

# Design and Implementation of Computer Experimental Teaching Mode Based on Flipped Classroom

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**Keywords:** Flipped classroom; Computer experiments; Teaching mode

**Abstract:** This article aims to explore in depth the design and implementation of computer experimental teaching mode based on flipped classroom, with the aim of further improving the quality and effectiveness of computer experimental teaching. Flipped classroom, as a new teaching mode that subverts tradition, emphasizes students' self-directed learning before class and practical operations during class. By strengthening teacher-student interaction and cooperative learning, it promotes the internalization of knowledge and the improvement of skills for students. In the current computer experimental teaching, the application of flipped classroom has important practical significance and broad application prospects. The article first provides a comprehensive overview of the theoretical foundation of flipped classroom, and deeply analyzes the basic concept, core characteristics, and differences from traditional teaching modes of flipped classroom. On this basis, the article elaborates in detail on the application value of flipped classroom in computer experimental teaching. By implementing flipped classroom, not only can it stimulate students' interest and enthusiasm in learning, but it can also cultivate their innovative thinking and practical abilities, laying a solid foundation for future talent cultivation in the field of computer science. Finally, this article delves into the design and implementation strategies of computer experimental teaching mode based on flipped classroom, and proposes a series of practical and feasible implementation strategies.

## 1. Introduction

With the rapid development of information technology and the widespread popularity of computer applications, exploring new computer experimental teaching modes to improve the quality and effectiveness of experimental teaching has become an important issue that urgently needs to be solved in the current field of computer education[1]. Flipped classroom, as an emerging teaching mode, provides new ideas for the reform and innovation of computer experimental teaching with its unique teaching philosophy and methods[2]. Flipped classroom emphasizes students' self-directed learning before class and practical operations during class. Through teacher-student interaction and cooperative learning, it promotes the internalization of knowledge and the improvement of skills for students. Introducing the flipped classroom model in computer experimental teaching can not only stimulate students' learning interest and enthusiasm, but also cultivate their self-learning ability and teamwork ability, and improve their computer practical operation level. This article aims to explore in depth the design and implementation of computer experimental teaching mode based on flipped classroom. By elaborating on the theoretical foundation of flipped classroom, analyzing its application value in computer experimental teaching, and elaborating on the design and implementation strategies of teaching modes, the aim is to provide new ideas and methods for the reform and development of computer experimental teaching, and promote innovation and development of computer experimental teaching.

## 2. The theoretical basis of flipped classroom

Flipped classroom, as an innovative teaching mode, has a profound and diverse theoretical

foundation. It is based on constructivist learning theory, self-directed learning theory, and cooperative learning theory, aiming to break the constraints of traditional classrooms and provide students with a more autonomous and practical learning environment[3]. Firstly, constructivist learning theory is an important cornerstone of flipped classrooms. This theory believes that learning is an active process of constructing knowledge, where students do not passively receive knowledge, but actively construct their own knowledge system through interaction with the environment. Flipped classroom is a combination of pre class self-directed learning and in class practical operations, providing students with more opportunities to interact with the environment and helping them actively construct and internalize knowledge. Secondly, the theory of self-directed learning also provides strong support for flipped classrooms. Autonomous learning emphasizes that students should have the ability to plan, monitor, and evaluate themselves, and be able to actively choose learning methods and resources that are suitable for themselves. Flipped classrooms encourage students to learn independently through preview resources, cultivate their self-learning ability, and enable them to exert greater initiative and creativity in learning[4]. In addition, cooperative learning theory is also an indispensable theoretical foundation for flipped classrooms. Collaborative learning emphasizes cooperation and interaction among students, promoting mutual growth and progress by jointly completing tasks, sharing resources, and exchanging ideas. The practical operations and group discussions in flipped classrooms provide students with opportunities for collaborative learning, cultivating their teamwork and communication skills.

