

The Flipped Class Mode Teaching Reform of Civil Engineering Construction Course Based on Outstanding Engineers

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Abstract

For the teaching situation of civil engineering construction course and the course features of comprehensive curriculum, practical application, it was proposed that teaching mode combining "flipped class" and Excellent Engineers Plan. The teaching practice shows that students' learning interest is significantly improved and the course practicality is developed well. Therefore, students can quickly theoretical knowledge into practical ability and teaching effect is better.

Keywords: Excellent Engineers Plan; civil engineering construction; flipped class; reform

1. INTRODUCTION

The education and cultivation of the Excellent Engineers Plan, which initiated by the Ministry of Education in 2009, organizing to carry out the education and cultivation of the Excellent Engineers Plan both in universities and enterprise, and establishing a new mechanism of colleges' talents cultivation combines with industries and enterprises. It also promotes teaching reform, adjusts talents training structure, improves the quality of talents cultivation, as well as accelerates the paces to engineering education power. Universities of engineering application aim for fostering a big batch of engineering and technical talents with excellent engineering practice ability, who could adapt the development demands of economy.

2. The flipped class mode

The flipped class mode originated from the high school chemistry course of the Forest Park in 2007 of the Rocky Mountain, Colorado in America. FCM, also called Inverted Class, bottoms up the two procedures—classroom teaching and after-class practice—in traditional teaching process. That is, before the class, teachers arrange preview tasks and students finish them by network and video resources. During the class, teachers guide students to have an oriented discussion surrounded the teaching goal according to the task contents. The basic idea of FCM is guiding a autonomous learning pattern and motivating learning interest b by the teaching mode of research, inspiration and interaction. Therefore, FCM is a constantly raised class teaching pattern and increasingly concerned among domestic universities.

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3. The teaching situation of civil engineering construction course

The civil engineering construction course is a core curriculum for civil engineering. This course's teaching aimed at grasping basic knowledge of civil engineering construction technology for students, understanding the construction crafts and development trend of major projects and mastering basic methods of proposed construction scheme, as well as possessing essential knowledge to solve the problems on construction technologies and organization design. According to the feedback from graduates in recent years, college graduates that majored in civil engineering undertake engineering construction takes a great proportion of those who work at the frontline. Furthermore, they are widely believed that this course has great importance in practical work while it gets low degree of teaching satisfaction. The main problems as follows:

3.1 The large span of curriculum theory and slow update of the teaching content

The civil engineering construction course including construction technology and construction organization. Also, it refers to wide range of specialized knowledge. On the other hand, it has strong practicality and mainly contraposes construction crafts, construction methods and practical operating process of various types of engineering. However, the majority of teachers lack abundant engineering practical experience so that their speculative knowledge and engineering practice is disjointed. Meanwhile, various new materials, crafts and construction technology emerge endlessly in diverse engineering projects. The fast update of design and construction regulations while things are opposite in textbook content, and the teaching is still in older edition that has gaps compared with practice.

3.2 Stereotyped teaching model and lack of practice

Teachers adopt traditional teaching model based on classroom instruction while teaching. Still in this way in class combine with assigning exercises and reference books after class, although they take measures to enrich their teaching, such as media, construction video and so on. Even if the teachers are well-prepared, with accurate teaching and students get core parts, the memory effect isn't so good as they expected. And they're hard to transform knowledge into ability only count on classroom instruction. On the other hand, on account of the rapid development of construction technologies and crafts, even the professional teachers with practice experience, they would have difficulty in grasping new crafts, technologies and materials of construction. In addition, professional teachers in universities under the pressure from many aspects, such as education, scientific research, etc. They can seldom get the study opportunity for a long time in specific projects so that they're weak in practical experience and short of practicality in their teaching.

3.3 Stereotyped teaching link and students lack enthusiasm in class

At present, the civil engineering construction course still adopt classroom instruction, its' practice including cognition practice and course design. The cognition practice place is construction site, which only demonstrates a static engineering or a certain process of construction rather than the whole procedures of an engineering, which causes the cognition practice just cursory and it has difficulty in combining with curriculum theory. And its' accordance hard to guarantee on account of the work yard or engineering project is unfixed, fluctuant construction progress and great influence from climate. The course design still

employs the pattern that students finish the tasks from teachers' specifications content and practice. The civil engineering construction course is offered in the first semester of the senior year when students are confronted with the pressure that comes out of employment and continuing with postgraduate education. Some are engaged in crafting their resume and commuting between a job fair to another, others are busy with preparing various examinations for further study abroad. Therefore, the learning initiative is low in class.

