

# *Talking about the Present Situation, Problems and Strategies of Information Technology in the Integration of Mathematical Modeling Courses*

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**Keywords:** Information Technology; Mathematical Modeling; Curriculum Integration; Problem Strategy

**Abstract:** With the development of information age in China, information technology has been widely used in mathematics education and teaching. According to the High School Mathematics Curriculum Standards (2017 Edition) issued in 2018, China's emphasis on mathematical modeling has been further enhanced, and the core quality of mathematical modeling has become one of the six core qualities. This paper analyzes the current situation and problems of the integration of information technology and mathematical modeling courses, and finally gives some strategies, hoping to have some guiding significance in the future mathematical education and teaching.

Mathematical modeling course is a highly practical course, which can help us use mathematical knowledge to solve problems about politics, economy, science, engineering and other applications; On the contrary, with the development of economy and the progress of science, we can better establish mathematical models, and then use certain information technology to improve the mathematical models. It can be seen that the application of information technology can enrich the content of mathematical modeling course. The core of information technology is computer, communication and the product of the combination of the two -- network [1]. To sum up, information technology is closely related to mathematical modeling courses.

In the post epidemic era, information technology has always existed around our lives. No matter where we go or what we do, it is impossible to do without it. In school education and teaching, information technology is also indispensable. The traditional teaching methods in the past can no longer meet today's social environment and curriculum content, and many courses need to be taught by information technology. The integration of information technology and mathematical modeling course teaching is both a change and an innovation [2].

## **1. The Current Situation of the Integration of Information Technology and Mathematical Modeling Courses**

"Integration" comes from "Integration" in English, which refers to combination and combination. Professor Li Kedong mainly believes that applying rich information-based learning resources to

mathematics courses, creating an information-based learning atmosphere, and correctly applying information technology can deepen students' understanding of the connotation of mathematical knowledge, promote students to love mathematics, and improve teachers' classroom efficiency [3].

### 1.1. Foreign integration status

In the 1970s, many countries around the world have realized the importance of information technology and curriculum integration, and have formulated relevant information education policies.

The United States attaches great importance to information technology and uses it frequently. It regards information technology as an indispensable part of daily life. The American education department has already formulated many policy documents on the integration of information technology and mathematics: in 1989, the School Mathematics Curriculum and Evaluation Standards was published, which first proposed the use of computers in mathematics curriculum, believed that computers played a great role in teachers' teaching process, and pointed out the idea that information technology should be fully integrated with mathematics in the "2061" plan. In 2016, the National Education Technology Plan was issued, which aims to enable students to gain learning experience both inside and outside the school. Whether formal or informal, students are expected to participate in the learning of Internet globalization [4].

The UK pays attention to the practicality of information technology and takes it as a powerful tool. In 1972, the United Kingdom began to fully explore the role of information technology to maximize the effectiveness of information technology to assist classroom teaching. In the British National Mathematics Curriculum issued in 2000, teachers were suggested to use ICT technology to carry out inquiry teaching.

In the 1990s, primary and secondary schools in Japan began to comprehensively study the integration of information technology and subject curriculum. The most significant feature is to emphasize whether the use of information technology can effectively collect feedback information in teaching, and scientifically evaluate teachers and students through feedback information. When problems occur in teaching links, teaching methods can be adjusted in a timely manner.

### 1.2. Domestic integration status

The research on the integration of information technology and mathematics in China can be divided into three stages: the first stage is the stage of tool assistance (2000-2010), the second stage is the stage of integration and application (2011-2017), and the third stage is (2018 - present) [6]. With the development of the integration stage, many experts and scholars began to study the integration of information technology and mathematics curriculum from different perspectives, with different interpretations of the concept of integration.

Professor He Kekang mainly conducts research from a theoretical perspective. He proposes a new teaching method characterized by "autonomy, inquiry and cooperation". Through the application and integration of information technology, a teaching structure of "leading subject combination" is formed [7].

Zhang Dingqiang and Jin Jiangxi believe that the integration of information technology and mathematics curriculum is the comprehensive development of teachers, students and learning resources on the basis of innovation. From the perspective of the structure of mathematics curriculum, the integration of information technology and mathematics curriculum is the multi-dimensional integration of information technology and mathematics curriculum goals, content, implementation and other processes, Promote the optimization of mathematics curriculum system and the improvement of mathematics structure. With the development of integration, both information technology and mathematics curriculum have been developed to achieve the goal of talent training [8].

