

Flipped Classroom in History of Art and Design

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Abstract

Teaching and Learning in the 21st Century plays an important role in today's classrooms, with examples that include "flipped classrooms" and "mobile learning." This paper discusses an experiment on a new teaching model used in conjunction with Bloom's taxonomy for the History of Art and Design classroom at KMUTT. In our experimental classroom, tablets, software applications, and wireless technology have been prepared and integrated into curriculum, which has improved students' competencies. By participating in various daily activities in the classroom, students have been more engaged in lessons than when the class is conducted in a traditional lecture style. Several types of reflections such as daily activities, blogs and videos were used to deeply assess their knowledge and skills. The results show that students' exam scores have increased, and moreover, their reading and writing skills have clearly improved.

Key words: Mobile learning, Tablet, Flipped classroom

1. Introduction

The students who currently study in the university, including at the undergraduate level, can be declared to be digital natives or digital citizens. They have grown up along with the full developments of technology, such as high-speed wireless, Web 2.0 and social media. On the other hand, the teachers and lecturers who grew up in different generations need to try to understand the culture or language to communicate with students, facilitate their learning paths, and prepare them for the digital workforce. The students will gradually generate life-long learning skills through their own personal learning environments. The "flipped classroom" [1] approach has become particularly attractive as an option that corresponds with the students' generation. A guiding principle of this model is that listening to lectures or watching videos is better accomplished at home using video lessons prepared by teachers or third parties such as the Khan Academy [5]. In class, students apply the knowledge gained from the videos or recordings by solving problems and doing practical work.

In their study on the flipped classroom, Freeman and Schiller assert, "The pitfalls of the flipped approach are identified through two major problems. First, students new to the method may be resistant. They may come unprepared to class to participate in the active learning phase of the course. Second, the homework (readings, videos) must be carefully tailored for the students. The quality of the teacher-created videos is often marginal [3]." As a result, the flipped classroom model must be adapted and matched to fit the students' culture of learning.

1.1. Background

ARC123, or History of Art and Design, is a course that 30 out of 120 students fail every year. This class is lecture style and students often feel that they are overloaded with information that they must remember and understand. From interviewing students who failed the course, 23% of students revealed that they could not keep their attention in class. 18% of students thought that the topics were not interesting, and 17% of students felt that the teaching style did not fit their needs.

After analyzing these issues with traditional styles of teaching, the authors decided that Bloom's taxonomy [2] would be the most appropriate framework to implement for the History of Art and Design course. Bloom's six major categories of learning objectives are described with verb forms, starting from the lowest to highest levels as follows: 1) remembering, 2) understanding, 3) applying, 4) analyzing, 5) evaluating and 6) creating. These verb forms can be applied to class dynamics especially in instances where students lack these components. For example, students have difficulty remembering information from the class since the historical data is overwhelming. The learning outcomes of Art History meet only five levels of Bloom's taxonomy, excluding the "creating" level.

Note-taking and blogging have been studied in conjunction with Bloom's taxonomy. Several techniques of note-taking exist. Razmov and Anderson studied a style of interaction whereby the instructor poses a question written on a slide and displayed on a tablet in front of each student, and the students write their answers in digital ink and submit them back to the instructor [7]. The results show that there was a high rate of student

participation and ample discussion generated by the an exercise for practicing critical thinking skills with the

| | | | | | | | |
|--|---|---|--|--|---|--|---|
| Content of History and Design Principle | History & Design Principle Prehistoric -figure Tablet training | Mesopotamia Egypt -shape -form -color | Greek Roman -scale -proportion | Medieval Gothic -geometric -light -shadow | Renaissance & Baroque -perspective | Industrial Revolution Modern Art -simplification | Summary |
| Learning Objectives | Linkage between two subjects Writing skill | Reading skill Critical thinking | Listening & speaking skill Comparative analysis skill | Analytical skill Analytical skill | Analytical skill Applying knowledge | Sequence skill | Assessment of knowledge |
| Activities/ Tools | Pre-test exam eClicker  Note taking from chalk talk  | Note taking on ebook iAnnotation  5 Whys Padlet  | Note taking on video Scribbee  God scales 360 cities  | Geometric Analysis, Photoshop Touch  Material analysis, Art painting Artrage  | Note taking from lecturer's slides Image analysis Augmented Reality Aurasma  | Historical Timeline | Post-test exam  Lesson learn Video reflection Touchcast  |
| Reflection | Linkage to Design Principle by using Blogger  | | | | | | |

Figure 1. Course structure

activities. A study by Simon et al. investigates blogs as personal reflections on shared experiences with content that spans many levels of intellectual engagement [8].

