

## Construction of Online Course based on FCM Concept

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**Abstract**— In 2007, flipped class model was firstly employed in class by Jonathan Bergmann and Aaron Sams, chemical teachers of Woodland Park High School, Colorado. Along with the popularity and development of internet, flipped class model of Khan Academy has drawn wide attention from global educators. Since Khan Academy was founded by Salman in 2011 to provide free learning platform for learners by means of flipped class video and teacher's personalized question-answering system. In this paper, taking for example the elective course of general education-Graph and Image Processing, focus is put on online construction of flipped class model based on FCM concept.

**Keywords**-FCM; Online Course; Teaching Design

### I. FLIPPED CLASS MODEL

In 2007, flipped class model was firstly employed in class by Jonathan Bergmann and Aaron Sams, chemical teachers of Woodland Park High School, Colorado. Along with the popularity and development of internet, flipped class model of Khan Academy has drawn wide attention from global educators. [1] In 2011, Jiao Jianli, Professor of South China Normal University, firstly presented flipped class model in his blog, which was seeing rapid development in 2012. In April 2013, Professor Gao Song, vice president of Peking University and Academician of China Academy of Sciences mentioned that advanced placement program should be established for junior high students to acquire admission qualification by dint of MOOC platform and flipped class model. [2] In September 2013, Nanjing Primary School was determined as the pilot school of flipped class model. In this paper, FCM-based online course is constructed, with *Graph and Image Processing*, the elective course

of general education (hereinafter referred to as the Course), taken as research object.

### II. ANALYSIS ON COURSE DEMAND

#### A. Student's huge difference in basic knowledge

The teaching about the elective course of general education is facing severe challenges, for there is a huge difference in regional development level of teaching informatization and students' application ability of information technology, and besides, universities attach importance to information technology to varying degrees. This is obviously embodied by the fact that teaching activities always encounter difficulties in meeting the requirements of all students. Some students perceive that the teaching contents are too simple and thus hope that teachers can increase the difficulty, while other students argue that it is difficult to catch up with the progress because of the fast teaching progress and the excessive software application knowledge. Teaching activities encounter difficulties in satisfying the demands of learners at different levels, and meanwhile, learner's dissatisfaction with teaching directly influences teaching enthusiasm, which will further impact the implementation of teaching objectives.[3]

#### B. Student's huge difference in basic knowledge The frequent emergence of new technologies and software versions as well as large quantities of course contents

Along with the emergence of new technologies and software versions, information technology has exerted an important influence on various fields such as education, economy, life and entertainment. Meanwhile, the teaching concept and methods have been turned into methodologies, which is of great

significance for the construction and development of other subjects. The concepts, such as computational thinking and methodologies of educational technology, have already been listed as course objectives by Teaching Instruction Committee of Ministry of Education. Therefore, the class given in computer room is filled with more and more teaching contents.

### III. Analysis on course investigation

Elective course of general education is oriented to all students. Questionnaires are distributed for the purpose of adjusting the teaching emphasis in each semester, because students of different specialties show a huge difference in basic computer skills and interests. The result of partial questionnaires in 2013 fall semester can be seen as below:

A. The overall evaluation on elective course of general education (Fig.1) shows that 5% of respondents are very satisfied, and “satisfied” means that the overall quality of the course needs to be improved.

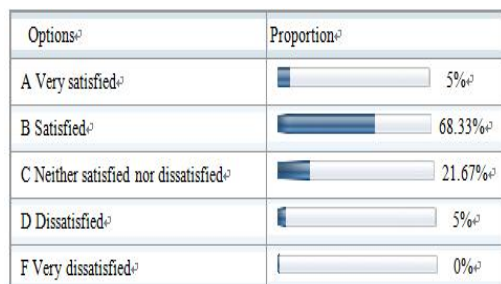


Fig. 1

B. Concerning what kinds of improvements need to be made in elective course of general education (multiple choices available), Fig. 2 shows that school ' s introduction to all courses occupies 50.94%. This suggests that most of the time, students rely on sense or the words of schoolmates to select courses online rather than on the understanding of the teaching contents. Of all respondents, 39.12% argue the elective course shall be adjusted; 35.84% agree the teaching management of elective course shall be improved; 33.96 % hold that

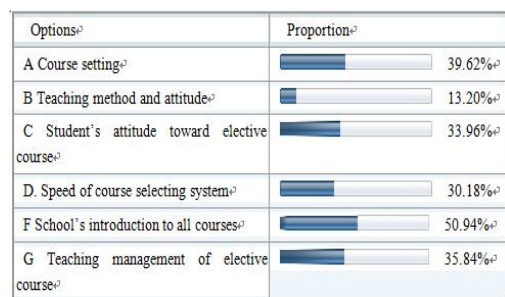


Fig. 2

C. Concerning the contents that students hope to learn from Graph and Image Processing, Fig. 3 shows that in this semester, students desire to master the application of PS tool, post-processing of digital photo, and the processing of creative design in descending order.

