

**THE CHINESE UNIVERSITY OF HONG KONG**

**Micro-Module Courseware Development Grant**

**Scheme 1: Basic Scheme**

**Final Report (2016-17)**

Report due 30 April 2018

Please return by email to The Ad hoc Committee on Planning of eLearning Infrastructure  
[mmcd@cuhk.edu.hk](mailto:mmcd@cuhk.edu.hk)

**PART I**

Project title: Using Flipped Classroom to Enhance Interactive Teaching and Learning in  
Advanced Topics in Biological Electron Microscopy and Live Cell Imaging

Principal supervisor: Prof. Jiang Liwen

Co-supervisor(s): Prof. Kang Byung-ho

Department / Unit: School of Life Sciences

Project duration: From May 2017 to April 2018

Date report submitted: 30 April 2018

**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 objective is to develop micro-modules on biological electron microscopy and live cell imaging to facilitate students' out-of-class learning, as well as to reinforce students' knowledge and interest in the topics.

The project follows its objectives. 8 Micro-modules (a total of 22 videos) regarding theories and proper procedures of operating the biological electron microscopy and live cell imaging systems have been produced by Prof. Jiang, Prof. Kang and their postgraduates successfully to meet the objectives. The micro-modules were the same as the original plan and the videos have been uploaded to website for students' self-learning, which have been put into use for teaching the course LSCI5012 in September 2017 for the first time.

## 2. Process, outcomes or deliverables

*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 here. Must specify duration of each micro-modules (in terms of students online contact hours), total duration time of all deliverables and style. (With reference to the “Summary of video presentation styles” developed by CLEAR)*

*Has the nature of the deliverables been changed?*

*Have you adjusted your timeline?*

*Overall, was the project completed satisfactorily?*

In the project, we aim to produce two sets of micro-modules. Set A contains 2 micro modules that focus on the theories of Electron Microscopy and Live Cell Imaging, with examples of research results derived from using the Microscopy techniques. Set B contains 6 micro modules, which displays the sample preparation and proper procedures for operating the Advanced 3D Tomography TEM and advanced live cell imaging system via video-taking of real-time demonstration of experienced researchers.

The micro-modules and the corresponding videos produced in this project are shown below:

No.	Video Title	Duration	Producer
Micro module A1: Theories of advanced Live Cell Imaging			
1	Introduction to live cell imaging	06:59	Prof. Jiang
2	Confocal microscopy I	20:54	Prof. Jiang
3	Confocal microscopy II	23:24	Prof. Jiang
4	Spinning disk confocal and super resolution microscopy, imaging analysis	18:57	Prof. Jiang
Micro module A2. Theories of Electron Microscopy			
5	Sample processing for TEM/ Tomography	1:33:33	Prof. Jiang
6	Cellular Electron Tomography	48:21	Prof. Jiang
Micro module B1: Confocal microscopy, spinning disk confocal microscopy, image analysis and Cryo-EM			
7	Confocal Laser Scanning Platform Basic Imaging	14:27	Prof. Jiang
8	Confocal Laser Scanning FRET and FRAP analysis	17:22	Prof. Jiang
9	Spinning Disk Confocal Microscopy for Four-dimensional Imaging	07:18	Prof. Jiang
10	Single-Molecule Super-Resolution Imaging – SIM	14:02	Prof. Jiang
11	IMARIS Image Visualization and Analysis	07:07	Prof. Jiang
12	Single-particle cryo-electron microscopy (cryo-EM)	08:36	Prof. Jiang
Micro module B2: High pressure freezing, freeze substitution			
13	High Pressure Freezing	05:36	Prof. Kang
Micro module B3: Mounting, trimming, glass knife preparation			

14	Mounting and trimming	06:26	Prof. Kang
15	Making glass knives	04:24	Prof. Kang
Micro module B4: Ultramicrotomy, post-staining			
16	Ultramicrotomy	04:57	Prof. Kang
17	Staining	03:14	Prof. Kang
18	Immunogold labelling	05:50	Prof. Kang
Micro module B5: TEM imaging and image interpretation			
19	Basic TEM operation	05:48	Prof. Kang
Micro module B6: Tomography data collection, tomogram calculation and tomography modeling			
20	Electron tomography	07:26	Prof. Kang
21	Tomogram calculation	29:52	Prof. Kang
22	Installing imod on Mac	03:47	Prof. Kang