Several research studies evaluate the use of tablets in the classroom. Koile and Singer studied the use of tablets in large classrooms [6]. They found that tablets increase student focus and attentiveness in class, provide immediate feedback and enable the instructor to adjust course material in real-time. Hamilton reports on efforts to blend tablets with collaborative workspace technology [4]. An instructor can achieve high volumes of feedback experience and engagement levels and learning will climb.

1.2. Modeling the class

The class was designed to cover the same content of the previous class. Eleven historical periods were set as key elements (see Fig.1) starting from prehistoric time through to the modern period. Forty-five hours of classes are held in total, with one hour for teaching and two hours for activities in class. Many students had previously never used tablets, so the students were trained on how to use the equipment at the beginning of the class. Since this class was taught parallel with the practice class called Design Fundamentals, design principles were integrated into the existing content to make the lessons more meaningful for students. The three learning outcomes were as follows: 1) students were able to sequence the history of art and patterns logically, 2) they understood the content related to design principles, and 3) they were able to read, comprehend the historical data and learn independently. The activities and tools were designed to fit the learning objectives. These objectives were used to measure both academic and life skills responses, while the activities were linked to the content that supports learning skills. For example, the “Five Whys Session” is

use of a “padlet” app for brainstorming questions and answers on the central display. The “flipped classroom” approach was adapted to fit the Thai students’ learning context, since students did not usually prepare their materials before coming to the classroom. As a result, instructors gave a lecture for a minimum of one hour before initiating the activities for two hours every class. The material that was used for teaching this class came from a standard textbook. The video material was from the Smart History [9], which is based on discussions between two specialized historians.

Table 1. Main applications used in the class

| | App name | Features | Activities |
|---|-----------------|---|--|
| 1 | iAnnotation | Annotating the PDF file of ebooks and slide presentations | Taking notes from an ebook and slide presentation of Mesopotamia and the Renaissance period. |
| 2 | Notability | Writing notes and doing reports | Taking notes from Chalk talk and doing a report. |
| 3 | Scribbee | Annotating videos | Note taking on video clips of Greek and Roman periods. |
| 4 | 360 cities | Viewing landscapes of cities or buildings | Comparing the god scale in Roman period. |
| 6 | Aurasma | Viewing and designing augmented objects | Design a Baroque style for an existing environment. |
| 7 | Artrage | Painting images | Draft images, insert colors to make a stained glass design from the Gothic period. |
| 8 | Photoshop touch | Cutting images and separating layers of objects | Geographic image analysis in Medieval period. |

1.3. Classroom environment

Seven to eight students were divided into four groups. Each group had a table that had an LCD television with Apple TV. A camera recorded both the students and the screens on the televisions. All students were equipped with a tablet (one tablet per student, for a total of 30 tablets) containing eleven apps. They were allowed to take the tablets home to continue their studies. The classroom was decorated with images from the augmented reality app called 'Aurasma'. The images were overlaid with information, 2D graphics and 3D objects to enhance the learning experience.

1.4. Objectives

The aim of this research was to examine the effectiveness of using the flipped approach and relevant technologies in the classroom, including:

- To investigate how the flipped classroom improves students' competencies and learning outcomes
- To investigate which types of learning techniques are the most effective for students, including assessing the results of note taking from ebooks, videos, and instructor's lectures.



Figure 2. Classroom environment

2. Method

Thirty freshmen who failed the History of Art were recruited and tested in a usability testing lab with one-way mirror. They were interviewed and completed a pre-test before the class began. All homework assignments were submitted online through social media networks like Facebook. All activities in the classroom were recorded with eight surveillance cameras.

Both summative and formative assessments were undertaken. The summative assessment was carried out by asking students to use the 'eclicker' app to answer 20 multiple-choice questions. Students were requested to do a pre-test before the course started, and they took a post-test at the end of the course. After the course ended, questionnaires were distributed to students in order to

understand students' learning experiences. For the formative assessment, students had to submit their work on-line and received feedback from instructors. The assessment included blogging assignments and video reflections. At the end of the course, students filled out a questionnaire to give feedback.

4. Results

The results have been collected into both summative and formative results.

4.1. Summative results

A paired-sample t-test was conducted to compare the pre-tests and post-tests. There was a significant difference in the scores for pre-test ($M=54$, $SD=10.53$) and post-test ($M=64.83$, $SD=9.78$); $t(29) = -4.92$, $p = 0.000$. This result suggests that the flipped classroom affected examination scores. The mean of the post-tests is higher than that of the pre-tests. The exam scores improved by 16.70% and 90% of students passed the examination. It is astonishing that students learned and remembered information through the class activities and through their own inquiries. From the questionnaire, 66% of students rated this class interesting when compared with the previous classroom.

4.2. Formative results

The formative results described in this paper are from students' feedback and outcomes of students' work according to Bloom's taxonomy.

