

Research on the Application of Flipped Classroom in Engineering Management Teaching

—Taking Engineering Evaluation as an Example

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Abstract—Flipped classroom has triggered a climax of research and teaching practice, which has been partly applied in university education. But because Engineering Management is an interdisciplinary subject with high specialization, the flipped classroom has not been widely applied in it. This paper solved the flipped class in how to apply difficult problem in engineering management, and designed a suitable method for teaching mode of engineering management major flipped classroom. This model is divided into three parts: preview before class, explanation in class and homework after class. Finally the model is applied to the teaching of engineering valuation and most students expressed recognition teaching method, which has obtained the good teaching effect. The teaching model for the theory and application of flipped class provides practical experience.

Keywords—*Flipped classroom; Engineering Management; Project valuation; Teaching mode*

I. INTRODUCTION

The flipped classroom, called as an inverted classroom as well, has been widely applied in schools currently and has become particularly popular in overseas schools already, such as Woodland Park High School, Harvard University and Stanford University. Wherein the American teacher Stacy Roshan has applied flipped classroom in his mathematics course and has obtained good effect. In domestic, the research and application of flipped classroom are accelerating as well, which has been partly applied in university education. But because Engineering Management is an interdisciplinary subject with high specialization, flipped classroom has not been widely applied in it. However, the advantages of flipped classroom are obvious, therefore, it is particularly important to conduct researches on the application of flipped classroom in Engineering Management teaching.

II. FLIPPED CLASSROOM

According to Wikipedia (2019), flipped classroom refers to readjusting the time inside and outside the classroom. Students learn knowledge content by reading e-books before class, watching video lectures online, listening to podcasts and other ways[1]. The valuable time in the classroom is no longer used for teachers to teach information, but for students and teachers to communicate, discuss and solve problems, get a deeper understanding and complete knowledge Internalization,

teachers' guidance to students is more personalized and targeted. Flipped classroom creates a more substantial and efficient classroom, which transfers the decision-making power of learning from teachers to students, promotes students' active learning, and thus leads to a series of changes in teaching mode, learning subject, teacher role, teaching environment, classroom content, evaluation method, and completely subverts the traditional teaching structure and teaching process of "learning and teaching"[2].

Traditional classroom teaching centers on the teachers and focuses on imparting knowledge to the students while the flipped classroom centers on the students. It can be seen from the application situation of flipped classroom in engineering evaluation teaching that the effect is good, that is, the students change their learning attitude and enhance their learning enthusiasm. Therefore, this application experience can provide reference for the application of flipped classroom in other courses. Accompanied by the unique advantages of flipped classroom, such kind of teaching mode will certainly become one of the main orientations in the teaching reform of domestic universities.

III. APPLICATION MODE DESIGN OF FLIPPED CLASSROOM

The application of flipped classroom is mainly concentrated in the pre-class, mid-class and after-class stages of the teaching process^[3]. The difference between flipped classroom and traditional classroom can be seen in Fig. 1, and the specific mode design is as follows.

A. Pre-class stage

Traditionally, the teachers just need to prepare related teaching materials and design the course scenario before the class while the students just need to preview the text and review the main knowledge of last class. But under the mode of flipped classroom, the teachers should not only prepare the course but also should assign teaching tasks to the students, upload the teaching plan and teaching outline to the network platform and even record the micro-lesson videos of difficult contents while the students should also transform from traditional knowledge receiver to active knowledge explorer to learn by themselves based on the uploaded teaching materials and collected materials.

