



# Experimental Teaching Strategies in Colleges and Universities Under Blended Learning Mode

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**Abstract.** Blended learning mode combines the advantages of traditional classroom teaching and online learning, which is conducive to cultivating students' personalization, autonomy, and creativity in learning. Experimental teaching is an important part of practical teaching of Engineering Majors in Colleges and universities, and it is also an important part of cultivating students' innovative ability and hands-on operation ability. This paper mainly analyses the necessity, advantages, application conditions and teaching strategies of implementing blended learning in experimental teaching, to promote the implementation of blended learning mode in experimental teaching.

**Keywords:** Teaching strategies · Blended learning · Experimental teaching in colleges and universities

## 1 Introduction

Experimental teaching is an important link in the practical teaching of engineering majors in colleges and universities, and it is an important link in cultivating students' innovative ability and practical operation ability. However, at present, experimental teaching does not give full play to its role, and the effect of practical teaching is not good. The main reasons are the traditional teacher centered teaching concept, students are mostly passive mechanical operation, more confirmatory experiments, and less design and research experiments, as well as the traditional classroom teaching mode, which leads to students' inherent learning methods and rigid thinking. Therefore, the reform of experimental teaching in colleges and universities is imperative. The application of blended learning mode to experimental teaching in colleges and universities is an important strategy to optimize experimental teaching. Through teaching reflection and full understanding of the blended learning mode and their own role positioning, experimental teachers should clarify that their identity must be changed from knowledge transmission to ability training, guide and encourage students to improve the experimental learning experience through the blended learning mode.

In the era of Education 2.0, blended learning is not just a mixture of technologies, but a full integration of live online learning, network resource learning, and offline learning, creating a highly participatory, personalized, and creative learning for students. In this context, the experimental teacher is no longer the lecturer and transmitter of knowledge, but the designer and organizer of experimental activities, as the guide and promoter of students' experimental learning practice. With the help of abundant network teaching resources and various advanced communication technologies, under the support and guidance of experimental teachers, students are encouraged to study independently and actively, and through the hands-on experiment of group cooperation, students' learning ability and creativity are improved, which is the essence of blended learning.

## **2 The Necessity of Blended Learning in Experimental Teaching in Colleges and Universities**

### **2.1 Comply with the Requirements of Teaching Reform**

Teaching reform is the guide to improve the quality of education and teaching. In recent years, most of the teaching reform in colleges and universities has focused on the organic integration of various teaching modes. While practicing the concept of "student-centered", we should realize the diversified learning modes of students' autonomy, personalization, innovation, initiative, and cooperation. Moreover, affected by the prevention and control of the COVID-19, home-based learning has forced the rapid growth of blended learning. In the era of Internet + education, the traditional teacher's unilateral indoctrination education has been unable to adapt to the development of the times. Blended teaching is recognized by modern higher education teaching reform because it can solve complex teaching problems, pay more attention to teamwork, and help students form an active learning consciousness. Especially for experimental teaching, students who have spare capacity for learning need to obtain good results in various innovative design competitions. Traditional experimental teaching alone has been difficult to meet their needs, and the blended learning mode with its rich resources, diversified learning means and flexible learning time and space can better meet their development requirements.

### **2.2 Break Through Social Environmental Restrictions**

As the epidemic is still sporadic and the virus has existed for a long time, we have entered a post epidemic era. Through practical exploration, blended learning mode is more suitable for the current social and educational development needs because it is more flexible, more adaptable to crisis, and breaks through the limitations of time and space. Because of its flexibility, autonomy, personality and innovation, and the essence of developing students' ability, blended learning mode is more suitable for experimental teaching activities with hands-on practice as the main and theoretical guidance as the auxiliary. In the current social environment, blended learning method can make the best use of the advantages of time and space, organically combine traditional learning and non-traditional learning, and promote the optimization of experimental teaching effect.

