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Teaching arrangements

Professor Chan planned to implement flipped classroom methods in two stages. In the first stage, students' self-learning with the support of e-learning tools was integrated into the teaching in a course for undergraduates, ENGG2430A Probability and Statistics for Engineers, in the second semester of 2014-15. This implementation was evaluated in late May 2015. In the second stage, Prof. Chan will adjust teaching strategies based on the evaluation of stage one, and then design more teaching activities for the flipped classroom strategy.

Description

The first-step of implementation was featured as follows. Lectures in the classroom were video-recorded and posted on YouTube for students' review after class. Multiple e-learning tools were used with the following purposes: to provide plenty of online exercises, to assign homework, and to record student participation. The e-learning tools served teaching and learning in the following ways.
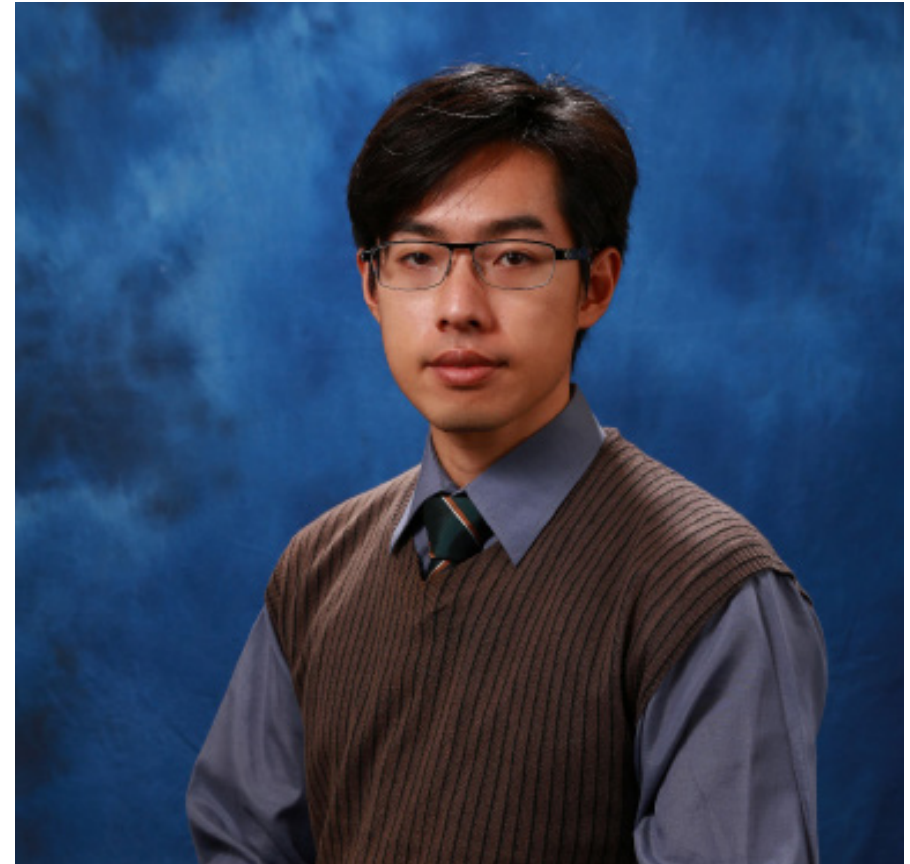
Student Self-learning with e-Learning Tools in a Flipped Classroom Environment

ALEKS

- Online homework was issued easily with links to worked example and specific section of an integrated e-book.

- Adaptive self-learning mode was available for students to do more practice questions appropriate to their knowledge background.

- Students' answers to the assigned problems were automatically graded with detailed statistics on common mistakes and time spent.

SAGE interact

- Interactive demonstrations for exercises were created with SAGE math engine.

- The parameters and code of mathematical concepts in the exercises could be changed easily, therefore students could learn more thoroughly by doing more exercises.

