



# Promoting the Hands-on Skills of Engineering Students by Blending Practice Teaching Method

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**Abstract.** Modern university has been from elite education to mass education, how to implement the quality education and cultivate students' practice ability and innovation ability are always a question that needs the constant research by universities and colleges. Taking the mining engineering as an example, the existing shortcomings in practice training were analyzed, on this basis, a blending practice teaching method combining modern computer technology and traditional experimental means was proposed, and then, the possible application directions in mining engineering were pointed out, and issues required attention were discussed. The conclusions show that new blending practice teaching method not only can make up for the deficiencies of the traditional laboratory method, but also can train more students at the same time and improve better hands-on skills of students. So, it is a effective teaching means conforming to modern education philosophy.

**Keywords:** Blending practice teaching · Manipulative ability  
Numerical simulation · Mining engineering

## 1 Introduction

With the continuous development of social economy, higher education in our country has also achieved the transformation from elitism to popularization, which has led to the dream of universities among thousands of families and students, and it is of great significance to comprehensively improve the overall quality of China and improve the overall competitiveness of our country. However, disturbingly, a large number of students have the phenomenon of strong theoretical calculation ability, weak practice ability, and strong imitation ability, weak innovation ability, resulting in the trust of the enterprise on education is continuously decreasing, which is more common in engineering colleges or engineering majors. The author believes that the reason for the above situation is the lack of practice teaching. In fact, the purpose of engineering major is to cultivate the senior engineering technical personnel who have some practical application ability in the corresponding engineering field, but practice teaching is often restricted by funds, venues, professional factors, safety and so on, which made the practice cannot

meet the training requirements [1, 2]. With the continuous development of computer hardware and software technology, the computer simulation methods or numerical simulation techniques have been increasingly spreading in all fields of society, and research teaching is no exception [3]. Therefore, introducing the numerical simulation technique can make up for the inadequacy and shortcomings of practical teaching in some degree and has a great practical significance in teaching of engineering major.

## **2 Inadequacy of the Practical Teaching in Mining Engineering**

For mining engineering, its research object is engineering geology with complex uncertainties. In order to improve practice and problem-solving abilities of students, achieve the requirement of students' engineering skills and abilities to innovate, it is important to take a definite proportion practical teaching courses. However, in the context of the rapid expansion of undergraduate students and the increasing security awareness, there are some following problems during the practical teaching courses arrangement:

- (1) Indoor experiment is watch more and operate less. Take the course of rock mechanics as an example, rock Mechanics is a compulsory course for the mining engineering students. The basic experiments of compression tests, tension tests and direct shear tests are important and basic teaching content, and which are required to use rock cutting machine, core drilling machine, grinder, for the reasons of safety and quantity of equipment, in general, students are forbidden to process the rock samples independently. So above experiments process have become demonstration experiments from operational test, students often watch more but do less and eventually they get limited knowledge.
- (2) Mining practice is in the form. Cognition practice, production practice and graduation practice are required practice training to undergraduate students of mining engineering, which is an important part of cultivating students ability to operate, analyze and solve problems. However, due to the particularity of mining engineering and fearing of the occurrence of security incidents, many mining companies just arrange students to visit the mining facilities and processes symbolically, the result is more form than content, and it is impossible to make students master the specific production technology and parameters [4]. Based on this, it is not strange for many engineering students to have the strong faculty of theoretical calculation and the poor practical ability.

## **3 Application of Blending Practical Teaching Method**

### **3.1 Blending Teaching**

As a new teaching method, by combining the electronic and networked technology with traditional teaching, blending teaching can guide, enlighten and monitor the

teacher's teaching process and fully reflect the students' initiative, enthusiasm and creativity as the center in learning [5].

### 3.2 Blending Practical Teaching Method Based on Modern Computer Technology

Blending practical teaching mainly refers to the combination of modern computer technology and traditional practice methods, which can avoid the deficiency of traditional laboratory and internship, and make the students achieve the goal of using every moment in class and outside to learn professional knowledge independently.