### **3 The Advantages of Blended Learning in Experimental Teaching in Colleges and Universities**

#### **3.1 Help Students Learn Effectively**

Promoting students' effective learning is the fundamental goal of all educational activities, and blended learning is the most powerful means to achieve this goal by creating a highly participatory, personalized, and creative learning experience. In the blended learning mode, students can use the rich teaching resources of the network platform to complete the experimental teaching through various stages of pre class initial learning, classroom teaching, after class expansion and question answering and communication. This fully realizes the concept of learning before teaching and student-centered, promotes students' active learning, and forms a virtuous cycle of learning promoting teaching and learning promoting practice. And it breaks through the learning mode of time and space constraints, so that students' learning activities can be arranged more flexibly, which is conducive to stimulating students' enthusiasm for experimental learning, to maximize the quality of experimental learning.

#### **3.2 Realize Students' Personalized Learning and Creative Learning**

On the premise of completing basic classroom teaching, students can use the opening hours of the laboratory, rely on online learning resources and the online guidance of experimental teachers, and complete independent experimental research and design according to their own interests and hobbies, so that they can choose to participate in various innovative competitions, such as intelligent car competition, robot competition, electronic design competition, etc. Moreover, the blended learning mode abandons the traditional experimental teaching design based on subject knowledge, and forms an experimental teaching design based on students' ability and interests. It takes students' interest development and ability training as the goal orientation, which is more conducive to students' initiative and choice in experimental learning activities, to realize students' personalized learning and creative learning. In the contemporary era when college students pay attention to personalization and liberalization, relying on rich online learning resources and advanced mobile communication learning technology, blended learning mode can undoubtedly make students' experimental learning more free, in-depth, and effective innovation.

#### **3.3 Stimulate Students' Internal Motivation in Learning**

The most typical characteristic of blended learning mode is that it is student-centered. Whether it is teaching content, teaching method or teaching purpose, it is based on the actual needs of students, which plays a great role in stimulating the internal motivation of students' learning. Moreover, blended learning has a high degree of flexibility in learning resources, learning methods, learning environment, and learning time, which is a great opportunity for students with different learning abilities and learning progress. They can use the laboratory opening hours and the rich learning resources of the network platform to study independently. This cannot only improve students' learning efficiency and

reduce learning frustration, but also greatly cultivate students' awareness of autonomous learning, improve learning enthusiasm, stimulate learning interest, tap students' learning potential, and finally improve students' learning effectiveness and promote the output of creative achievements.

## **4 The Conditions of Blended Learning in Experimental Teaching in Colleges and Universities**

### **4.1 Integrate Online Learning Resources of Experimental Courses**

In the process of recommending blended learning for experimental courses in colleges and universities, the first condition is to integrate the course network learning resources, establish a database of learning resources, and provide students with a network learning platform with richer experimental learning resources. Rich experimental online learning resources help to realize students' personalized, differentiated, and creative learning needs, and can give the strongest support to students who have spare efforts to participate in various innovative design competitions. Learning without space-time constraints mainly depends on the network learning platform, so it is necessary to supplement and maintain the experimental learning resource database regularly. In the selection of experimental learning resources on the network platform, we should not only pay attention to the professional knowledge of the subject, but also pay attention to the interesting and innovative content. For example, the production of various middle school physics experiment teaching aids, the design of robots and intelligent cars, etc. It is not only interesting, practical, and creative, but also conducive to students' autonomous learning and self-help learning.

### **4.2 Design of Blended Learning Activities in Experimental Courses**

Learning activity design is an important support of blended learning design. At the same time, it is also a bridge connecting learning theory and educational practice. Moreover, the design concept of "learning activity as the center" is an important design idea in today's information technology environment. In order to achieve good results in the hybrid learning of experimental courses, we need a practical and systematic learning activity design, which can not only focus on the micro level, but also provide a systematic and leading design strategy for the design of blended learning activities.