In the proposal, we planned to produce Micro-modules A1-2 and B1-2 by October 2017 and completed Micro-modules B3-6 by April 2018. With slight alteration of the original plan, we have completed modules A1 and B1-3 by October 2017. By April 2018, we have finished producing all the 8 micro-modules according to the original schedule and completed the project satisfactorily. A total of 22 videos have been produced for the 8 micro-modules. The videos are complemented with a set of questions including multiple choice, true or false and short discussion questions.

The videos and the related question sets have been uploaded into the CUHK Blackboard online platform. Students taking the course *LSCI5012 Using Flipped Classroom To Enhance Interactive Teaching and Learning in Cell and Molecular Biology* are required to watch the required videos before classes, so as to reinforce students' knowledge and interest in the topics. They were also required to answer the questions after watching the videos and prior to the lectures. Subsequently, the lecture period can be more focused on discussion among students and presentations. The videos were also uploaded to a public-accessible website to share the eLearning resource to other students in CUHK or from other institutions, who are interested in the topics but are not taking the *LSCI5012* course.

### 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?*

We have distributed surveys to the students during the lectures of *LSCI5012 Using Flipped Classroom To Enhance Interactive Teaching and Learning in Cell and Molecular Biology*.

Students reflected that online learning allowed more time for discussion in lecture. They also suggested that the micro modules served as a good learning tool for illustrating the theories and the experimental procedures as they could be watched repeatedly and in flexible time. The evaluation indicated that the project has achieved its objectives effectively and completely.

#### 4. Dissemination, diffusion and impact

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

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

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

The videos and the related question sets have been uploaded CUHK Blackboard online platform for students taking the course *LSCI5012 Using Flipped Classroom To Enhance Interactive Teaching and Learning in Cell and Molecular Biology* to view before classes. The link for Blackboard is:

[https://blackboard.cuhk.edu.hk/ultra/courses/\\_93682\\_1/cl/outline](https://blackboard.cuhk.edu.hk/ultra/courses/_93682_1/cl/outline)

The videos were also uploaded to a public-accessible website to share the eLearning resource to other students in CUHK or from other institutions. The website link is:

<http://www.cuhk.edu.hk/centre/ccdb/mmcd2016-17/>

The work in the project was shared as a Poster in the "Teaching and Learning Innovation Expo 2017" held at CUHK on 7 December 2017. The objective and content in the project were summarized and introduced to the participants via poster presentation.

#### PART II

##### Financial data

Funds available: HK\$90,000

Funds awarded from MMCDG	\$ 90,000
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Funds secured from other sources	\$ 0
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(please specify \_\_\_\_\_)

Total:	\$ 90,000
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Expenditure:

Item	Budget as per application	Expenditure	Balance
RA ( <i>we will try to hire a RA who is knowledgeable in both Microscopy and computer graphic. If not, half of the money will be used for a RA who have experience in Microscopy and another half will be used for an external vendor for computer graphic and animations</i> )	70,000	11,050	58,950
Student helper	10,000	42,258	-32,258
Computer system with software and stationeries	10,000	36,692	-26,692
Total:	90,000	90,000	0

Remarks: We have just received the account statement on April 30. The account is now \$7604 deficit. We will settle the deficit amount as soon as possible.

### 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*
- *Difficulties encountered and remedial actions taken, if any*
- *The role of other units in providing support, if any*
- *Suggestions to CUHK, if any*
  - *Example: what should be done differently?*

We planned to continue producing videos on other topics in Biological Electron Microscopy and Live Cell Imaging. We will continue updating new online lectures and quizzes onto the website which is accessible for both CUHK and non-CUHK students.

We would like to thank the Centre for eLearning Innovation and Technology (ELITE) of CUHK for providing professional support for video recording and editing.

