THE CHINESE UNIVERSITY OF HONG KONG

Micro-Module Courseware Development Grant

Final Report (August 2015)

Report due 31 August 2015.
Please return by email to The Ad hoc Committee on Planning of eLearning Infrastructure
mmcd@cuhk.edu.hk

PART I

Project title: Micro-modules for Engineering Mathematics

Principal supervisor: Prof. Sidharth Jaggi

Co-supervisor(s): N/A

Department / Unit: Department of Information Engineering

Project duration: From January 2015 to August 2015 (extended and also used for the semester Sept 2015-Dec 2015 with permission from the MMCD committee)

Date report submitted:

1. Project objectives

Is the project on track to meet its objectives?
Have the objectives been changed as a result of the experience of working on your MMCDG project?

The project was successful in meeting its primary objectives, namely:
* Increasing student engagement and performance in the Engineering Mathematics classes it was used for
* Suggesting pathways for improvement in Flipped Classroom teaching.

While the high-level objectives remained unchanged, specific tactics to achieve them changed, based on feedback during teaching. Specifically, using student helpers to create interactive exercises for students to build intuition on mathematical concepts turned out to be a more useful use of resources (rather than shooting videos, which was done more effectively by the course instructor (myself) quickly using publicly available tools)

2. Process, outcomes or deliverables

1

Please specify the number of micro modules produced, and the course(s) (with course codes and titles) that have used the micro modules in Part IV, and provide more detailed descriptions in here.
Have the nature of the deliverables been changed?
Have you adjusted your timeline?
Overall, was the project completed satisfactorily?

The resources were used for ENGG1410 (Engineering Mathematics I) and ENGG2420 (Engineering Mathematics II), to produce STACK modules. These are interactive modules for students to practice mathematical concepts (such as contour integrals) – the system interprets complex symbolic inputs, and evaluates mathematical expressions as a function of such inputs. This enables for quite intricate exercises to be designed, with a fairly large scope for Teaching and Learning opportunities.

The timeline was indeed adjusted – after trying out a first version of some of these ideas in a flipped classroom setting (ENGG1410), an iterated version of these ideas was tried out in ENGG2420.

Generally speaking, based on student learning outcomes (as measured by student grades) and student feedback (see below), I think it is safe to conclude that the objectives have been met.

3. Evaluation Plan

Have you altered your evaluation plans?
What monitoring data did you collect?
Does your evaluation indicate that you have achieved your objectives?

The evaluation plans were not altered significantly.

Evaluations:
* Students were asked on a per-class basis what they thought of that particular lecture.
* CLEAR helped evaluate the class via interviews/focus groups, and surveys (<u>please see attached CLEAR report</u>)

The evaluations indicated student satisfaction with various aspects of the flipped classroom modality, and also areas in which the experience could be improved (see CLEAR report for details).

4. Dissemination, diffusion and impact

Please provide examples of dissemination: website, presentations in workshops or conferences, or publications.

- **Was invited to speak at an interuniversity workshop on flipped classrooms organized by CLEAR.**

- **Am a featured instructor on CLEAR's flipped classroom website**

    http://flipped.mcuhk.com/

    http://flipped.mcuhk.com/teachers/09sidharth_jaggi.pdf

Please provide examples of diffusion: how the project results/process/outcomes/deliverables being used in your unit and other parts of CUHK or other institutions?

Same as above.

Please provide examples of impact: how the project results (micro modules) can be adapted to other disciplines.

STACK micromodules are a fairly powerful way of allowing for interactive exercises to be programmed for students. Especially in more mathematically courses, since the backend of STACK is a freeware version of MATHEMATICA, the software is capable of interpreting complex symbolic inputs, and evaluating mathematical expressions as a function of such inputs. This enables for quite intricate exercises to be designed, with a fairly large scope for Teaching and Learning opportunities.

PART II
Financial data

Funds available:

Funds awarded from MMCDG	$	
Funds secured from other sources	$	-
(please specify_____)		
Total:	$	

Expenditure:

Item	Budget as per application	Expenditure	Balance
Total:			

PART III

Lessons learnt from the project

Please describe your way forward.

