Classroom flipping as the basis of a teaching model for the course *Mobile Application Development*

Chang Xu

Zhejiang Business Technology Institute
Ningbo, Zhejiang, People's Republic of China

ABSTRACT: In this article, the *classroom flip* used to reform the Mobile Application Development course is presented. This reform aims to enrich teaching content and diversify the teaching methods. The classroom flip focuses on effective pre-class learning and active class interaction between teachers and students using appropriate videos. In classroom flipping, both the teachers' roles and students' roles are reversed. Also the classroom flip allows achievements to be shared and evaluation improved. Through this flipped teaching process, students' skills in self-learning can be improved. Results indicate that it has been a successful course reform, making the inverted classroom more effective than the traditional classroom.

INTRODUCTION

Lives have been changed by the popularity of mobile terminals, such as intelligent mobile phones and the applications based on these mobile terminals. As can be seen on well-known domestic recruitment Web sites, the advertisements aimed at job-seekers specify graduates who have majored in mobile phone platform system development, wireless technology or embedded application development. To adapt to teaching reform in higher education the course, Mobile Application Development, was developed at the Zhejiang Business Technology Institute. The aim is to achieve a training model to ensure it is appropriate to the modern workplace.

One teaching strategy aims to introduce students to course content outside of the classroom to enable learners to engage with content more deeply than they would inside the classroom. Because this way of structuring the classroom turns around the more traditional concept of introducing students to course content inside the classroom and assigning homework to engage content at a deeper level outside the classroom, it is referred to as the *inverted classroom* or the classroom flip [1].

Considering the popularity and advantages of the classroom flip, this teaching method has been introduced into the Institute's course reforms. This reform emphasises pre-class learning and class interaction.

DEALING WITH THE ISSUES

Years of traditional teaching have revealed several issues, such as:

Gaps in Students' Pre-requisite Knowledge

Although students will have acquired command of basic knowledge, there are differences in pre-requisite knowledge. Students' needs cannot be satisfied in the classroom environment; discontent can affect the teacher and disrupt the teaching. The goal of personalised instruction usually means replacing traditional modes of education with customised instruction. Traditional classrooms cannot always provide this type of differentiation, which has led some educators to recommend a blended learning environment, which incorporates technology via the inverted classroom [2].

The Size of the Course

Mobile Application Development is oriented towards a rapidly developing emerging industry. Mobile development tools and applications are constantly being updated and improved. What the students learn at the school may be not

new. The content of the course is growing larger and course numbers are increasing. These changes are limited by class hours. What is more, it is impossible to change or update teaching content every term or every year.

Difficulties in Providing Effective Practice Guidance

This course differs from former software technology courses in that equipment, such as a mobile phone simulator or prototype requires development and debugging, and to debug requires a significant amount of time, which may vary greatly depending upon the student.

STATE-OF-THE-ART: INVERTED CLASSROOM

The idea of classroom flipping has captured imagination world-wide. It was also judged by the Canadian newspaper, *The Globe and Mail* to be the most significant technological change in 2011 influencing class teaching [3]. Classroom flipping involves providing instructional resources for students to use outside of class so that class time is freed up for other instructional activities.

Enfield referred to the Flipped Classroom Model described and defended by Mull. While not all of the principles Mull describes are utilised by all teachers who flip classrooms, all implementations include the idea that, ...*students prepare for class by watching videos, listening to podcasts, reading articles, or contemplating questions that address their knowledge* [4]. Table 1 shows a comparison between the traditional classroom and the flipped (or inverted) classroom.

Table 1: Comparison of the traditional classroom and the inverted classroom.

	Traditional classroom	Inverted classroom
Teachers	Knowledge initiator, class controller	Learning instructor, promoter
Students	Passive recipients	Active researcher
Teaching methods	Class teaching and homework	Pre-class learning and class exploration
Teaching content	Knowledge transfer	Problem exploration
Technology application	Content exhibition	Self-learning, interaction and reflection
Evaluation from	Traditional paper tests	Multi-directional, multi-mode

Changes in the Teacher's Role

The inverted classroom makes the teacher a facilitator and advisor of teaching, and not the initiator, but the promotor. This means the teacher no longer will be the centre of knowledge; instead, he/she will become a promoter of learning. In the classroom flip, students are the centre of study; in student-centric learning, knowledge should be acquired through participation in class. Teachers help students to work through the difficulties they encounter by questioning them and helping them to identify alternative paths, but the students have to resolve the problems [5].

Redistribution of Teaching Time

Knowledge transfer that takes place in class is now shifted to before class. The interaction between students and teachers is strengthened in class. As well, students can control their learning more effectively.

Changes in the Student's Role

In personalised learning supported by technology, students are self-paced and they can control their learning. If needed, they can interact with classmates and the teacher, the students' active explorations benefit the student-centred study model. Student-centred learning environments are designed to provide students with opportunities to take a more active role in their learning by shifting the responsibilities of organising, analysing and synthesising content from the teacher to themselves [6].