### 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: Live cell imaging  
                                 Keyword 2: Confocal microscopy  
                                 Keyword 3: Transmission electron microscopy (TEM)  
                                 Keyword 4: Cellular electron tomography
- (Least relevant)      Keyword 5: Spinning disk confocal microscopy

## 2. Summary

Please provide information, if any, in the following tables, and provide the details in Part I.

<b>Table 1: Publicly accessible online resources (if any)</b>
<p>(a) <b>Project website:</b> <a href="http://www.cuhk.edu.hk/centre/ccdb/mmcd2016-17/">http://www.cuhk.edu.hk/centre/ccdb/mmcd2016-17/</a> <i>If a publicly accessible project website has been constructed, please provide the URL.</i></p>
<p>(b) <b>Webpage(s):</b> <i>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) here.</i></p>
<p>(c) <b>Tools / Services:</b> <i>If you have used any tools or services for the project, please provide names of the tools or services in here.</i></p>
<p>(d) <b>Pedagogical Uses:</b> <i>If any flipped classroom activities have been conducted, please provide information in here. If relevant, please indicate how your project output can be used to support flipped classroom activities.</i></p> <p>The videos and the related question sets have been uploaded CUHK Blackboard online platform for students taking the course <i>LSCI5012 Using Flipped Classroom To Enhance Interactive Teaching and Learning in Cell and Molecular Biology</i> to view before classes. The link for Blackboard is: <a href="https://blackboard.cuhk.edu.hk/ultra/courses/_93682_1/cl/outline">https://blackboard.cuhk.edu.hk/ultra/courses/_93682_1/cl/outline</a></p>
<p>(c) <b>Others (please specify):</b></p>

<b>Table 2: Resources accessible to a target group of students (if any)</b>
<p><i>If resources (e.g. software) have been developed for a target group of students (e.g. in a</i></p>

course, in a department) to gain access through specific platforms (e.g. Blackboard, facebook), please specify.

<u>Course Code/ Target Students</u>	<u>Term &amp; Year of offering</u>	<u>Approximate No. of students</u>	<u>Platform</u>
<i>Eg1. DEPTXXXX</i>	<i>1<sup>st</sup> term 2017-2018</i>	<i>20</i>	<i>Blackboard</i>
<i>Eg2: Dept of xxxx</i>			
<b>Table 3: Presentation (if any)</b>			
<i>Please classify each of the (oral/poster) presentations into one and only one of the following categories</i>			<b>Number</b>
(a) In workshop/retreat within your unit (e.g. department, faculty)			
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)			
(c) In CUHK ExPo jointly organized by CLEAR and ITSC			<i>1</i>
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)			
(e) In international conference			
(f) Others (please specify)			

<b>Table 4: Publication (if any)</b>	
<i>Please classify each piece of publication into one and only one of the following categories</i>	<b>Number</b>
(a) Project CD/DVD	
(b) Project leaflet	
(c) Project booklet	
(d) A section/chapter in a booklet/ book distributed to a limited group of audience	
(e) Conference proceeding	
(f) A chapter in a book accessible internationally	
(g) A paper in a referred journal	
(h) Others (please specify)	

### **3. A one-page brief write up**

*Please provide a one-page brief write-up of no more than 500 words and a short video.*

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In the project, we have produced two sets of micro-modules. Set A contains 2 micro modules that focus on the theories of Electron Microscopy and Live Cell Imaging, with examples of research results derived from using the Microscopy techniques. Set B contains 6 micro modules, which displays the sample preparation and proper procedures for operating the Advanced 3D Tomography TEM and advanced live cell imaging system via video-taking of real-time demonstration of experienced researchers. A total of 22 videos have been produced for the 8 micro-modules. The videos are complemented with a set of questions including multiple choice, true or false and short discussion questions.

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We have distributed surveys to the students during the lectures of LSCI5012 Using Flipped Classroom To Enhance Interactive Teaching and Learning in Cell and Molecular Biology. Students reflected that online learning allowed more time for discussion in lecture. They also suggested that the micro modules served as a good learning tool for illustrating the theories and the experimental procedures as they could be watched repeatedly and in flexible time. The evaluation indicated that the project has achieved its objectives effectively and completely.