4. Implementation of teaching reform

In summary, traditional teaching model of civil engineering construction can't adapt current objectives—excellence initiative. Therefore, it's necessary to explore a new teaching model to increase teaching satisfaction degree and promote education effect. The emergency of the inverted classroom provide new ideas. As a local application-oriented institution, the civil engineering undertook the experimental task from 2013—The education and cultivation of the Excellent Engineers Plan. Many young core instructors are selected to take part in the network training of national universities' teachers of Ministry of education and learn new teaching model and method, such as FCM and MOOCs. Eventually, our university put the inverted classroom reform into effect on civil engineering construction course, and the conception as follows:

4.1 Devise the ability outline

Requirements for students of civil engineering :(1) Master of crafts, procedures and theory of civil engineering construction technology;(2) Grasp all sorts of construction schemes of civil engineering and planning method of the design of the construct organization.(3)Autonomous learning and the ability of knowledge summary and application.(4)The ability of team corporation, exchange, communication and expression.(5)The ability of problem-based learning.

4.2 Formulate the content of flipped class

There is much content on civil engineering construction, including construction technology and construction organization. Owing to the limited curriculum hours, we choose the former which is more intuitive and procedural as the main reforming subject of the flipped class, as shown in Table 1.

Table 1. Part of content and curriculum hours distribution of flipped class.

Chapter	Key point in class	curriculum hours distribution
Chapter 1 Earthwork	Engineering classification and properties of soil	1
	Soil wall ability and measures for anti-collapse	2
	Drainage construction technology	2
	Mechanical construction of earthwork	2
Chapter 2 Foundation treatment and pile foundation engineering	The procedure and method of foundation pit trench inspection	2
	The theory and crafts of foundation reinforcement	2
	The procedure of pile foundation construction	2
Chapter 3 Masonry structure engineering	The classification and application of masonry materials	1
	The classification and installation points of scaffold	2
	The construction crafts and quality requirement of masonry	2

4.3 The application of flipped class

Firstly, teachers should foreshow later content and tasks of courses when the former class finished, and provide video and documents resources by cloud storage. Secondly, students preview in their extracurricular time and finish corresponding study tasks on the basis of teachers requirement. Finally, teachers organize oriented discussion that dominates with students in the flipped class. Now we take the first quarter of the earthwork for example, as shown in figure 1.