### **4.3 Establishing the Evaluation System of Blended Learning in Experimental Courses**

Experimental teachers need to reform the evaluation method of students. Through the establishment of a more scientific, perfect, and flexible assessment and evaluation system, students' experimental learning can be assessed in a variety of ways, to stimulate students' personalization, creativity, and autonomy in learning. At the same time, it can also promote students to carry out self-help learning under the requirements of diversified evaluation, find their own learning orientation, and improve students' enthusiasm

and initiative in learning. Blended teaching design has changed from front-end design to whole process design, and its goal has changed from knowledge transfer to ability training. Therefore, the evaluation system of blended learning must also cover the whole process of learning. Simple knowledge points assessment can no longer meet the development needs of current blended learning mode. Moreover, experimental teaching in colleges and universities is different from theoretical teaching, and pays more attention to the improvement of practical skills. Therefore, the evaluation system of learning results should not only cover the whole process of learning, but also involve more evaluation indicators, such as the mastery of experimental theoretical knowledge, the mastery of practical skills, and more importantly, the growth of learning and innovation ability through experimental courses.

## **5 Experimental Teaching Strategies in Colleges and Universities Under Blended Learning Mode**

### **5.1 Reshaping the Role Orientation of Experimental Teachers in Colleges and Universities**

The experimental teacher in the mixed learning mode is no longer the instigator of theoretical knowledge, but the designer and organizer of experimental learning activities, and the guide, promoter, and inspiration of students' learning. Therefore, the first thing the experimental teachers should do is to change their own identity cognition, actively learn or participate in the training of blended learning related concepts and cognition. Secondly, we should do a good job in the teaching design of "learning activities as the center", and the whole design runs through the whole process of learning. Thirdly, because the blended learning model is an organic integration of online learning, mobile learning, and offline learning, and emphasizes the flexibility of online learning and mobile learning, experimental teachers need to strengthen the learning and application of information technology operation ability. Finally, guided by the goal of "helping students learn effectively", experimental teachers should actively guide, assist, and motivate students' autonomous learning, cooperative learning, and inquiry learning, and finally cultivate students' learning ability and innovation ability.

### **5.2 Organic Integration of Various Learning Means**

In order to achieve good learning results in experimental teaching, blended learning mode needs to organically integrate traditional offline learning means and information-based learning means to form complementary advantages. During the epidemic, many MOOC resources were activated, enriching our experimental classroom teaching, and learning resources in different forms and perspectives also activated students' thinking vitality. Although the blended learning mode emphasizes the flexibility of online learning and mobile learning and the richness of resources, practical teaching is different from theoretical teaching, and pays more attention to hands-on practical ability. Therefore, traditional offline teaching is still the mainstream, but online learning is not the auxiliary of offline learning. Online learning, mobile learning and offline learning focus on different contents and different aspects of ability growth. They are an organic combination of close communication between teachers and students.

### 5.3 Design of Blended Learning Activities in Experimental Courses

Blended learning is a deep reform of teaching and learning. It has diversified learning means, so the evaluation of its effect is also multidimensional. Promoting the implementation of online and offline blended learning evaluation system from multiple dimensions can conduct multi-dimensional assessment and evaluation of students' experimental learning effects, to stimulate students' learning enthusiasm and thinking vitality, and then produce more creative results. Because the learning activity design of blended learning covers the whole process of learning, the assessment and evaluation must also cover the whole process, and the implementation of the evaluation system should have more flexibility. Because the engineering experiment in colleges and universities is a highly practical discipline, the production of experimental works can be included in the assessment as an important indicator.

## 6 Conclusion

The teaching mode of experimental courses in colleges and universities based on blended learning fully embodies the concept of "learning before teaching and promoting students' active learning", realizes the integration of traditional classroom teaching and online learning, reflects students' high participation and personalized learning, improves students' ability of autonomous learning and innovation, and realizes the optimization of experimental teaching effect.

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