Teaching Applications of Flipped Classroom on Transportation Planning Software

Xiao-Mei XIA

Business School of University of Shanghai for Science and Technology, Shanghai, China

Xm_xia@163.com

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Abstract. As an advanced teaching mode, flipped classroom is introduced to the training activities of transportation planning software. According to the teaching characteristics of traffic planning software course, combining the traditional teaching method with the teaching method, the new teaching method is put forward. First of all, the training video resource and the case library are created. Students should use network-training platform to watch video, practice and test before the class. Then the students enter into the classroom with the problems, discussing with the teachers and classmates in the classroom. By the interaction, communication between students and students, students and teacher, students can deepen the understanding and mastering the knowledge of transportation planning software.

Introduction

With the rapid development of information technology, a number of engineering and technical work is realized with the aid of advanced professional application software. As an important part of the urban master plan, traffic planning schemes will be proposed in transportation planning after the large-scale surveys of residents’ travel, establishing scientific and advanced transportation planning model to predict traffic demand in urban planning year’s with the transportation planning software. Transportation planning is a complex and essential work, because it involves the urban land use planning, economic development, population status analysis, traffic status analysis etc. With different analysis modules of advanced transportation planning software, people can quickly and easily carry out various traffic demand forecast to achieve a multiplier effect.

Currently, teaching and research organizations, urban traffic design, planning and management organizations are all using transportation planning software, including TransCAD, Emme, Trips, Visum, etc. Each software has its own characteristics. In order to cultivate the students with the applied talents to meet the requirements of the rapid development of the society, it is necessary to pay more attention to strengthen practice in teaching the traffic planning software to let the students comprehensively and systematically master the skills on using the software to carry out the traffic planning in the teaching of transportation planning software. By the course of transportation planning software, the practical application ability of students will be improved.

Teaching Characteristics of Transportation Planning Software

The theoretical foundation, practical application of transportation planning software curriculum are very strong. Teaching characteristics of the transportation is as follows:
(1) Strong theoretical basis. As the level of engineering application, teaching of transportation planning software needs students to understand the process of transportation planning, and to master the basic knowledge of the theory of transportation planning. The planning process generally includes the determination of the target of transportation planning, traffic data investigation, traffic analysis and prediction, traffic plan design, traffic plan evaluation and adjustment. It is important for students to grasp the model of the core module of the transportation planning, such as traffic analysis and prediction. Models used in traffic production include regression, cross-classification method etc. The traffic distribution model includes growth factor, gravity model method and so on. Model of modal split includes regression model, discrete choice model and so on. The traffic assignment model includes all or nothing method, the user equilibrium model, the stochastic user equilibrium model and so on. It is necessary for the students to master the applicability of each model and the parameters that need to be entered. Only with the solid theoretical knowledge, students will be able to quickly understand the function of each module of the software, improve the effectiveness of software application learning.

(2) Many practical steps. The operation of transportation planning software includes several menu commands, input and output parameters and options settings. There are many operating steps with the strong inheritance in the program. The production and attraction data of traffic zone that is output from the traffic generation is the input data of the traffic distribution prediction stage, and the OD matrix output from the traffic distribution is the input of the traffic assignment. Finally, we get the road traffic volume from the traffic assignment, V/C and other indicators which are the basis of the development of traffic plan. The whole traffic planning forecasting process is a continuous and complex process. With the traditional teaching mode, students are not easy to understand the function and operation of each process. Students have to spend a lot of time and effort to find their own way after the class. However, the effect may be still not good[1].

(3) Flexibility of software application. It is necessary to analyze and deal with a large number of external survey data, to carry on the demand modeling, calculation and analysis, and to analyze the uncertainty of the future. Teachers often focus on the construction of the theoretical knowledge system of traffic planning for students in the classroom teaching of traffic planning. Teaching emphasis is the process, the steps, the method and the model of the planning. Relying solely on the traditional teaching mode, it is difficult for students to form perceptual knowledge and grasp the practical operation ability. This will form a situation that teachers have difficulty on teaching and students have difficulty on learning. The purpose of traffic planning software teaching is not only to let the students master the process of software operation, but also let students use each module of the software flexibly to deal with and solve the practical problems according to the actual project preliminary data.

Content of the Transportation Planning Software

In the process of the teaching of transportation planning software in class, we focus on the construction of the transportation planning theory system. The purpose for the practice of the transportation planning software is to make students to master the professional software application ability. The following aspects include the main content of teaching:

(1) Summary of the transportation planning software. Including the development background, main functions, advantages and disadvantages, the main interface and the
application of the software. The main purpose is to let students learn about the main transportation planning software domestic and overseas.

(2) The basic operation of the transportation planning software. Due to the different development environment, different software has respective characteristics and some basic operations, such as the operations of the data input, delete or sort. As for the starters, mastering the basic operation can be a better way for the next step of study. EMME, for example, provides a rich content for users, which can be a set of requirements analysis and network analysis model tools. The functions include database building, city information system, a variety of transport mode, data processing, assignment of the traffic and transit, demand model, function and expression, test and calculation, data input and output, the network and model calculation, explanatory note, macros, etc.

(3) The application training of the transportation planning software. This is the key of the transportation planning software application teaching. Using the modeling tools and methods in the transportation planning software and combing with the teaching case, the application training can be completed, including the traffic assignment, path selection. Thus, students could master the basic method for the software in the transportation planning. In the transportation planning, the classical traffic demand forecasting model based on the four stage method is the core part of the transportation planning software. Including the construction of the traffic network and traffic zone, traffic generation prediction, traffic distribution prediction, modal split and traffic assignment.