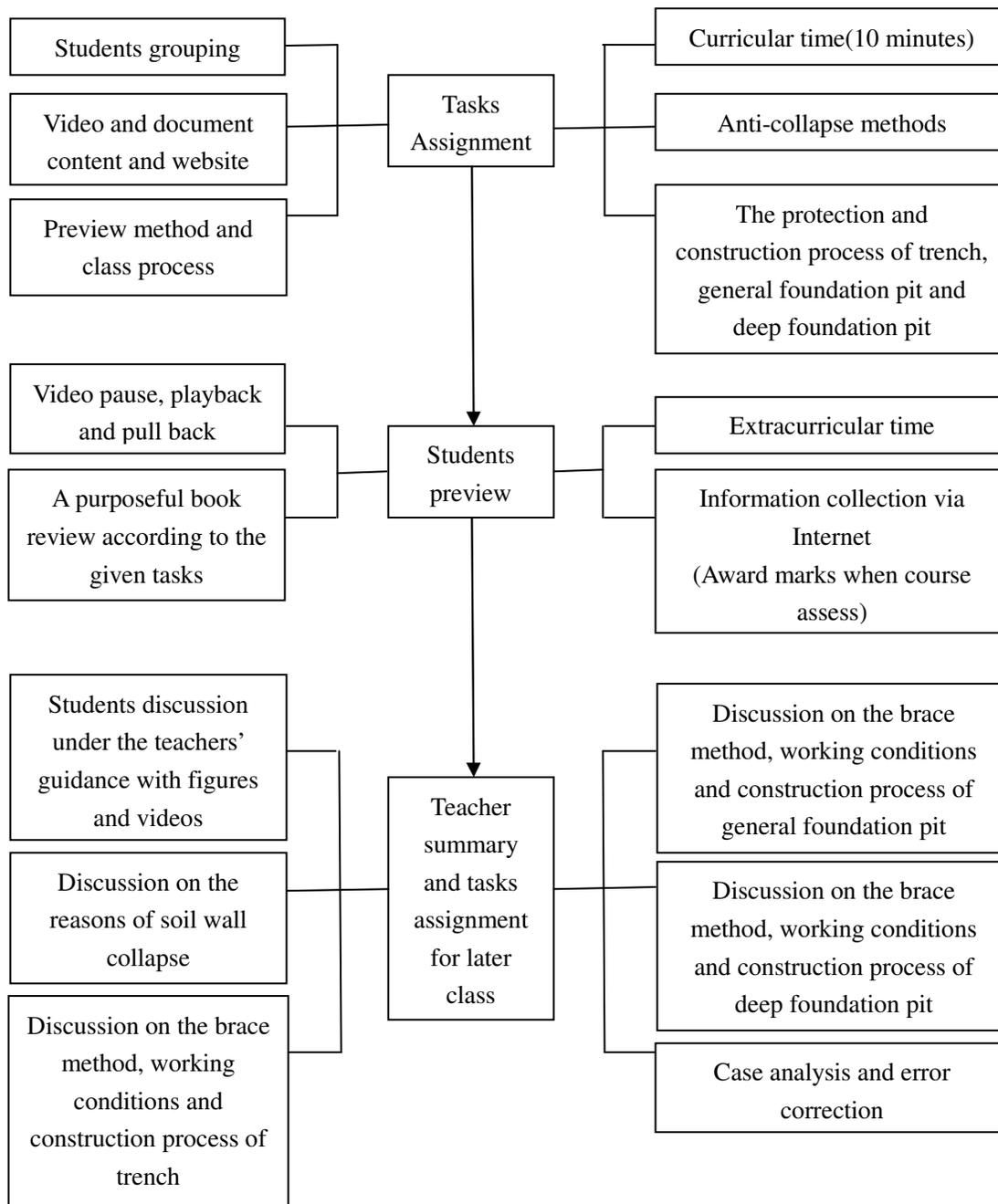


Figure 1. Conducting procedures of soil wall stability and anti-collapse methods.

4.4 Course assessment pattern

In the course assessment of flipped class, the key point is learning attitude, thought expression, as well as team communication and co-operation rather than knowledge quantity and proficiency. Therefore, The constitution of grades adjusted from regular grades: final

grades=2:8 to regular grades : discussion grades : final grades=2:5:3. Moreover, the assessment of oriented discussion should according to students ability outline and choose self-assessment and mutual evaluation as assessment methods.

5. Conclusions

It can be proved that the courses teaching reform which combines Excellent Engineers Plan with flipped class is entirely feasible. The civil engineering construction teaching model we established based on the flipped class promoted independent participant and positivity of students, increased practicality of courses which contributes to transforming the theoretical knowledge into practical ability. Furthermore, the teaching model obtained good effect and high satisfaction from students so that it's worthy of popularization. However, the following parts must be kept in mind in teaching process:

(1) Prepare teaching resources properly and pertinently

The foremost procedure of flipped class is students preview before the class that would directly affects the learning effect in later courses. Thus, the teaching resources which teachers prepared for students preview should be pertinent and diversiform in teaching pattern, which mainly including problems, exercises, project cases analysis and micro video. In consideration of students' energy and learning time after class, the study resources that teachers prepared shouldn't be too much. Especially the teaching video is supposed to be limited within 10 minutes.

(2)The attention on the autonomous learning ability and self-restraint consciousness of students

Whether the flipped class is successful or not, the autonomous learning ability and self-restraint consciousness play a dominated role. Even though the learning resources will be complete and the settings of learning record requirements will be elaborate, the autonomous learning before class for students who lack autonomous learning consciousness and poor self-restraint ability, the learning effect can be imagined eventually. Moreover students will easily get lost on Internet since it has many induction factors, strong interference for study, as well as free, relaxed and unencumbered environment. What teachers should concern and emphasize compared with general teaching model is pay more attention to enhance time management consciousness of students, foster anti-interference ability and develop the habit of self-study.

(3)It's better to implement small-class teaching

At present, the classes of civil engineering in our university are large classes which have large scale. On account of so many students, it's hard for teachers to focus on each student and their personality difference, as well as peculiarity tend to be ignored during topic discussion and problems answer. Nevertheless, what we advocate in flipped class is complete the exercises in classroom, resolve students' confusion pointedly and carry out differentiated instruction to promote their personality development. But this teaching model is limited in large class teaching. Therefore, it's better to implement small-class teaching.

References

- [1] Dong Hui. Research and thinking on the flipped class[J]. The Border Economy and Culture, 2013(5): 124-125.
- [2] Su Yangui. The civil engineering teaching reform based on the flipped class[J]. Science & Technology Vision, 2014, 17.
- [3] Wu Xiangguo. FCM reform analysis of concrete structure course of civil engineering specialty[J]. Journal of Architectural Education in Institutions of Higher Learning, 2014, 6.