Please describe any of the following item(s) accordingly:

- *Key success factors, if any*
  - o **While the technical support provided by micromodules/STACK exercices, etc was important, the biggest factor contributing to improved learning outcomes, I think, was the social engineering accompanying the teaching and learning exercices, ensuring that students talked to and interacted with each other both inside and outside the classroom. As two examples:**
    - ▪ **Group-based problem solving in class,**
    - ▪ **Inviting students to come to the lectern and provide their solutions in their native language.**
- *Difficulties encountered and remedial actions taken, if any*
  - o **Students initially (especially in first offering) fairly reluctant to sign on to flipped-classroom modality. The Faculty of Engineering was quite supportive, and by the second offering students were more comfortable with the mode of teaching.**
- *The role of other units in providing support, if any*
  - o **CLEAR played an integral role in providing support (both in terms of suggestions on how to structure the flipped classroom setting, and in evaluating performance).**
- *Suggestions to CUHK, if any*
  - o **I think Prof. Irwin King in the FoE is providing sterling leadership in innovative teaching methods, be they flipped classrooms, micromodules, the use of technology (hardware and software), etc, and is worth serving as a template for the whole university.**

PART IV

Information for public access

Summary information and brief write-ups of individual projects will be uploaded to a publicly

accessible CUHK MMCDG website. Please extract from Part I the relevant information to facilitate the compilation of the publicly accessible website and reports.

1. Keywords

Please provide five keywords (in the order of most relevant to your project to least relevant) to describe your micro-modules/pedagogies adopted.

(Most relevant)   Keyword 1: Flipped classroom

Keyword 2: Interactive software

Keyword 3: STACK modules

Keyword 4: Short online videos

(Least relevant)   Keyword 5: Per-lecture feedback

2. Summary

Please provide information, if any, in the following tables, <u>and provide the details in Part I</u>.

Table 1: Publicly accessible online resources (if any)
(a) **Project website:**   *If a publicly accessible project website has been constructed, please provide the URL.*   **N/A**
(b) **Webpage(s):**   *If information of your project is summarized in a webpage (say a page in the department's or faculty's website), please provide the URL(s) in here.*   *http://flipped.mcuhk.com/*   *http://flipped.mcuhk.com/teachers/09sidharth_jaggi.pdf*
(c) **Others (please specify):**

Table 2: Resource accessible to a target group of students (if any)			
If resources (eg. software) have been developed for a target group of students (eg. in a course, in a department) to gain access through specific platforms (eg. Blackboard, facebook), please specify.			
<u>Course Code/ Target Students</u>	<u>Term & Year of offering</u>	<u>Approximate No. of students</u>	<u>Platform</u>
Eg1. Faculty of Engineering,	*1st term 2015-16*	*50*	*Moodle*

ENGG2420C			(STACK Modules)

Table 3: Presentation (if any)	
Please classify each of the (oral/poster) presentations into one and only one of the following categories	**Number**
(a) In workshop/retreat within your unit (eg. department, faculty)	*1*
(b) In workshop/retreat organized for CUHK teachers (eg. CLEAR workshop, workshop organized by other CUHK units)	*Please insert no*
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	*1*
(d) In any other event held in HK (eg. UGC symposium, talks delivered to units of other institutions)	*Please insert no*
(e) In international conference	*Please insert no*
(f) Others (please specify)	*Please insert no*

Table 4: Publication (if any)	
Please classify each piece of publications into one and only one of the following categories	**Number**
(a) Project CD/DVD	*Please insert no*
(b) Project leaflet	*Please insert no*
(c) Project booklet	*Please insert no*
(d) A section/chapter in a booklet/ book distributed to a limited group of audience	*Please insert no*
(e) Conference proceeding	*Please insert no*
(f) A chapter in a book accessible internationally	*Please insert no*
(g) A paper in an referred journal	*Please insert no*
(h) Others (please specify)	*Please insert no*

3. A one-page brief write up

Please provide a one-page brief write-up of no more than 500 words or a short video (~2 minutes) (preferred).

This project focused on using Micromodules for Engineering Mathematics courses, in a flipped class environment.

