doi: 10.14355/jitae.2014.0303.02

Flipped Classroom: an Effective Model of Improving Student Teachers' Educational Technology

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Received 1 June 2014; Accepted 3 July 2014; Published 28 July 2014

Abstract

With China's progression of information technology in education, more attention has been putting on teachers' educational technology abilities; In the process of training student teachers' educational technology, teachers and researchers have found that it is hard to meet students' academic needs, and difficult to achieve training objectives due to limited training time, heaviness of training tasks and students' various technology levels. This project uses the model of "flipped classroom" in training, and finds that it has handled various vital functions in training students' educational technology, especially helpful to enhance student teachers' innovation and personalities.

Keywords

Student Teachers; Education Technology Abilities; Flipped Classroom

Introduction

In order to improve teachers' technological competence in primary and secondary schools and hence promote teachers' professional development, the China Ministry of Education in 2004 promulgated "Standard of Teachers' Educational Technology Competence in Primary and Secondary Schools (Trial Version)" and in 2005 carried out "Teacher Education Technology Capacity Improvement Project". Since then, educational technology training has become obligatory for pre-service teachers, i.e., student teachers. The core of teachers' technological competence lies in the implementation of modern educational philosophy and technology in pre-teaching, while-teaching and post-teaching, that is, practice is at the core. Accordingly, the pattern of training student teachers in teachers' colleges has been changed from the lecture-based approach to the unity of knowing and doing or teaching and practicing. As has been found in our teaching practice over the past decade, many problems concerning technological competence training arise: training time lasts very short but training tasks increase very fast; students have unbalanced levels, so unbalanced that teachers could not meet their requirements in a precise and efficient way; traditional training in uniformity cannot capture the diversity and idiosyncrasy of students, and so on.

These facts throw open the whole of pedagogical field to reconsideration: how to improve the training efficiency, in particular students' manipulation and innovation of educational technology.

Flipped Classroom: an Effective Instructive Model

Flipped Classroom: An Overview

Flipped classroom, also named "upside down classroom", is a radical change of the traditional teaching: lecturing by day and doing homework by night.

The notion of flipped classroom can date back to Woodland Park High School in Colorado Rockies. Due to poor traffic and extreme weather, lots of pupils were absent from school. In 2007, the school teachers Jonathan Berman and Aaron Sams put their classroom PowerPoint presentations and audio materials on videos and then uploaded them to web, so that those absent would learn by themselves at home. Later, this

additional way was extended to those students present at class, who watched the video at home or after class and did homework in class. In class, teachers would not lecture but help students to solve homework problems. This teaching method was gradually accepted and popularized and then entitled "flipped classroom". More important, Salman Khan and Khan Academy (www.khanacademy.org) contribute a lot to the popularization of flipped classroom. Salman Khan made amount of videos on mathematics and published them on the net. All these videos were highly praised by students and teachers in other schools. Some teachers and schools changed their teaching style after watching Khan's videos. For instance, in some schools, watching Khan's videos at home replace traditional class lectures. This model is soon very popular across America[1] and the Canadian "Globe and Mail" in 2011 granted to the model the most radical technological innovation of class teaching.

The philosophy behind the flip is that students themselves acquire knowledge after class with the help of information technology, and they internalize what they know in class with the help of teachers and other students. The flip is in practice a completely student-centred teaching mode, where teachers become real organizers, mentors and facilitators. [2] Lectures will go on only when students make clear each point. Moreover, teachers could spend the time they save in working together with students to solve problems students encounter in their learning or homework.

Since 2011, flipped classroom has been introduced into China and applied in secondary schools such as Chongqing Jiangjin Jukui School and Guangzhou Haizhu No. 5 Secondary School, and higher education institutes such as Tsinghua University, [3] College English in Shangxi Teachers' University, [4] and Information Technology in Beijing Teachers' University.[5] No researches about the application of the model in student teachers' technological training have been reported to my knowledge.

Requirements for the Application of Flipped Classroom

Detailed analyses of ten typical flipped classrooms demonstrate that successful application of the new teaching model has to meet the following conditions. The most fundamental condition is a feasible information environment, where teachers and students can publish and access electronic materials and communicate with each other after class. The second is to make appropriate videos, appropriate in terms of teaching contents, teaching methods and the length of each video (about 10 minutes per video in Khan's). Some researches indicate that videos should keep to the point and be concise; otherwise, students would be so easily distracted.[6] The final is a relatively higher degree of students' independence, that is, students have to be so independent as to use the learning platform in their own agenda, monitor and evaluate their own learning processes.[7]

Empirical Study on Flipped Classroom in Educational Technology Training Course

Research Methodology

The present study conducts the flipped classroom teaching model in Class 1 and Class 2 in Southwest University. The course Educational Technology Training was offered to student teachers in the spring semester of 2013. The main methods employed in this study are literature review, questionnaire, interview, and action research, with such objectives as applying the flipped model first, and then adapting it to student teachers as well as to technological courses. It is expected that by doing so student teachers' general technological performance, in particular their practicality, can be improved.