4.2.1. Students' feedback from questionnaires

Nine questions were used to ask students' opinions after the course finished.

q-1. Please rate the difficulty level of using tablets as learning tools.

Students rate very difficult (0%), difficult (37.93%), neutral (20.69%), easy to use (27.59%) and very easy (13.79%).

q-2. Please rate how the tablet helps you to better understand course material.

Not at all (3.45%), not really (62%), undecided (24.14%), somewhat (6.9%) and very much (3.45%).

q-3. Experience of using tablet for presentations.

Very good (10.34%), good (51.72%), neutral (34.48%), and bad (3.45%).

q-4. How useful was it to use the central display screen for doing the critical thinking skills activities with your friends?

Very useful (13.79%), useful (62.07%), neutral (24.14%), useless (0%) and very useless (0%).

q-5. Does eclicker (polling) help you to participate in the class?

Strongly agree (10.34%), agree (48.28%), neither (27.59%), disagree (13.79%), and strongly disagree (0%).

q-6. Which type of media do you prefer for note taking?

Teacher's talk (13.79%), video annotation (41.38%), presentation slide (34.48%), and ebook (10.34%)

q-7. Which app is the most useful during your studies? Please rank the order of importance from 1 to 7, where 1 is the most important and 7 is least important to you.

1. Notability, 2. iAnnotation, 3. Scribdeo,
4. Photoshop Touch, 5. Aurasma, 6. Artrage,
7. 360 cities

q-8. Does learning through tablets and social media increase when experienced with friends and instructors?

Very much (37.93%), more (34.48%), neutral (10.34%), little (10.34%), not at all (0%)

q-9. Tablets and social media help you in which way?

Content (20%), guidance (6.67%), consult (6.67%), learning (20%) and thinking (46.67%).

The first question shows that most students have less experience using tablets and apps. Some of them have tablets but never used them for studying before. As the responses to the second question illustrate, they agree that tablets help them to understand the course material. The third question shows that half of the respondents had good experiences when using tablets for presentations. Similarly, in the fourth question, students felt that the central display screen was useful for practicing critical thinking skills. For the fifth question, students agreed that the eclicker helped them engage with the activities and assessed whether students understood the content. For the sixth question, students preferred to take notes using video media, followed by presentation slides. Responses to the ninth question demonstrate that students preferred the 'Notability' app for writing on-line reports, followed by 'iAnnotation,' which can be used for reading and note taking. As the feedback shows, students preferred apps that they used frequently as opposed to apps that offered more compelling user experiences, such as Aurasma, Artrage and 360 cities. For the eighth and ninth questions, students agreed that tablets increased engagement with instructors through the use of social media platforms such as Facebook. Finally, tablets impacted and increased students' level of thinking skills over other abilities.

4.2.2. Remembering and Understanding

Figure 3 shows an example of notes that a student took using the app iAnnotation. Students were assigned to read a chapter and make annotations by writing or drawing. In this instance, the student highlighted and drew a causal relationship between the text and external images in an ebook. This example exemplifies how students can learn independently after they have read the material. The annotations increase levels of remembering and understanding according to Bloom's taxonomy.

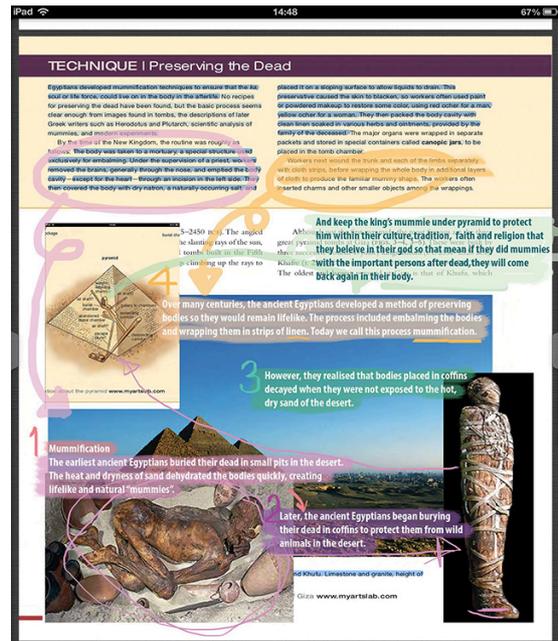


Figure 3. Note-taking from ebooks.

4.2.3. Applying

Figure 4 presents an example of a student's work on a tablet. Students were assigned to decorate the existing environment with Baroque-style influences. The previous style of this church was the Roman style (Fig. 4a), and the student overlaid the Baroque columns (Fig. 4b). This exercise shows that students can apply knowledge that they learned in class. They are enthusiastic about use mobile devices outside of class.



Figure 4. (a) Existing church and (b) Augmented columns in Baroque style

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