Process:

- **The instructor shot videos (typically <10 minutes long) highlighting key concepts/examples to be taught over the next week,**

- **With helpers the instructor created STACK/Moodle interactive online exercises for students to practice some of the applications of these concepts**

- **The instructor created worksheets to be used for in-class exercises.**

  Pre-class: Students were expected to watch videos for the upcoming week's lectures. These videos had both concepts, and examples of applications of these concepts. They were also expected to attempt some STACK exercises about these concepts.

  In class:

  The instructor began each class with a quick review of key concepts and examples. In-class exercise sheets were then handed out.

  In-class exercises comprised of group-work, in groups of three. Student groups were given 2-3 problems to solve in class, while the instructor and TAs walked around and were available to help individual student groups. Each student in each group was expected to write down their solution. Student groups were then graded by selecting a random student from each group to be graded, and the entire group was given the grade of this student – this scoring mechanism was intended to encourage student interaction (each group was seeded with at least one relatively strong student).

  After class: After each class, students were asked to give feedback about their learning experience in that class, and also give a numerical score for that class. While this feedback was anonymous, in the beginning of each semester each student chose a secret ID that they used to give feedback throughout the semester, allowing for longitudinal tracking of student feedback throughout the semester. The instructor attempted to address each issue raised in the anonymous feedback, or explain why it was not possible.

  Online support: Piazza was used as an online Teaching & Learning feedback platform, to allow materials to be posted, and students to ask questions about specific topics. Challenging questions about the week's materials were also posted on Piazza, to challenge advanced students to gain a deeper understanding of the material.

  Evaluation: Besides the per-class feedback, the instructor also solicited support from CLEAR to help evaluate the effectiveness of the teaching modality. Findings from CLEAR are incorporated in the attached report.

ENGG 2420C Complex Analysis and Differential Equations for Engineers

<u>Flipped Classroom Survey Report</u>

The Centre for Learning Enhancement And Research (CLEAR) at the Chinese University of Hong Kong conducted this survey based on questionnaire and phone interview to understand student engagement and study motives in the flipped classroom of ENGG 2420C Engineering Mathematics II.

The questionnaire (see **Appendix A**) is divided into two parts: <u>Part A</u> asks students to rate their agreement on a 7-point Likert scale, aiming to understand students' perceptions of flipped classroom (QA1-3)[1], deep motives (QA4-6) and surface motives (QA7-9)[2], epistemological beliefs (QA10-11)[3], students' self-reported independent learning (QA12), satisfaction (QA13) and their willingness to have the flipped classroom method used in future (QA14). <u>Part B</u> explores topics such as students' cultural background (QB1), time input (QB2-3), difficulties (QB4), enjoyments (QB5) and any other comments (QB6).

The questionnaire survey was administered by CLEAR researchers during class break on 23rd November 2015. Students were informed that participation was voluntary and anonymous. A total of 17 questionnaires were obtained among 28 students. As such, response rate was 61%. Survey results were analyzed with SPSS.

Two rounds of telephone interviews were conducted. One round was in the middle and the other was at the end of the semester (see interview questions in **Appendix B**). Anonymous student interviewees were selected by random sampling. Three students were individually interviewed in both rounds. The phone interviews were conducted in Cantonese and each lasted around 30 minutes. Interview summaries were written down by two researchers immediately after the interviews.

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[1] Gilboy et al. 2015. "Enhancing Student Engagement Using the Flipped Classroom". *Journal of Nutrition Education and Behavior* 47(1): 109-114.
[2] Biggs, J., Kember, D, and Leung Y. P. 2001. "The Revised Two-Factor Study Process Questionnaire: R-SPQ-2F". *British Journal of Educational Psychology* 71: 133-149.
[3] Bråten, I. and Strømsø, H. I. 2005. "The relationship between epistemological beliefs, implicit theories of intelligence, and self-regulated learning among Norwegian post-secondary students". *British Journal of Educational Psychology* 75, 539–565.

1. Part A Survey Results

1.1. Perceptions of Flipped Classroom

In QA1-3, students expressed their perceptions towards their flipped classroom experiences (see Table 1 for a summary of questionnaire results of part A). 35 % of the students indicated that they liked studying the pre-lecture materials than having straight lectures (affirmative response including slightly agree, agree and strongly agree) (M=4.18, SD=1.70). 71% of the students liked to participate in the in-class learning activities than to have the professor giving lecture (M=4.82, SD=1.67). 59% of the students agreed that pre-lecture materials enabled them to understand the course content more effectively than lectures alone (M=4.47, SD=2.04).