Based on the detailed analyses of ten typical flipped classrooms and the critical thinking of traditional teaching of educational technology training, this study follows the logic as illustrated in Fig. 1.

It is necessary to explain several points listed in the

[1] For instance, Bill Gates comments that Khan is leading an educational revolution.

[2] Zhang Jinlei, Wang Yin & Zhang Baohui. "Study on the flipped classroom teaching model." Journal of DistanceEducation 4(2012): 46-51.

[3] Liu Zhen &Cao Zexi. "Application of Flipped classroom teaching model to courses of ideological and political theory." Modern Educational Technology 8(2013): 17-20.

[4] Li Lili. "Flipped classroom teaching model in College English." Young Writer 10(2013): 116-117.

[5] Ma Xiulin, Zhao Guoqing & Wu Tong. "Empirical study of flipped classroom in college information technology courses." Journal of Distance Education 1(2013): 79-85.

[6] Veronica Phillips. "Lights, Camera, Learn!: Five tips for using video in eLearning [EB/OL]."
http://elearnmag.acm.org/featured.cfm?aid=2206721

[7] Roohollah Mozaffaripour. "The Role of Education in Constructing the Individual Identity in Internet Era According to the Existence Philosophy." Journal of Information Technology and Application in Education (JITAE) 1 (2013): 33-45.

figure. First, classifying students into the experimental group and the control group depends on the pre-class students' analyses, for instance, whether it is convenient for them to use internet, whether they are familiar with word processing system or PowerPoint, etc. Second, the instructor chooses teaching contents according to the teaching syllabus, well prepared videos and other source materials and determines in which parts the flipped classroom model will be employed.

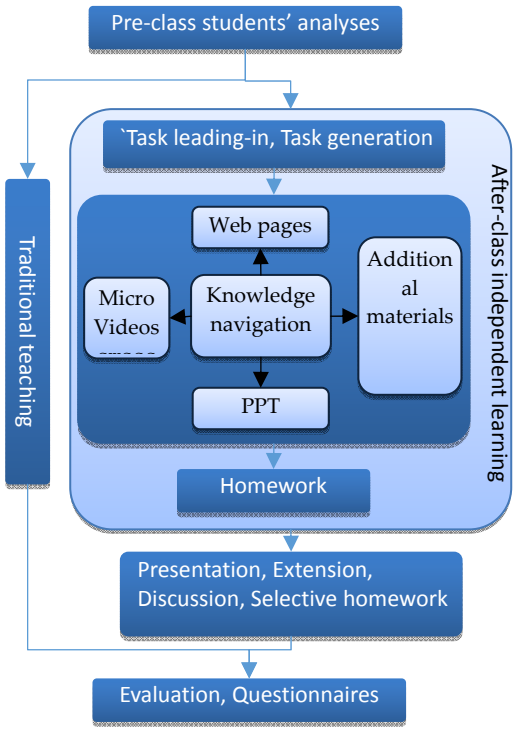

FIG. 1 RESEARCH FLOWCHART

The teaching content selected is Task 3 in Unit One –Designing and making flash materials, consisting of 3 sub-tasks with 9 types of knowledge or skills, as shown in Fig. 2.

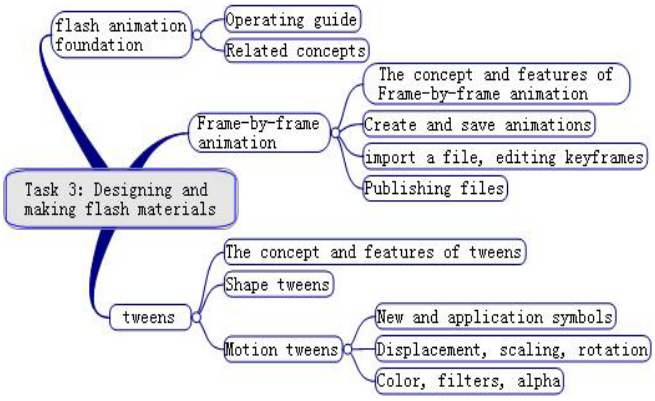

FIG. 2 KNOWLEDGE (SKILL) POINTS IN TASK THREE

All the knowledge (or skill) points in Task 3 are lectured or illustrated in mini videos. Each video lasts 8-15 minutes, with a total of 66 minutes. These videos are published as streaming media on Southwest University E-blackboard, which is free for all registered student teachers.