### **3. The application value of flipped classroom in computer experimental teaching**

The application of flipped classroom in computer experimental teaching has demonstrated its unique and profound application value. This teaching mode not only optimizes the teaching process, but also greatly enhances students' learning effectiveness and practical abilities[5]. Firstly, flipped classroom effectively enhances the practicality of computer experimental teaching. Through pre class self-directed learning, students have gained a preliminary understanding of basic knowledge, which provides a solid foundation for practical operations in class. During the in class stage, students are able to combine theoretical knowledge with practical operations, and deepen their understanding and application of knowledge through hands-on practice. This practical learning approach enables students to better master computer experimental skills and enhance their ability to solve practical problems. Secondly, flipped classrooms help cultivate students' self-learning and teamwork abilities. In flipped classrooms, students need to independently plan their learning progress, select learning resources, and complete preview tasks independently. This learning method cultivates students' self-learning ability, enabling them to participate more actively in learning. At the same time, group discussions and collaborative learning in class also provide opportunities for students to exercise their teamwork skills, promoting communication and cooperation among students. In addition, flipped classroom has also promoted the personalized development of computer experimental teaching. Through pre class self-directed learning, students can choose suitable learning content and difficulty based on their own learning progress and ability level. This personalized learning approach enables each student to receive teaching resources and guidance that are suitable for them, thereby better meeting their learning needs.

### **4. Design of computer experimental teaching mode based on flipped classroom**

The design of computer experimental teaching mode based on flipped classroom aims to build a student-centered and practice led learning environment[6]. This mode closely combines pre class self-directed learning, in class practical operations, and post class feedback evaluation, forming a complete teaching loop. In the pre class self-learning stage, teachers need to prepare preview resources in advance, including teaching videos, courseware, cases, etc., and publish them to students through online platforms. Students need to use these resources for self-directed learning, master basic knowledge, and record difficult problems. The practical operation stage in class is the core of the entire teaching mode. Students need to complete practical tasks through computer

experimental equipment under the guidance of teachers. Teachers can organize group discussions, case studies, and other activities based on the learning situation of students to promote communication and cooperation among them. At the same time, teachers also need to provide timely answers and guidance to students on the problems they encounter in practical operations. The post class feedback evaluation stage is a test and summary of the entire teaching effectiveness. Students are required to complete post class expansion tasks and submit experimental reports. Teachers can understand students' learning outcomes and provide personalized guidance for existing problems by correcting and commenting on experimental reports. In addition, teachers can also organize students to conduct mutual evaluation and self-evaluation to promote their self reflection and progress. The design of computer experimental teaching mode based on flipped classroom is shown in Table 1.

Table 1 Design of computer experimental teaching mode based on flipped classroom

Stage	Activity content	Student tasks	Teacher responsibilities
Autonomous learning before class	Preview resource release	Autonomous learning, recording problems	Prepare preview resources and publish on online platforms
In class practical operations	Computer experiments, group discussions	Complete practical tasks and participate in discussions	Organize practical activities and answer questions
Post class feedback evaluation	Submit experimental reports, mutual evaluation and self-evaluation	Complete expansion tasks and submit reports	Correction report, personalized guidance

## 5. Implementation strategy of computer experimental teaching mode based on flipped classroom

### 5.1. Carefully plan and prepare teaching resources

Before implementing computer experimental teaching based on flipped classroom, teachers need to carefully plan and prepare teaching resources. This includes producing high-quality experimental teaching videos, writing detailed experimental manuals, and preparing the necessary software and hardware environments for the experiments. Experimental teaching videos should cover the purpose, principles, steps, and precautions of the experiment, so that students can engage in self-directed learning before class. The experimental guidebook should include specific experimental operation steps and experimental data analysis methods to help students correctly operate and deeply understand the experimental principles in the experiment.

### 5.2. Building an online learning platform and interactive mechanism

In order to better implement flipped classroom, teachers need to build a fully functional online learning platform and design effective interactive mechanisms. The online learning platform can provide students with functions such as watching experimental videos, downloading experimental materials, and submitting experimental reports, making it convenient for students to engage in self-directed learning and experimental operations. At the same time, teachers can also publish experimental tasks, organize online discussions and Q&A through online platforms, and promote communication and interaction between teachers and students.