1.2. Learning Motives

In this section, students' learning motives are categorized into deep motive (QA4-6) and surface motive (QA7-9). These questions assess if students are motivated to engage cognitively in the course.

In terms of deep motive, 47% of the students believed they worked hard at their studies because they found the course material interesting (M=4.53, SD=1.33). On the other hand, 53% of the students indicated that they came to the class with questions in mind (M=4.24, SD=1.48). 59% of the students felt that virtually any topic can be highly interesting once they get into it (M=4.65, SD=1.54).

In terms of surface motive, only 29% of the students agreed that they aimed to pass this course while doing as little work as possible (M=3.53, SD=1.51). 18% of the students indicated they saw no point in learning material that was unlikely to appear in the examination (M=3.41, SD=1.06). 6% of the students indicated it was not helpful to study topics in depth (M=2.94, SD=1.35).

As such, it seems that students displayed higher deep motives than surface motives. Most students seemed to want to learn the course content in depth.

1.3. Knowledge Construction

This section aims at students' epistemological beliefs about how knowledge is constructed and whether they critically process the knowledge.

41% of the students agreed that they liked thinking about issues that authorities can't agree on (M=4.71, SD=1.05). 71% of the students agreed that they would try their best to combine information across chapters or classes (M=5.12, SD=1.11). As a result, the majority of the students seemed to hold relatively mature views that knowledge was actively constructed and constant evolving, rather than given and stable.

1.4. Independent Learning

59% of students agreed that they study more independently in flipped classroom than in traditional teaching (M=4.76, SD=1.68).

1.5. Satisfaction and Willingness to Recommend Flipped Classroom

41% of students were satisfied with their flipped classroom experience (M=4.35, SD=1.62). 41% of students would recommend the teacher to keep using flipped classroom (M=4.29, SD=1.57).

Table 1   Part A Descriptive Statistics

Questionnaire Item	Mean	SD	Percentage of 5 (slightly agree) to 7 (strongly agree)
QA1. I like to study the pre-lecture materials (notes/ videos etc.) rather than having straight lectures.	4.18	1.70	35%
QA2. I like to participate in the in-class learning activities than to have the professor giving lectures.	4.82	1.67	71%
QA3. Pre-lecture materials enable me to understand the course content more effectively than lectures alone.	4.47	2.04	59%
QA4. I work hard at my studies because I find the course material interesting.	4.53	1.33	47%
QA5. I come to the class with questions in mind that I want answering.	4.24	1.48	53%
QA6. I feel that virtually any topic can be highly interesting once I get into it.	4.65	1.54	59%
QA7. My aim is to pass this course while doing as little work as possible.	3.53	1.51	29%
QA8. I see no point in learning material which is not likely to be in the examination.	3.41	1.06	18%
QA9. I find it is not helpful to study topics in depth. It confuses me and wastes time, when all you need is a passing acquaintance with topics.	2.94	1.35	6%
QA10. I find it refreshing to think about issues that authorities can't agree on.	4.71	1.05	41%
QA11. I try my best to combine information across chapters or even across classes.	5.12	1.11	71%
QA12. I study more independently in flipped classroom than in traditional teaching.	4.76	1.68	59%
QA13. In general, I am satisfied with my flipped classroom experience in this course.	4.35	1.62	41%
QA14. I would recommend the teacher to keep using flipped classroom in future.	4.29	1.57	41%

2.   Part B Survey Results

The Part B survey results show that among 17 surveyed students, 15 are locals, 1 is from mainland China and 1 is from South Korea.

Most students spent around 2 hours on pre-class preparation (see Figure below). On average, surveyed students spent 2.43 hours preparing and their expected time spent was about the same (M=2.59).

