break through the heavy difficulties of teaching. In addition, the electronic whiteboard has a special hiding function. Teachers can cover some contents that need to be revealed with specific graphics through the design of the teaching plan. When the content is explored to a certain extent, they can play the content prepared in advance through the hiding function. This part of the hidden content in the classroom is to stimulate students' interest in inquiry and promote children's thinking. And the traditional paper cover, this kind of way is more convenient.

### **5.5. To Establish a Diversified Evaluation System to Improve the Quality of Mathematics Teaching in Colleges and Universities**

For a long time, when we evaluate students, we mainly take the examination results as the basis of evaluation. But in fact, the evaluation content and method are relatively single, which is not conducive to improving the quality of mathematics teaching in colleges and universities. Based on the relevant content of education reform and the penetration of college mathematics education informatization, it is necessary to establish a diversified evaluation system. First of all, the evaluation content should not be limited to test scores, but also include students' online learning time, classroom performance, homework completion etc, to design a reasonable proportion.

Secondly, the subject of evaluation should include not only teachers, but also students themselves and group peers. Students' evaluation of their math learning should also be carried out to evaluate the information teaching of teachers. Teachers should constantly optimize the teaching methods according to the evaluation. The last form of evaluation is mainly written test, oral test, activity report, after-class interview and so on.

## **6. Conclusion**

In a word, under the background of educational informatization, the teaching reform of mathematics teachers in colleges and universities is an inevitable trend. Mathematics teachers in colleges and universities must establish correct educational concepts, actively learn advanced technology, and closely combine it with the content of teaching, so as to enhance students' interest in learning mathematics, help students break through the difficulties in high mathematics learning, and improve the quality of mathematics teaching in colleges and universities.

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