The Teaching Method of Transportation Planning Software

The traditional teaching method of transportation planning software is mainly based on the classroom teaching, and the students' operating practice is supplemented. But we found that in the teaching process, students cannot grasp the very complex operation through the traditional teaching methods. So students cannot master a very complex operation process very well, and the learning effect is not ideal. Thus, the goal of cultivating students' practical ability cannot be reached.

Flipped Classroom

The flipped classroom is proposed as an effective instructional approach in counselor education. While there is no one model, the core idea is to flip the common instructional approach: With teacher-created videos and interactive lessons, instruction that used to occur in class is now accessed at home, in advance of class. Class becomes the place to work through problems, advance concepts, and engage in collaborative learning. Most importantly, all aspects of instruction can be rethought to best maximize the scarcest learning resource time.

Flipped classroom teachers almost universally agree that it’s not the instructional videos on their own, but how they are integrated into an overall approach, that makes the difference. In his classes, Bergmann says, students can’t just “watch the video and be done with it”. He checks their notes and requires each student to come to class with a question. And, while he says, it takes a little while for students to get used to the system, as the year progresses he sees them asking better questions and thinking more deeply about the content. After flipping his classroom, Bergmann says he can more easily query individual students, probe for misconceptions around scientific concepts, and clear up incorrect notions[2].
The flip’s focus is to highlight the self-study in advance of the class and the strengthen counseling on classroom, which achieves the transfer of learning "main front", so that students can search for knowledge independently in a relaxed and free environment. Therefore, the flipped classroom is helpful for students’ personalized learning. Students can improve their learning efficiency according to their learning style and ability to control their own learning progress. Reconstruction of the flipped classroom teaching structure, reversing the traditional classroom’s two stages of the "transfer of knowledge "and" internalization of knowledge" are realized. The "transfer of knowledge" is completed independently by the students before class, and in the classroom the stage of "internalization of knowledge" is completed by the teachers and students together. In this process, the role of teachers and students have changed, teachers from the traditional knowledge initiators transfer to the guiders of the knowledge, students from passive recipients transfer to the researchers of knowledge.

Teaching Method Reform Based on Flipped Classroom

According to the teaching characteristics and content of transportation planning software, appropriate learning method is very important for student to grasp and use the transportation planning software in practice. In the flipped classroom teaching mode, teachers analyze the learning situation of students at first before the class, then determine the teaching objectives based on the student's learning characteristics, the degree of mastery of the concept, planning content and the characteristics of the software. Teachers should design a variety of video, pictures and other teaching resources of the software operation process. Students chose the right place and time to learn through the computers, laptop, mobile phones and other terminals on internet in advance of the class according to their own situations. They can use the form of pause, fast forward and playback to control the learning progress. Also, the students test their learning effect by watching video and finishing work independently online. Students use the exchange platform to communicate with the teacher and feedback their learning situation. According to the feedback of the students and the contents of the course, the teaching content of the class is designed. In the classroom, teachers give some questions to the students and ask them to form some groups to discuss and learn with each other. After the guide of teachers by PPT, video etc., students are asked to make communications with each other about achievements to complete absorption of knowledge and understanding. After class, the students consolidate or expand the exercise according to their own situation, and the teachers provide the corresponding teaching cases and other resources to help the students to deepen the internalization of knowledge.

According to the teaching characteristics of transportation planning software, combined with process of practice teaching of flipped classroom, the main teaching methods for transportation planning software is summarized as follows:

(1) Traditional classroom teaching method. As to the introduction of the transportation planning software, we should adopt the traditional teaching method, the teacher's classroom instruction is given priority to, the student extracurricular preview and review is supplemented.

(2) Project binding method. As to the application of software in practical, it is very important to cultivate students' ability to use the theoretical basis of knowledge to actual projects. By using methods of teaching combined with projects, in accordance with the teaching contents and purpose, teachers should choose the suitable projects to make teaching design and carry out teaching activities, such as the comprehensive urban transportation
planning, transit planning, traffic impact assessment, the feasibility of highway evaluation etc., to make the software teaching not only closer to the actual situation, but also to fit classroom teaching and students’ learning.

(3) Applications of screen recording method. In the process of operating the computer software, we may use special video software to record the operation steps, mouse movements, mouse movement track and dynamic change of screen to make the multimedia courseware. This is also an important part of the flipped classroom. Because the operation steps of transportation planning software are more, according to the traditional teaching methods, students in the classroom need to write down the operation steps, while they are operating the software. If so, they will not be able to keep up with the progress of teaching. The flipped classroom combined with the screen recording method, teachers can make the videos available to students on the operation process. With the video students can study the process repeatedly and practice.

The focus of the flipping classroom teaching method in the course of transportation software planning is to highlight the pre class learning and the guidance in the classroom to strengthen, to transfer the main position of learning from classroom to anywhere, so that students can explore knowledge in a relaxed and free environment. According to this idea, the design of the flipped classroom teaching mode is shown in figure 1.

![Figure 1. Structure of flipped classroom teaching pattern.](image)

**Conclusion**

Teaching of transportation planning software is an important part of training students’ practice ability. After summarizing the characteristics and contents of transportation planning software teaching, the important role of flipped classroom teaching mode in transportation planning software teaching is put forward, and the new teaching pattern on transportation planning software is proposed. With the combination of traditional teaching method on software with the flipping classroom mode, it is useful to improve the teaching effectiveness of transportation planning software.
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References