Figure   Actual and Reasonable Time to Be Spent on Pre-Class Preparation per Week
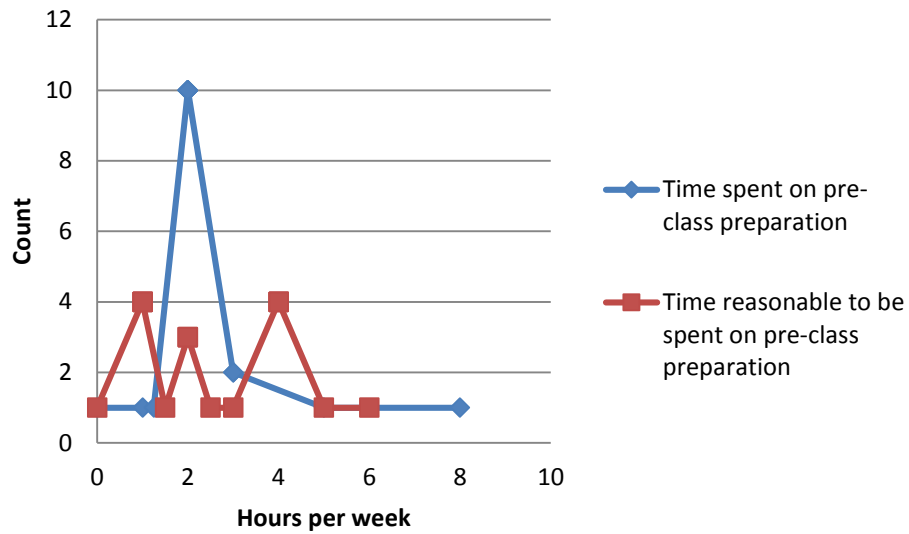
In addition, students wrote down the following difficulties they encountered in flipped classroom.

Difficulties in pre-class preparation

Understanding	–	I may not fully understand the topics just by watching videos.
	–	I don't really know how to learn some calculations. It's hard to understand the topics and there are a lot of learn each time.
	–	I can't understand some topics even though I have finished watching everything.
Time management and workload	–	Sometimes I couldn't prepare for class because of mid-term.
	–	Sometimes I don't have the time to watch all the videos.
	–	There are too many videos sometimes. I may not have the time to finish.
	–	Don't have enough time.
	–	Too many videos to watch.
	–	Accent, lack of time.
Others	–	Getting the feedback is a slow process and it is hard to estimate how much knowledge is required.

Difficulties in in-class activities

Understanding	–	No clarification of problem.
	–	I only do calculations. I cannot understand all content completely.
	–	Sometimes I don't understand the exercise topic.
	–	It's hard to understand all the exercises in class.
Others	–	There's some gap between my preparation and teacher's requirement.
	–	Too many exercises to do. Sometimes I need to do them after class. The workload is more than homework.
	–	The exercises are sometimes too hard.
	–	The in-class exercise during the middle of semester is more difficult. I prefer to have one or two easy questions to understand how to solve the harder questions.
	–	I hope there is more lecturing.
	–	Fewer tutors answer to my questions. I need more time.

Some students also wrote down their comments on what they enjoyed the most in flipped classroom:

- I understand the course content more in class.
- The class is relaxing.
- I can have the chance to present my answers in every class.
- I can learn the content before class. Large amount of exercises can help me understand the content more.
- There are more opportunities to talk to the teacher.
- The tutor and lecturer can explain topics one by one.

Some students gave some further comments and suggestions:

- The class exercises can be reduced to 2-3 in the double lesson and 2-3 in single lesson. Because they take much time and I need to do the extra lesson exercise at home.
- I hope the teaching model can be abolished.
- I cannot follow the class progress.

3. Correlation between Variables

Correlation among 8 variables are analyzed in this section; average numbers are used for

variables which have more than one test items (Cronbach's alpha α provided)[4]. This study selects 3 variables to conduct correlation analysis: (1) students' perception of flipped classroom; (2) independent learning; (3) satisfaction. Correlation analysis is done separately between these variables with 5 other variables, including deep motive, surface motive, knowledge construction, time actually spent on pre-class preparation, and time reasonable to be spent on pre-class preparation.

1.6. Students' Perception of Flipped Classroom

There is a significant positive correlation (r=0.62) between students' perception of flipped classroom and deep motive (see Table 3). Students who are motivated to learn the course in depth seem to tend to have positive views towards their flipped classroom experience.