In a word, classroom flipping can play an important role in promoting autonomous learning to strengthen practical learning. But, the complexity of this type of class teaching requires that this model should be combined with appropriate teaching content and better class organisation, among other factors.

RESEARCH CONTENT

Constructing Class Teaching

In the classroom flip, teaching begins with pre-class study and, then, class study. For practical courses students' training in those skills should be given particular attention. Students can engage in self-regulated learning out of class according to the type of learning involved and, then, in class, the teacher will give them more practice. The teaching cycle is shown in Figure 1.

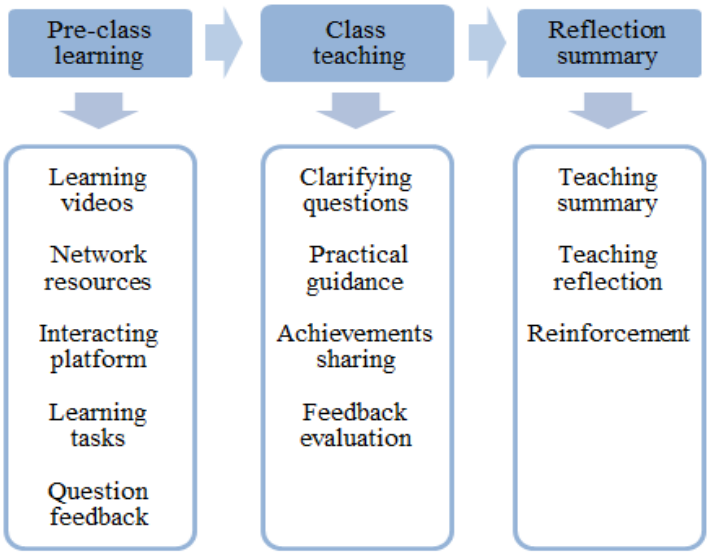

Figure 1: Teaching cycle for the inverted class.

Designing Pre-class Teaching

In the classroom flip, knowledge is acquired through students' self-learning. Teaching resources, such as videos, are provided by the teacher. The videos can be developed by the teacher or compiled from open teaching resources. Course construction and reform include the following two aspects:

Optimisation of Pre-teaching Resources

Since OpenCourseWare was launched by the Massachusetts Institute of Technology in 2002, many Chinese universities, organisations and individuals are carrying out open teaching resource development; for example, the Ministry of Education's *National Course of Excellence*, university public classes and networked courses.

Videos produced by the teacher should be consistent with the course teaching aims and content. The teacher can produce various versions of a video for different classes. Teachers should portray the main teaching points visually, while at the same time taking account of the viewing time for the students.

Besides the teaching videos, teachers also should make full use of advanced technologies. Technology influences how concepts are represented and how learners think about them [7].

Setting Pre-class Homework

To guarantee maximum benefit from pre-class work, the teacher should give homework to the students. The pre-class self-regulated learning is mainly through unsupervised networked and other kinds of course resources. The study guide can be effective in supporting learners in the acquisition of both knowledge and academic skills [8].

Through viewing the video, which is a means of self-regulated learning, students will grasp the theory and practical information. To avoid the situation where students may treat viewing the course video as a movie, students should be given tasks and questions to ponder during the viewing.

Designing the Class Activity

The classroom flip requires well-thought-through organisation of the class and is best combined with other teaching methods.

Definition of the Problem

As classroom flipping differs from the traditional method of teaching, teachers should summarise problems that can be explored. Teachers should adjust teaching content according to students' feedback. Hence, the learning is not just presented by the teachers, but is *flipped* by students through self-learning.

Independent Exploration

In student-centred classes, independent learning should be mastered by every student, as it empowers and enables students to take responsibility for their own learning. This has been shown to be of great benefit in student learning [9].

In terms of individual development, the students' studying develops from one of dependence to independence. The teacher should emphasise to students the skills required to learn independently. The distinctive personalities of all the students should be respected by letting them construct the knowledge required in their own way.

Exchanging Learning Achievements

After completing the work, students report their findings and share learning experiences, particularly positive ones. There are many forms of reporting, such as project demonstrations and interface design exhibitions. Apart from traditional direct presentations, students also can *flip* their reports by filming their presentations outside of class and uploading them to the Internet; this allows others to discuss or evaluate their work or even vote on it or make comments.

Feedback and Assessment

Shapiro, referred to both McKeachie and Marsh, who concluded that student evaluations are valid measures of teaching effectiveness [10]. Classroom flipping clearly emphasises the evaluations during study, but it also requires students' learning portfolios to be set up to make assessments of their learning. The assessments should be made objectively, and combined with quantitative and qualitative evaluations, individual and group evaluations, self-evaluation and evaluations by others.

CONCLUSIONS

The classroom flip idea was used as the basis for reforming teaching of Mobile Application Development. The aim of the reform was to enrich teaching content and diversify teaching methods. As a practical course, the knowledge and skills acquired during Mobile Application Development has a short *shelf life*.

Much attention was paid to training students in both self-learning and other key skills. There has been a highly positive result from the reform of teaching based on classroom flipping (or the inverted classroom). Students have advanced ability, as has been acknowledged by their employers.

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