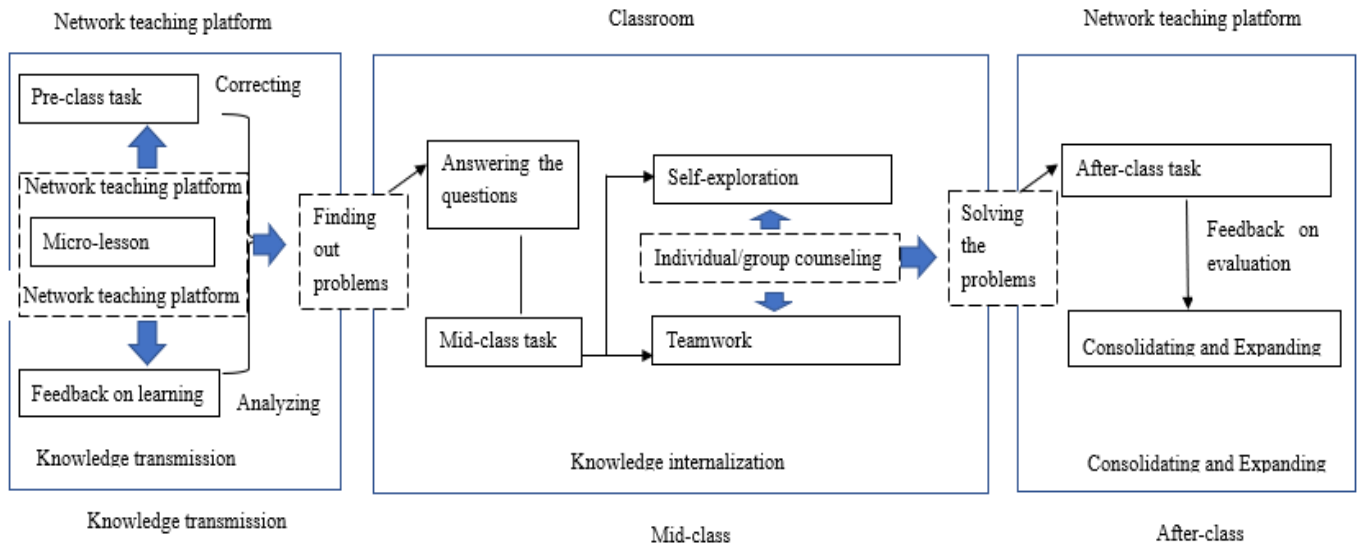


Fig.1. The flipped classroom

B. Mid-class stage

Traditionally, the teachers just need to manage the classroom and impart knowledge well while the students just need to listen to the teachers and make notes seriously. However, under the mode of the flipped classroom, the teachers should become the learning guider and classroom pusher while the students should become the knowledge researcher and discussant[4]. In classroom, the teachers should guide the students to discuss about the self-taught knowledge, divide them into groups and let them to explain related knowledge in the classroom, should give most of the classroom time to the students, manage the classroom well, explain the knowledge misunderstandings and make summary while the students should complete the classroom task under the guidance of the teachers and have deep understanding of the knowledge.

C. After-class stage

After the class, the teachers can upload the related learning resources to the network platform for the students to use and learn, evaluate the learning situations of the students and make feedback. Meanwhile, the content and form of the after-class assignments can become more diversified. Besides, the performance appraisal for the students can be diversified as well, such as discussion enthusiasm and course preparation.

A. Before the class

The teacher uploads the engineering evaluation teaching plan, teaching outline and courseware to the Learning Through network platform, record 8 micro-lesson videos with 5 minutes for each aiming at the knowledge difficulties and emphases and upload to the network platform for the students to learn. Besides, the teacher should divide the 46 students into 5 interest groups, select the group leader and assign different learning tasks to them. Wherein the teacher and the students can communicate at any time on the network platform[5].

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B. In the class

The group leaders select one representative to explain the difficulties and emphases involved in the teaching task for 10 minutes, and other students can ask questions and conduct discussion for 5 minutes after the explanation, and finally, the teacher corrects the explanations and make summary and then conduct evaluation on the learning situation and classroom performance of each group.

C. After the class

The teacher should upload related test questions on the network platform while the students need to log-in the platform to answer the questions thus to test their learning effect. Meanwhile, the teacher can base on the feedback information to know the difficulties faced by the students and then make corresponding micro-lesson videos for students to learn better.

IV. APPLICATION OF FLIPPED CLASSROOM IN ENGINEERING EVALUATION

The flipped classroom is applied in the Engineering Evaluation teaching for 2016 and 2017-session engineering management majors, centering on Gross Floor Area Specifications and Introduction to Construction Project Budget Calculation Rules, five lessons in total. Wherein the network platform is based on the Learning Through software, and the specific process is as follows.

V. PRACTICAL RESULTS

In the last class of the semester, the teacher sent out questionnaires to all students, covering the curriculum design, content arrangement, curriculum implementation, learning effect, curriculum evaluation, student participation, etc. of the hybrid teaching based on the flipped classroom. The results show that 92% of the students think the pre-class micro-video and network resources are very helpful; 86% of the students are satisfied with the teacher's teaching design; 85% of the students think that cross-cultural awareness and communication strategies have been improved through the course of this semester; 81% of the students agree with the flipped classroom hybrid teaching mode; 72% of the students think that online learning and classroom performance are integrated. The evaluation method is reasonable[6].