Nowadays, there are many subjects have their own modern computing simulation teaching software, for example, electronic power subject has electronic simulation software and Multisim 13.0 software and so on, the logistics system has three-dimensional logistics simulation software called AUTOMOD, and the finance and economics subject has simulated stock exchange, simulated futures trading and so on [1]. With continue develop of computer technology, the simulation software will be updated continuously, which will become more intelligent and realistic. As for mining engineering, numerical simulation can adapt to various teaching content.

#### (1) cognize of mining system

As is known to all, mining engineering is a very large and certain dangerous systems engineering, if you want to know the development, production, promotion and transportation of the whole underground mining, it is necessary to do a long workshop practice in the mine. However, at present the mines belong to dangerous industries in that accidents often occur, therefore, the Practice time is often not guaranteed because of the enterprise's safety management needs, and which reduced the cognitive ability of the students to mine system.

The metal mine simulation system is a set of visual teaching software based on actual mine development. It includes the main parts from development to production to transportation, which can meet the students' basic understanding to the whole mine system and can be completed indoors [6]. On this basis, combining with a certain amount of workshop practice, it will make the whole mining practice achieve better results.

#### (2) rock fracture process

As stated in the previous article, research on the rock mechanical properties under pressure, pull or shear situation by indoor experiment are although visualized, but it's impossible to get all involved and capture rock failure process, in this case, the simulation can be solved by using rock real fracture process analysis software. When using this software for simulating conventional rock mechanics experiment, the rock sample size, loading paths, experimental steps are all consistent with the laboratory test, but the superiority is the process of cutting and machining to rock can be omitted, furthermore, the failure process and fracture development of rock samples can be observed in detail, which are not done in a conventional laboratory test. So, the simulation method is not only reduces the workload but also ensures experimental safety, and it also achieves the purpose of teaching [7, 8].

## (3) slope stability

It is very important for safety production and economic benefits of open-pit mine to ensure the stability of slope, once the slope is unstable, it will bring immeasurable losses to the mining enterprise. In order to exactly understand the degree of slope stability and master the possible scope, instability mechanism and effective prevention and control measures of the landslide, carrying out the similarity simulation experiment is one of the effective ways [9]. However, similar simulation experiments are time-consuming and laborious, and difficult to be exactly similar to the actual situation. Using numerical simulation software will solve this problem, and more importantly, by changing engineering excavation steps and material parameters, a variety of different calculation schemes can be analyzed lightly, and the results are more image and intuitive, which are not comparable to indoor similar experiments. There are many softwares in this field, including Lizheng, geo-slope, FLAC2D/3D, 3DEC, etc.

## (4) underground pressure disaster

In the process of underground mining, because natural equilibrium of rock mass is broken, so a series of ground pressure phenomena appeared constantly, and then resulting in mine disasters occurred one after another, such as: roof falling, rock strata movement and surface subsidence. The point is that these disasters are irreversible and losses caused by the disaster cannot be recovery, therefore, it is not realistic to conduct local industrial experiments without research. Numerical simulation can make up for these deficiencies by precomputed analysis, softwares like UDEC, 3DEC, FLAC2D/3D, 3D-sigma, ANSYS, etc. are all having above function [10].

### 3.3 Considerations for Using Numerical Simulation Teaching

Using numerical simulation to assist practical teaching, while playing the powerful functions of modern electronic technology, there are other issues to be concerned about.

- (1) Although the numerical simulation can well simulate the all kinds of conditions to finish different experimental contents, but the whole test processes are completed by computer after all, and students have no real sense of operation. In addition, due to a low cost of error by computer technology, it is easy for students to develop a careless habits.
- (2) Students need to be actively involved. The combination of numerical techniques and traditional teaching methods can stimulate students' interest in learning, lead students from passive learning to active learning and enhance comprehensive ability of the students.
- (3) Numerical simulation is only a teaching method, mastering the core content of the course is still the first element of the student.

## 4 Conclusion

Apart from teaching basic knowledge and basic theory, the cultivation of practical ability and innovation ability is also an important content of education. But, the achievement of innovative ability requires repeated practice, blending practice teaching method can complete different experiments safely and conveniently, and practice exercises are not limited by time, space and equipment conditions. Therefore, blending practical teaching method based on modern computer technology is an advanced teaching method and should be strongly advocated.

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