In 2004, Li Mang proposed that the integration of information technology and mathematics has three levels: the first level is to regard information technology as the learning object itself, which needs to be mastered by every learner; The second level is to use information technology as a learning aid, and students learn with it; The third level is used as a teaching tool. Teachers use information technology to carry out teaching activities.

In terms of the research on the advantages of the application of information technology in mathematics teaching: In 2016, Wang Dong proposed that when information technology is applied to students to solve relevant mathematical problems, it is convenient to improve students' thinking level and cooperation and communication ability, and information technology can be used to create situations in the classroom [9]. In 2019, Wang Pengfei proposed that the integration of information technology into mathematics teaching can improve the learning effect of mathematics, but we should pay attention to the two extremes of excessive use of information technology and never use information technology, which will be detrimental to the learning effect of students, leading to misunderstanding that both teachers and students use information technology as a wrong choice [10].

## **2. Problems in the Integration of Information Technology and Mathematical Modeling Courses**

Information technology has become crucial in the course of mathematical modeling, but there are also many problems. Teachers and students cannot form a good cooperative relationship, which will lead to low efficiency in the classroom, and students fear learning. The following will specifically discuss some existing problems:

### **2.1. School leaders and relevant education departments do not attach importance to the integration of information technology and mathematical modeling courses, and school teachers lack targeted training**

If we want to improve the comprehensive level of a school, we must first have the strong support of the education department and the deep concern of the school leaders, so that we can achieve some specific measures in the social environment. Teachers, as the instructors implementing the integration of information technology and mathematical modeling courses, need to update and train some old teaching concepts and information technology application abilities of teachers. Through consulting materials and interviewing mathematics teachers in several schools, it is found that many teachers have participated in the training related to the integration of information technology and mathematics curriculum once every two years, and even some teachers have not participated. It can be seen from this that school leaders and relevant education departments do not pay attention to improving teachers' information technology application ability and integration concept, resulting in the lack of information technology application ability and integration concept, It seriously affects the deep integration of courses.

### **2.2. The school's information technology software and hardware facilities are not in place and need to be improved and perfected urgently**

As for the people's desire for a better life, food and clothing is a prerequisite; For teachers and students to better implement the integration of information technology and mathematical modeling courses, school equipment and facilities are the prerequisite. The author visited some high schools in cities and rural areas through his own school, and found that some schools did not even have multimedia classrooms. The relatively new teaching media, such as electronic whiteboard and touch machine, are rare. This will lead to people being unable to learn new knowledge more intuitively and observe the modeling process of mathematical modeling better. Secondly, many teachers are not equipped with computers, which will affect the courseware making in class. Finally, there is the problem of network construction. If the network construction of schools is not very good, the network

will often be disconnected, affecting teachers' daily mathematical modeling teaching. Even some schools do not have a network. To sum up, school facilities are very important.

### **2.3. Some teachers and students do not attach importance to the integration of information technology and mathematical modeling courses, and their understanding is shallow**

Through a visit to several high schools near their schools, we found that many teachers and students do not know the word integration and mathematical modeling very well. For this phenomenon, the biggest reason may be that many teachers only teach for the purpose of teaching, and only limit teaching to textbooks, neither broadening knowledge nor cultivating students' comprehensive ability. Although today's students are living in the information age, they will not take the initiative to pay attention to this knowledge. Theory is the advance of practice. Teachers have to spend more time to supplement mathematical modeling knowledge, and then learn about the integration of mathematical modeling and information technology. If there is no clear understanding of the word "integration", it will certainly affect the implementation of integration and cannot better teach mathematical modeling knowledge.

### **2.4. Teachers' information technology level and application ability need to be improved urgently**

After the promulgation of the new curriculum standard for ordinary high schools, teachers have known about the integration of information technology and mathematical modeling courses, are familiar with the importance of integration, and have also mastered the ability to make simple information technology software and courseware. However, for some complex software, many teachers can't use or even listen to it, so they can't show the whole dynamic process of model construction to students, and the classroom effect will be greatly reduced. As a mathematics teacher, it is necessary to master matlab, lingo and other mathematical software, but the actual situation is that many teachers will not use these, which will affect the overall effect of the class. Therefore, it is very important to improve teachers' professional ability, otherwise it will hinder the development of integration.