Table 3　　Pearson Correlation between Perception of Flipped Classroom and Other Variables

Variables	Correlation with Perception of Flipped Classroom
Deep motive	.62**
Surface motive	.10
Knowledge construction	.21
Time actually spent on pre-class preparation	-.03
Time reasonable to be spent on pre-class preparation	.01

** Correlation is significant at the 0.01 level (2-tailed).

1.7. Independent Learning

A certain correlation may exist between students' self-claimed independent learning and deep motive (r=0.37). However, no significant finding is discovered due to small sample size.

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[4] The variables are: (1) perception of flipped classroom (QA1-3, α=0.71); (2) deep motive (QA4-6, α=0.62); (3)surface motive (QA7-9, α=0.72); (4) knowledge construction (QA10-11, α=0.62); (5) independent learning (QA12); (6) satisfaction (QA13); (7) time actually spent on pre-class preparation (QB2); (8) time reasonable to be spent on pre-class preparation (QB3).

Table 4　Pearson Correlation between Independent Learning and Other Variables

Variables	Correlation with Independent Learning
Deep motive	.37
Surface motive	-.19
Knowledge construction	.28
Time actually spent on pre-class preparation	.09
Time reasonable to be spent on pre-class preparation	-.003

1.8.　Satisfaction

Certain positive correlation is found between students' satisfaction and their deep motive (r=0.53). However, no significant finding is discovered due to small sample size.

Table 5　Pearson Correlation between Satisfaction and Other Variables

Variables	Correlation with Satisfaction
Deep motive	.53[*]
Surface motive	-.15
Knowledge construction	.12
Time actually spent on pre-class preparation	-.09
Time reasonable to be spent on pre-class preparation	-.20

* Correlation is significant at the 0.05 level (2-tailed).

4.　Telephone Interview Results

4.1 Overall Impression on the Approach

Six students were interviewed via telephone in two rounds. Of the six students, four liked flipped classroom teaching and two did not like.

4.2 Pre-Class Preparation

Some students found videos were useful particular used with notes. But some students could not get used to the learning by watching videos. Comparison of the two rounds of interviews shows that students watched fewer videos near the end of the semester.

4.3 In-class Activities

All students agreed that in-class activities were useful to their learning because they could do more exercises, and other students' explanation helped them to understand the knowledge better. But one student said he did not like group study because his group members were always absent from class.

4.4 Changes of Opinions on the Approach

In the interviews near the end of the semester, two students became more positive to the flipped classroom approach after one semester's study because they found they could follow this approach. But the third student became negative to this approach although he liked it at the beginning. The reason was when the content became more difficult, it was more difficult for him to study independently. Now he thought flipped classroom was not suitable for learning brand new knowledge.

4.5 Changes of Learning Attitudes and Behaviors

In the interviews near the end of the semester, two students found their learning attitudes and habits changed after learning in the flipped classroom approach. One student said he spent more time in studying. He was more active and independent in learning. And he was more confident in this subject. The other student said he took more notes. The third student did not experience changes.

4.6 Difficulties Confronted

The second round of interviews shows that students had mainly two difficulties. Firstly, learning by watching videos was very difficult for some students, particularly when the content became more difficult in the latter part of the semester. Secondly, it is difficult for students to understand the teacher's English at the beginning of the semester. But students admitted that they overcame this problem as time went by.

4.7 Suggestions

In the second round of interviews, one student wanted the teacher not to push students to watch videos. He said he omitted videos because he could understand the contents without watching videos. One student suggested the teacher to provide more exercises with standard answers online. And the last student suggested the teacher to give the sheets of exercises back to

students after class and tutorials, so that students can review and double check.

Meanwhile, Students thought the functions of Moodle were not easy or convenient to use. Thus one student admitted that he did not use Moodle at all. Two students thought bonus marks were too little to affect GPA, although the bonus may stimulate them to engage more in class sometimes.