65% of the students think that the learning experience based on flipped classroom and mixed teaching improves the ability of autonomous learning; 56% of the students think that the comprehensive ability has been improved. But at the same time, 72% of the students think that the stability of the platform is not good, which affects the learning efficiency; 70% of the students think that it is difficult to determine the results of cooperative discussions with their classmates; 55% of the students think that the online learning stage lacks effective guidance and feedback[7].

From the above statistical results, it can be concluded that the personalized student-centered teaching mode of flipped classroom has a high degree of recognition of students, and the online teaching design and arrangement of face-to-face teaching give students greater autonomy and flexibility, which is also conducive to the construction of students' understanding of knowledge and the improvement of their language ability[7].

At the same time, it also needs to be clear that a good network platform and effective teacher guidance is an important prerequisite for hybrid learning to play a role. We need to further improve the teaching platform, enhance the relevance between the online part and the classroom part, and fundamentally improve the motivation of students' Online Autonomous Learning[8-9]. The training of teachers' educational technology and computer ability should also be strengthened, so that they can adapt to the new teaching mode faster and provide better guidance and support for students.

VI. CONCLUSION

Based on the flipped classroom teaching mode, this study aims to improve the disadvantages of traditional engineering management courses, such as boring content, high consumption and low efficiency. Through observation and other research methods to verify the application prospect of flipped classroom teaching mode in the course of engineering evaluation, the purpose is to explore the feasibility, application skills and effects of flipped classroom mode in the course of Chinese culture[10].

Through the research on the teaching mode of engineering evaluation flipped classroom, a set of unique teaching mode of

engineering management course in our school is finally formed, which shows the characteristics of our school. This study has the following practical significance:

- The engineering evaluation teaching based on flipped classroom can provide a new idea for the engineering evaluation teaching reform. Through the combination of flipped classroom and engineering evaluation teaching in this study, it has certain reference significance for other courses in the teaching system of engineering management specialty.
- The research on the application of engineering evaluation teaching based on flipped classroom teaching mode is beneficial to the upgrading of teachers' teaching ideas, and the transformation of "teachers' main body" into "students' main body" in the traditional classroom, which is conducive to the realization of students' personalized learning, the cultivation of their ability of independent learning and cooperative learning, and the establishment of lifelong learning ideas.
- This study explores the application of flipped classroom teaching mode in the engineering management professional classroom, and becomes the brick of localization research and practice of flipped classroom.

REFERENCES

- [1] Xiaoliu Zhong, Shuqiang Song, Lizhen Jiao. Research on The Teaching Design in The Information Environment based on Flipped Classroom Idea [J] Open Education Research, 2013(1): 58-6
- [2] Yuan Yao. Research on The Application of Flipped Classroom in Engineering Evaluation Teaching[J]. Examination Weekly, 2015: 85-157.
- [3] Qiliang Zhang, Yongsheng Chen. Research on The Application of Flipped Classroom in Operating System Experiment Teaching [J]. Experimental Technology and Management. 2014 (12).
- [4] Na Li, Wei Wang, Cuihong Li. Exploration on The Application of Flipped Classroom in Engineering Evaluation Teaching based on Micro-lesson [J]. Education Forum. 2017. 16-159.
- [5] Kang An, Jing Li, Yuhuai Wang. Single-chip computer course based on mobile learning app research on the design and implementation of "improved flipped classroom" [J]. Higher science education, 2019 (1):108-114
- [6] Fangxia Guo, Qi Liu, Research on the correlation between online learning behavior and learning effect - Practice of flipped classroom teaching based on blackboard[J]. Higher science education. 2018(1). 16-159.
- [7] Tianlin Sun, Shusheng Shen, Ruibin Zhao. Internet thinking promotes the realization of educational reform [J]. Higher science education. 2018(3). 16-159.
- [8] Xiaoliu Zhong, Shuqiang Song, Lizhen Jiao Research on the teaching design based on the concept of flipped classroom in the information environment. [J]. Research on Open Education. 2013(1). 17-159.
- [9] Zhili Qu, Shujia Han, Yue Chen, Liguang Huang, Desen Dong. A study on the adaptive factors of college students to MOOC. --Yanbian University as the research object. [J]. Education and Teaching Forum. 2017(8): 63-64.
- [10] Yan Qun, Zhi Li, Jiarui Cui, Shoumei Han, Chang Wang. Research on Electrical Technology Experiment Teaching Based on flipped classroom. [J]. Higher science education. 2017(4): 115-64.