OneNote

- Syllabus, lecture notes (including the teacher's handwritten notes), videos, and homework were kept on this platform so students could access them easily.

- The teacher's handwritten notes were synchronized near real-time to students' mobile via this platform, thus students could read the most updated notes conveniently anytime.

- The handwritten notes were saved and recorded as screencasts, thus replacing the whiteboard.

Moodle STACK

- A question bank was created and maintained by the teacher in order to provide students with various types of exercises.

- Students' exercises were graded automatically using symbolic computation engine capable of doing algebra and calculus.

Students' feedback

In order to obtain the feedback on students' self-learning experience using the e-learning tools in a flipped classroom environment, an online survey was conducted in May 2015. The survey showed that half of the respondents were satisfied with the learning using the e-learning tools. Meanwhile, the survey indicated that students' learning experiences were polarized. The feedback in detail is as follows.
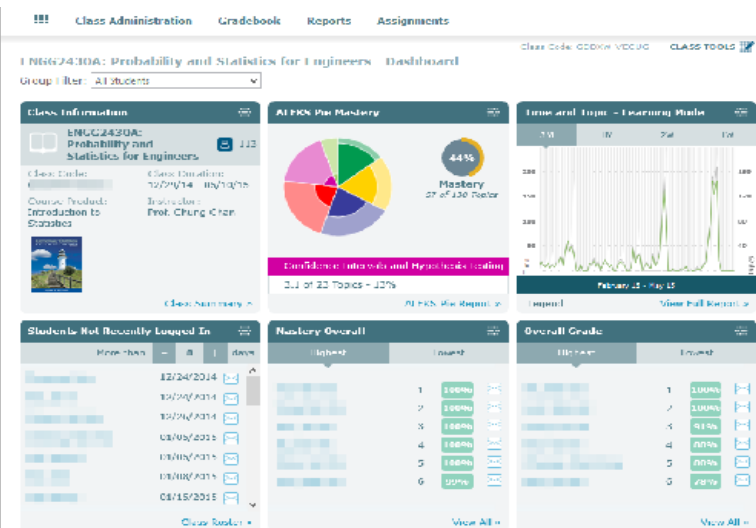
Advantages

1. The majority of respondents agreed that the e-learning tools were helpful to their learning. Around 67% of the respondents agreed with "to a moderate extent and above", when answering the question "To what extent do you feel that the online platform had explained the problems and concepts clearly and easily for understanding?"

2. Students liked the e-learning tools because the tools provided plenty of exercises as well as explanations to each exercise. "ALEKS provides well-designed simple homework and detailed explanations. Students curious about advanced knowledge could ask questions through Piazza", they remarked.

3. The majority of respondents agreed that the e-learning tools motivated independent learning. In total 83% of the respondents selected "To some extent" and "To a moderate extent" when answering the question "To what extent do you feel that the online platform has motivated/encouraged you to do more independent learning?"

4. The majority of respondents preferred the learning supported by the e-learning tools. Around 67% of respondents selected "to a moderate extent and above", when answering the question "To what extent do you feel that you performed better in this course than you would have if you didn't have access to the online platform?"

Disadvantages

1. Learning using the e-learning tools required students to take strong initiative. For example, students needed to manage the learning platform, to control their learning process, and to seek solutions for overcoming the difficulties confronted.

2. The e-learning tools were not user-friendly so students claimed that they spent a lot of time getting familiar with the tools.

3. Some students thought ALEKS did not explain the concepts clearly or systematically. Therefore, they had to look for learning materials other than those provided by this course.

4. Contents on ALEKS were not consistent with the contents taught in the classroom. According to students, the terms used in ALEKS were not the same as those taught by the teacher; and the examples were not related to the questions in final examinations.

Improvements

1. Revising online learning materials to fit the classroom teaching will help both teaching and learning. For example, questions on ALEKS should be more difficult or more relevant to the final examination.

2. More guidelines on how to use the e-learning tools will help students to save time during the learning.