Research Procedures

Those students enrolling in our courses are classified into two groups: Class 1 with 47 students, two of them no PC, and Class 2 with 45 students, all having PC. The former class is the control group, and is instructed through traditional teaching; while the latter is the experimented group, where the flipped model is employed. The teaching procedures in the latter group are as follows:

1) Pre-testing and Guiding

Before implementing the flipped approach, the teacher introduces the basic ideas, and demonstrates how to operate on-line, including the structures and functions of e-blackboard, on-line teaching materials like videos, PowerPoint slices, homework, etc., and requirements for on-line interaction, reflection and evaluation.

2) Students' Independent Learning

Students spend their free time on on-line learning. First, they enter into the Leading-in Module to ensure that they have a clear mind of the contents or the required tasks. Second, guided by the knowledge navigation map, they watch mini videos or PowerPoint slices. Third, encountering problems or sharing their views, they can log in to the on-line chat room to discuss with their mates or teachers on duty, or to the e-message board to leave a note. Fourth, it is time for them to do their homework after independent learning. Knowledge points or skill operation points required in doing homework can be found in those on-line materials like mini videos, web pages and PPT. In doing their work, students have more opportunities to review what they have learned. If possible they can labour at additional materials provided on the platform, which is not only a necessary extension of their knowledge or skills, but a best way to train their personality or interest.

3) In-class Presentation, Discussion and Practice

Students display their work in class, and get criticisms from their classmates and teachers. Subsequently, they themselves choose one topic (relating to their majors or subjects) and have to finish it in class. Obviously, the self-chosen tasks can transparently reflect students' understanding of related knowledge or skills, more specifically, reflect their individuality or interest.

4) Evaluation and Questionnaire

Before the next unit, teachers will make comment on students' self-chosen work, and then give students a questionnaire each to fill in. This means the end of the first round of experimental flipped classroom teaching.

5) Data Collection

The data in the present study have two sources: tests and homework, and on-line questionnaire and follow-up surveys. In sum, there are 92 student records, homework, test achievements and questionnaires collected. The 6 questions in the questionnaire are:

(i) Compared with the teaching form used in the previous units, do you like to use the flipped classroom model?

A. I like it very much. B. I like it.
C. It does not matter. D. I do not like it.
E. I hate it.

(ii) Do you feel pressed for the flipped classroom after-class learning?

A. I feel hard pressed. B. I feel a little pressed.
C. I do not feel pressed. D. I feel at ease.

(iii) Do flipped classroom activities help your learning?

A. Negative effect. B. No help
C. Help. D. Great help.

(iv) Do you know how to design flashes before this unit?

A. I do not know. B. I know some notions.
C. I know a little. D. I know a lot.

(v) Compared with the effects of other units, how do you think of this unit?

A. Not as good as other units.
B. The same as other units.
C. Better but tired.
D. Better and easy.

(vi) What do you think the major advantage of the flipped classroom teaching model is?

Results and Discussions

Analyses of different types of data demonstrate the following points.

First, and Foremost, Flipped Classroom Teaching Model Has Unarguably Exerted Great Influence on Student Teachers

Table 1 reflects the differences between the control group and the experimental group in students' familiarities with flash designing.

TABLE 1 STUDENTS' FAMILIARITIES WITH FLASH DESIGNING

Group (Class)	Know nothing	Know some notions	Know a little	Know a lot
Control group (Class 1)	95.74%	4.26%	0.00%	0.00%
Experimental group (Class 2)	97.78%	2.22%	0.00%	0.00%

From Table 1, it can be found that there are no significant differences between the two groups. A great majority of students are lacking in technique bases of flash making, let alone skills of how to do it.

The flipped classroom experiment is followed by course evaluations. The first evaluation is students' self-chosen homework for Task 3. The second is terminal self-chosen and freely chosen homework. It is required that all course teachers work together to design two sets of tests according to the 17 tasks. Each consists of 5 tasks, two of which are about flash making. Students choose their favourite task from one of the two sets, and they are freely assigned a task from the other set. Table 2 is the comparison of the three types of flash homework between the two groups, and Table 3 presents the differences between flash work and other types of work in the experimental group.