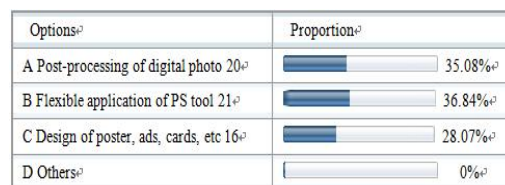


Fig. 3

### IV. Course design and construction

#### A. Course study model[4]

Course consists of four modules, namely, pre-class self-study, course inquiry, evaluation and course discussion. The flipped class model requires that the original teaching process should be reconstructed. The teaching contents will be firstly recorded and then uploaded to the website along with related course materials for student ' s pre-class learning. During online self-study, students can give a feedback on the difficulties and focuses to teachers, and then, teachers

can make a summary to guide students' study in a more targeted way. In practical class, however, students often seek individualized guidance from teachers based on their personal study, or apply the knowledge and skills acquired from online record to addressing actual problems in activities under the guidance of their teachers. This process is called course inquiry.[5] As a matter of fact, it is difficult for the evaluations on traditional electronic works to embody student's actual condition. The combination of inter-team evaluation and teacher evaluation can not only enhance teamwork spirit of members, but also arouse the competitive consciousness among all teams.

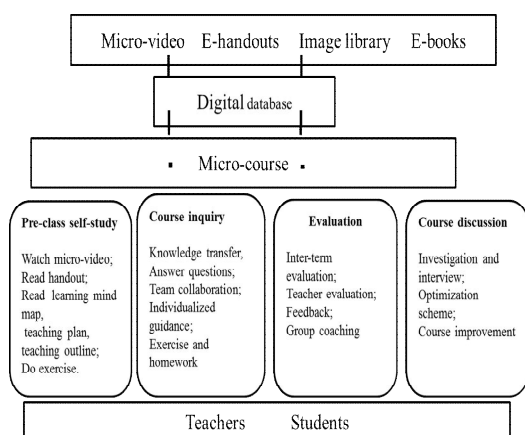


Fig. 4

## B. Course module

### 1) Course information module

The result of questionnaire survey shows that 50.94% of students lack the understanding of curriculum information. Thus, course information module, including curriculum's introduction, property, guiding thought, characteristics, and semester objectives, as well as teacher's major introduction and contact information, is added to online course.

For school's elective course of general education, it is necessary to address the problem that teaching activities have been always encountering difficulties in satisfying the requirements of all students. Facing new knowledge points, students might achieve different learning effects, either fast assimilation or slow assimilation, as a result of the different durations of new knowledge assimilation.[6] The basic skills of *Graph and Image Processing* can be made into video. By this way,

students suffering slow assimilation can repeatedly watch the video and seek assistance from companions by dint of online teaching resources, whereas the students who can assimilate new knowledge quickly can get involved in in-depth learning according to their own abilities. [7]The teaching activities can be implemented in BBS and evaluated by students who can help other students as teaching assistants. In this way, student's learning enthusiasm will be heightened.

### 2) Content module

#### • Micro-unit resource pool

The teaching should be reconstructed, with the teaching contents (the application of various tools and filters) divided into micro units based on knowledge points and then made into micro video. Before class, the videos will be uploaded to the website together with related course materials for students' pre-class learning. Micro unit modules include the application of tools, post-processing of digital photo, art design, and textual creativity. Micro unit pool is composed of handout and micro-video.

#### • Learning mind map

Mind map software should be applied to drawing knowledge map of courses.

It is known to all that mind map uses a central key word or idea to form the visualized thinking of structure and classification.[8] It refers to a diagram that connects a central key word or idea to the words, ideas, tasks or other related items in the form of radiation. As shown in Fig.2, it links a key word to related tasks and knowledge with a view to helping students establish learning framework.

#### • Learning guidance

Flipped class model can improve not only students' autonomy in learning but also team collaboration. Learning guidance is the comprehensive summary about course knowledge and design works of *Graph and Image Processing*, which can be used as

all-round and systematic reference for self-study of students and teams.

### 3) Course inquiry

Having studied the corresponding content modules before class, students shall primarily seek individualized guidance from teachers according to their learning condition as well as improve the knowledge and skills acquired from micro unit pool and realize knowledge transfer under the guidance of teachers in the activities of work design and team collaboration.

### 4) Feedback and evaluation module

The evaluation method combines teacher evaluation and inter-team evaluation.[9] The traditional method that makes a record by pen or uploads electronic assignment by FTP is unable to fully test the learning results of flipped class model, since it also involves other aspects, such as student's cooperation ability, organization ability, personal time management ability and expression ability. Inter-term evaluation, which includes five grades, namely, A, B, C,D, and E, requires students to state the specific evaluation grounds. In this way, not only can student's evaluation ability be cultivated, self-evaluation and mutual evaluation will also maintain their original significance. The final marks shall be given by teachers in consideration of various opinions.

### V. Conclusions and thinking

Traditionally, for practical teaching in computer room, there has been a lack of interaction between teachers and students.[10] It is difficult to meet the requirements of all students, since they are equipped with different computer skills. As a result of technology-based teaching, students can only do as what teachers say without independence

or initiative. On the contrary, flipped class model can allow students to conduct self-learning activity freely, increase learning interaction, realize individualized learning and help students suffering learning difficulties. In flipped class, knowledge is imparted to students after class by dint of information technology, while knowledge internalization is accomplished in class with the help of teachers and classmates. In this way, the flipped class opposite to traditional teaching will be shaped to improve teaching quality.

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