5.   Summary

–   Around half of the students reflect positive perception and satisfaction about their flipped classroom experiences. They also seem to display higher deep motives than surface motives, as well as hold relatively mature learning attitude in processing knowledge in this course. Slightly less than half of the students would recommend the teacher to continue to use flipped classroom teaching method.
–   In terms of difficulties, some students had problems understanding some of the pre-class materials and having enough time to go over all the videos. Some students also indicated that there the class exercises could be difficult and time consuming.
–   Correlation analysis shows that students who are motivated to learn the course in depth seem to be more likely to enjoy the flipped classroom experience.

–   The two rounds of telephone interviews show that more than half of the students are positive to the flipped classroom approach. Students benefit most from the approach by doing more exercises and by more interaction with the teachers in class. Most students watched videos at the beginning of the semester, but they could not insist until the end. The most difficult part for some students is they cannot get used to the learning by watching videos alone, particularly when the subject was difficult.

Appendix A Questionnaire Sample

Flipped Classroom Questionnaire

Student Engagement and Study Motives

The Centre for Learning Enhancement And Research (CLEAR) at CUHK is conducting a survey on student engagement and study motives in flipped classroom.

We hope you can spend about 5 minutes to fill out this form based on your own experience.

Your anonymity and confidentiality will be preserved.

Part A: Please indicate the extent to which you agree or disagree with the following statements by putting a ✓ in the appropriate box.

		Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
1	I like to study the pre-lecture materials (notes/ videos etc.) rather than having straight lectures.	☐	☐	☐	☐	☐	☐	☐
2	I like to participate in the in-class learning activities than to have the professor giving lectures.	☐	☐	☐	☐	☐	☐	☐
3	Pre-lecture materials enable me to understand the course content more effectively than lectures alone.	☐	☐	☐	☐	☐	☐	☐
4	I work hard at my studies because I find the course material interesting.	☐	☐	☐	☐	☐	☐	☐
5	I come to the class with questions in mind that I want answering.	☐	☐	☐	☐	☐	☐	☐
6	I feel that virtually any topic can be highly interesting once I get into it.	☐	☐	☐	☐	☐	☐	☐
7	My aim is to pass this course while doing as little work as possible.	☐	☐	☐	☐	☐	☐	☐
8	I see no point in learning material which is not likely to be in the examination.	☐	☐	☐	☐	☐	☐	☐
9	I find it is not helpful to study topics in depth. It confuses me and wastes time, when all you need is a passing acquaintance with topics.	☐	☐	☐	☐	☐	☐	☐
10	I find it refreshing to think about issues that authorities can't agree on.	☐	☐	☐	☐	☐	☐	☐

	Strongly Disagree	Disagree	Slightly Disagree	Neutral	Slightly Agree	Agree	Strongly Agree
11 I try my best to combine information across chapters or even across classes.	☐	☐	☐	☐	☐	☐	☐
12 I study more independently in flipped classroom than traditional teaching.	☐	☐	☐	☐	☐	☐	☐
13 In general, I am satisfied with my flipped classroom experience in this course.	☐	☐	☐	☐	☐	☐	☐
14 I would recommend the teacher to keep using flipped classroom in future.	☐	☐	☐	☐	☐	☐	☐

Part B: Please fill in answers that most appropriately describe your situation.

1. What is your cultural background?

   ☐   Local   ☐   Mainland   ☐   International (Please specify district): _____

2. How much time <u>did you spend</u> on pre-class preparation (notes/ videos etc.)?   ___ Hours

3. How much time <u>is reasonable</u> for you to spend on pre-class preparation?   ___ Hours

4. What difficulties did you encounter during the flipped classroom? Please list your **reasons**.

   Pre-class preparation: _____

   In-class activities: _____

   Others: _____

5. What do you enjoy in flipped classroom the most?

   _____

   _____

6. Any other comments?

   _____

- Thank You –

Appendix B Phone Interview Questions

Interview Questions:

1. Why did you choose this course session?

2. What is your overall impression of the flipped classroom?

3. What do you think about the online videos?

4. What do you think about the in-class activities?

5. Compared to the beginning of the semester, have your perceptions about flipped classroom changed? (In the second round only)

6. Compared to the beginning of the semester, have your learning attitude and behavior changed? (In the second round only)

7. What difficulties have you encountered?

8. Do you have any suggestion about the course teaching?