### **2.5. In the process of integration, we only focus on outcome evaluation, but lack of process evaluation**

Good evaluation will make classroom teaching timely adjusted, summarized and reflected, and evaluation is a good teaching resource. Many teachers only pay attention to the result evaluation of students in the teaching process, ignoring the process evaluation of students, which is not conducive to the personalized development of students. In the mathematical modeling class, many teachers do not show the process of modeling to students, but directly tell students the results of modeling, resulting in students being unable to better absorb knowledge, and students have no real grasp of this knowledge. Comprehensively strengthen the individualized development of students, and give guidance to students who are not good at learning. Teachers should guide the communication between students, pay more attention to the feedback information of students in and out of class, and give certain evaluation.

## **3. Effective strategies for the integration of information technology and mathematical modeling courses**

In the basic education in the information age, in order to comply with the development trend of social informatization, the integration of information technology and mathematical modeling courses has become a new model accepted by the public. This new model is not going smoothly, so some

strategies to promote effective integration are given for some problems arising from the integration.

### **3.1. The state establishes a high-quality information technology resource library and e-learning platform**

Many teachers do not have enough stored knowledge in information technology and mathematical modeling, and they want to learn relevant knowledge, but it is difficult to find learning resources, which wastes a lot of time. Some teachers are busy with their work, so they have no time to complete the production of electronic courseware. Therefore, the country needs to establish a high-quality learning resource pool for teachers to consult, and more learning platforms for teachers to learn at any time. Mathematical modeling course is a special course. With the support of information technology, the course will become more vivid and interesting. Through the network, you can create a problem scenario, establish a model, analyze a model, and solve the model step by step. For example, in the current epidemic environment, if there is no online learning platform, students cannot feel the satisfaction brought by learning, and teachers' teaching progress and arrangement will also be delayed. Therefore, it is necessary to establish an information technology resource library and online learning platform.

### **3.2. Strengthen and improve the information technology facilities of schools**

If you want to better implement the integration of information technology and mathematical modeling class, you must first have a good information technology facility, otherwise the integration is an empty slogan. For example, many rural schools do not have computers, and the construction of campus network is not good, so they need to cooperate with the computer room to ensure that the network is smooth, so that teachers and students can learn anytime and anywhere when they need to learn. At this time, funding is a problem, which requires a large amount of financial support from relevant education departments and school leaders, so that the information technology infrastructure for each learning can be better built.

### **3.3. Teachers should change their educational concepts and actively carry out integration work**

In the era of rapid development of information technology, the traditional teaching methods are no longer suitable for the current teaching methods. As teachers in the new era, they should actively learn the connotation and theoretical practice of the integration of information technology and mathematical modeling courses. Many teachers do not understand the importance of the mathematical modeling course, do not know how to do well in the mathematical modeling course, and have been using traditional teaching methods, which is not effective. Although the traditional methods are good, they should also follow the latest education policy. Teachers should adjust their teaching methods, keep up with the pace of information technology, and strive to learn information technology related knowledge and integrate related knowledge.

### **3.4. Implement the reward system to stimulate the interest of teachers and students**

In view of the reasons such as some teachers' own information technology ability is not high, the existing test pressure, the old teaching concept, and teachers do not attach importance to mathematical modeling teaching, the school can implement a reward system to reward teachers who actively use information technology for classroom teaching. After the reward, it can set a good example for other teachers and recognize the importance of integration. The school can also hold some mathematical modeling competitions on a regular basis so that both teachers and students can participate. In the competitions, teachers and students can actively understand the importance and convenience of information technology for mathematical modeling. In this way, we can not only learn knowledge,

but also increase the feelings of teachers and students.

### 3.5. Schools need to actively implement the information technology education content to improve students' information literacy

Schools should publicize the importance of integrating information technology and mathematical modeling courses. In the process of implementing integration, students' information literacy can directly reflect the effect of integration. When a student has such literacy, the effect of learning integration must be good, otherwise, learning is particularly difficult. The key to how to improve students' information literacy is that schools should set up more information technology courses to ensure that each student can access knowledge about information technology and understand and master simple software. Teachers need to use information technology to carry out diversified classroom teaching, let students understand that information technology is very convenient for learning after participating in it, and integrate the learned information technology knowledge into the learning of mathematical modeling textbooks to improve students' information technology literacy.

## 4. Summary

At present, education informatization is the trend of national education reform, and the integration of information technology and mathematical modeling courses will continue. Proper integration will improve the teaching effect, enable students to effectively train and develop their thinking and innovation ability, provide a good reference for future mathematics education, and realize the great promotion of innovation education and quality education under the information technology background.

## Acknowledgement

Fund project: Supported by the 13th Five Year Plan for Education and Science of Shaanxi Province (SGH18H330); Project supported by Baoji University of Arts and Sciences (YJ18JGZD02).

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