TABLE 2 COMPARISON OF THREE FLASH WORKS

Group (Class)		Control group (Class 1)	Experimental group (Class 2)
Self-chosen homework for Task 3		70.6	78.0
Terminal self-chosen homework	Average score	80.0	83.6
	Percentage	15 students, 31.91%	35 students, 77.78%
Terminal freely chosen homework	Average score	71.7	78.3
	Percentage	9 students, 19.15%	9 students, 20.00%

TABLE 3 COMPARISON BETWEEN FLASH WORK AND OTHER TYPES OF WORK IN THE EXPERIMENTAL GROUP

Topics	Self-chosen homework		Freely chosen homework	
	Average score	Percentage	Average score	Percentage
Flash	83.6	35 students, 77.78%	78.3	9 students, 20.00%
other types	82.5	10 students, 22.22%	70.5	36 students, 80.00%

Table 2 shows that the experimental group's average scores of the three kinds of flash homework are obviously higher than those of the other group. For

instance, in terminal self-chosen homework, 77.78% of experimental students show greater interest in flash homework, while only 31.91% control group students tend to choose flash as their homework. On the other hand, the comparison between flash work and other types of work in the experimental group, as is shown in Table 3, demonstrates that as much as 77.78% students take flash making as their terminal self-chosen homework, which means that compared with other types of tasks, a greater majority of students are confident of their flash making abilities. This result also gets support from their freely chosen homework, that is, the average score of flash homework with 78.3 point is higher than that of other types of work with 70.5 point. Overall, it is clear that the practice of the flipped classroom model in the third task of flash making is beneficial for students' learning.

Second, Flipped Classroom Performance Has a Positive Effect on Students' Belief of Learning

The experimental class's attitude towards flipped classroom teaching is shown in Table 4 and Table 5.

TABLE 4 WILLINGNESS TO USE THE FLIPPED CLASSROOM MODEL

Like very much.	Like	Does not matter	Do not like	Hate
44.44%	48.89%	4.44%	2.22%	0.00%

TABLE 5 DEGREE OF PRESSURE FOR THE FLIPPED CLASSROOM

At ease	Not pressed	A little pressed	Hard pressed
46.67	51.11	2.22%	0.00%

It is assumed that students would dislike the flipped classroom model or they are hard pressed for it since they take a lot of after-class time to finish their task. The data in Table 4 and 5, however, give an opposite view. In the experimental class, 95.56% of students are willing to participate in flipped classroom activities and a further 97.78% give a positive response to the question whether they feel pressed for the new method, they feel at ease or at least no pressure exists. As for the open question of the advantages or disadvantages of the flipped model, 93.33% students answer that the best is that they can hold their own pace, and 68.89% think that they like to watch the videos repeatedly until they have a clear mind. Moreover, the in-class discussions also reveal some differences. The experimental students focus on how to perfect their self-chosen work, while the control group pays more attention to techniques or skills proper.

Third, There Is No Increase but Decrease in Teachers' Workload in the Flipped Model

In addition to students' learning effects a new model could bring, it is worth noting teachers' aspects, workload being one of them. Table 6 is a rough time calculation, but tells us something important (each lecture per week lasts 80 minutes, covering two periods, each 40 minutes).

Table 6 presents the time the teacher would spend on the experimental and non-experimental units. In pre-class preparation, more than 50 minutes have been increased in the experimental unit, mainly for video-making, but about 30 minutes have been saved in in-class teaching (with each period 15 minutes). There is no noticeable change in checking after-class homework. It seems that more time (190 mins vs. 155 mins) has been taken in the experimental unit, which must increase teachers' workload. However, the fact is that once the materials like videos and web pages are well prepared, they can be shared by other classes, teachers or even other grades. In this sense, we can say there is no increase but decrease in teachers' workload.

TABLE 6 COMPARISON OF TEACHERS' WORKLOAD

	Pre-class preparation per unit	In-class lecture per teaching period	After-class homework checking per class	Sum
Experimental unit	About 90 mins	< 10 mins	About 90 mins	190 mins
Non-experimental units	About 40 mins	>25 mins	About 90 mins	155 mins

Conclusion

Blended learning is an innovative direction for present education reform and development, and "flipped classroom", as a completely radical form, comes into the blended stream. The present study shows that flipped classroom teaching changes students' attitudes toward learning, improves their performances, and decreases teachers' total workload. In particular, the model is beneficial to improving student teachers' technological competence; in general, it is suitable for higher education though it originated from secondary education. Nevertheless, the new model cannot do everything, for instance, it cannot meet the needs of those tasks which require face-to-face direction such as the operation and use of multimedia instruction system, or those where students are difficult to build practice situations. The proper way is a combination of the new model with the traditional teaching.

ACKNOWLEDGEMENTS

This work was supported by Fundamental Research Funds for the Central Universities under Grant No. XDJK2014A002.

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