### 5.3. Strengthen classroom practice and team collaboration

The core of flipped classroom is to transfer the teaching process from traditional classroom to pre class, and allocate classroom time to student practice and discussion[7]. Therefore, when implementing computer experimental teaching based on flipped classroom, teachers should pay attention to strengthening classroom practice and team collaboration. In the classroom, teachers can organize students to conduct group experiments, encouraging students to collaborate and solve

problems together. At the same time, teachers can also design innovative and challenging experimental tasks to stimulate students' exploratory spirit and innovative ability.

#### 5.4. Implement a diversified evaluation and feedback mechanism

In order to comprehensively understand the learning situation of students and adjust teaching strategies in a timely manner, teachers need to implement a diverse evaluation and feedback mechanism. This includes evaluating the experimental process, results, reports, and classroom performance of students. At the same time, teachers should also provide students with specific feedback and suggestions in a timely manner, helping them improve their experimental skills and enhance learning outcomes. In addition, teachers can also invite enterprise experts or industry professionals to participate in the evaluation of experimental teaching, providing more objective and comprehensive feedback for experimental teaching.

The implementation strategy of computer experimental teaching mode based on flipped classroom is a comprehensive process. The introduction of this teaching mode aims to stimulate students' learning interest, enhance their practical abilities, and promote deep interaction between teachers and students. By carefully planning and implementing these strategies, we can effectively promote the reform of computer experimental teaching and cultivate more students with innovative spirit and practical ability. The implementation strategy of computer experimental teaching mode based on flipped classroom is shown in Table 2.

Table 2 Implementation strategies for computer experimental teaching mode based on flipped classroom

Strategy content	Specific implementation measures
Preparation of teaching resources	Create experimental teaching videos that cover the purpose, principles, steps, and other aspects of the experiment; Write a detailed experimental guidebook, including experimental operation steps and data analysis methods; Prepare sufficient experimental software and hardware environment to ensure the smooth progress of student experiments
Building an online learning platform	Build a fully functional online learning platform, providing functions such as video viewing, material downloading, and homework submission; Set up an online Q&A area to facilitate students to ask questions and obtain answers at any time; Establishing student exchange communities to promote interaction and learning among students
Classroom practice and team collaboration	Arrange classroom time for student practical operations, organize group experiments, and promote cooperation and communication among students; Design challenging and innovative experimental tasks to stimulate students' spirit of exploration; Guide students to analyze and discuss the experimental results, deepen their understanding of the experimental principles
Multivariate evaluation and feedback	Design a diversified evaluation system, including evaluations of experimental processes, results, reports, and classroom performance; Provide students with specific and targeted feedback and suggestions in a timely manner to help them improve and enhance; Inviting enterprise experts or industry professionals to participate in evaluations, providing industry perspectives and suggestions for experimental teaching

## 6. Conclusions

The introduction of flipped classroom has injected new vitality into computer experimental teaching. Compared to traditional teaching methods, flipped classroom emphasizes students' self-directed learning before class and practical operations during class, effectively improving their participation and learning effectiveness. During the self-learning stage, students master basic

knowledge through preview resources, laying a foundation for practical operations and deep learning in class; During the in class stage, deepen the understanding and application of knowledge through practical operations and teacher-student interaction; In the post class stage, further consolidate the knowledge and skills learned by expanding tasks and providing feedback and evaluation. The design and implementation of computer experimental teaching mode based on flipped classroom not only significantly improves students' practical ability and innovative thinking, but also through the combination of pre class self-directed learning and in class in-depth practice, enables students to have a deeper understanding of the core values of flipped classroom, and thus better grasp and adapt to this innovative teaching mode. This model not only cultivates students' self-learning and teamwork abilities, but also stimulates their interest and initiative in learning, promoting the internalization of knowledge and the improvement of skills. At the same time, this model also provides teachers with more possibilities for teaching innovation, promoting the comprehensive improvement of the quality of computer experimental teaching. In addition, flipped classrooms also focus on individual differences among students, providing personalized learning paths for students of different levels, further promoting their comprehensive development, and laying a solid foundation for cultivating computer talents in the new era.

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