

# 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: Breaking down the barrier: Using micromodules to establish a conceptual framework for learning immunology

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Department / Unit: School of Life Sciences

Project duration: From May 2017 to April 2018

Date report submitted: April 27 2018

#### **1. Project objectives**

The goal of this project was to develop a series of micromodules that introduce basic concepts in immunology to upper-level undergraduate students in a 4000-level immunology course at CUHK. The project sought to move basic course content online as out-of-class learning activities so as to make way for more active and intellectually engaging course content to be introduced during face-to-face lecture periods.

#### **2. Process, outcomes or deliverables**

Five micromodules have been produced in the form of voice-over mini-lectures with PowerPoint slides. They were used for the course, BCHE4060 Basic and Applied Immunology. Two additional micromodules that introduce laboratory techniques commonly used for life science research in the form of lab demonstration was also produced and used for the courses, CMBI3010 Cell and Molecular Biology Laboratory. The theme and duration of each micro-module are as follows:

1. *Cytokine networks (16 min 38 sec)*

- A complex network of soluble factors called cytokines that provide cells with the ability to communicate with one another

2. *The Complement System (22 min 43 sec)*

- A highly evolutionarily-conserved defense system that labels foreign microbial pathogens for destruction

3. *Hypersensitivity (20 min 39 sec)*
  - Classification of the 4 major types of hypersensitivity reactions including allergies
4. *Vaccines Strategies (23 min 32 sec)*
  - Current and newly-developed vaccination strategies and their immunological features
5. *Immunodeficiency (18 min 49 sec)*
  - The cellular and molecular basis of immunodeficiency disorders
6. *Step-by-step Lab Techniques for Life Science Research 1 (7 min 28 sec)*
  - A tutorial on basic animal cell culture techniques that includes sub-culturing, counting and plating cells
7. *Step-by-step Lab Techniques for Life Science Research 2 (4 min 35 sec)*
  - A tutorial on infection and genetic transformation of plant cells by the bacterial pathogen, *Agrobacterium tumefaciens*

Together, these micromodules offered 114 minutes of online contact time for 88 students in the two courses combined in the School of Life Sciences. The micromodules were produced and released on time according to the teaching schedule. They were uploaded to the Panopto video platform linked to the respective course on the CUHK Blackboard eLearning system. Slides used in the micromodules were also uploaded to Blackboard as part of the lecture notes. Announcements were made in class and on Blackboard asking students to watch the micromodule before a certain day of class (usually within 1-2 weeks). Worksheets based on content mentioned in the micromodules were uploaded to Blackboard as supplementary teaching materials to help students construct and consolidate their knowledge better. Answers to the questions on the supplementary worksheets were discussed during face-to-face lecture time after students had watched the micromodules.

These micromodules allow for a blended approach to learning in which students are required to study these online resources on their own. Topics covered in the micromodules represent part of a wider scope of knowledge delivered only during lecture time in the past. Due to time constraints, many topics were touched on superficially without much explanation. With this blended approach, the newly produced micromodules allow students to carry out lower order processing (e.g. learning definitions) prior to class time so that the instructor can utilize the extra face-to-face class time to focus on facilitating students' higher order thinking skills and help them apply their new knowledge in ways that advance their conceptual understanding.

The Panopto platform linked to Blackboard eLearning provides tracking statistics that include the number of views, total and average duration of viewing and identity of the student who viewed the videos. From the tracking statistics, we found that as much as 94% of the students watched the video, indicating a high participation rate. The total number of minutes viewed by all the students in the two courses reached 8328 minutes or 139 hours when considering all the micromodules combined. Therefore, we believe the project is completed satisfactorily.

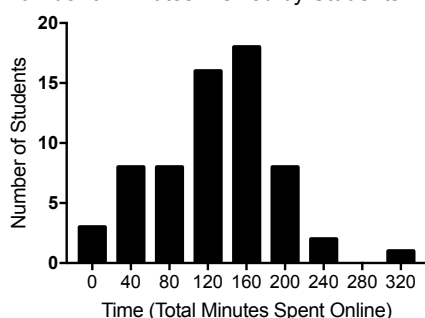
### 3. Evaluation Plan

Tracking statistics from the Panopto video platform were very useful for evaluating students' engagement and the overall participation rate (~94% of students have gone through the micromodules). The effectiveness of the micromodules was further evaluated by an in-house survey on the micromodules provided to the students at the end of the course. Students were also encouraged to comment on what they enjoyed *the most* and *the least* about the micromodules in the in-house survey, in the University's CTE exercise, or in-person.

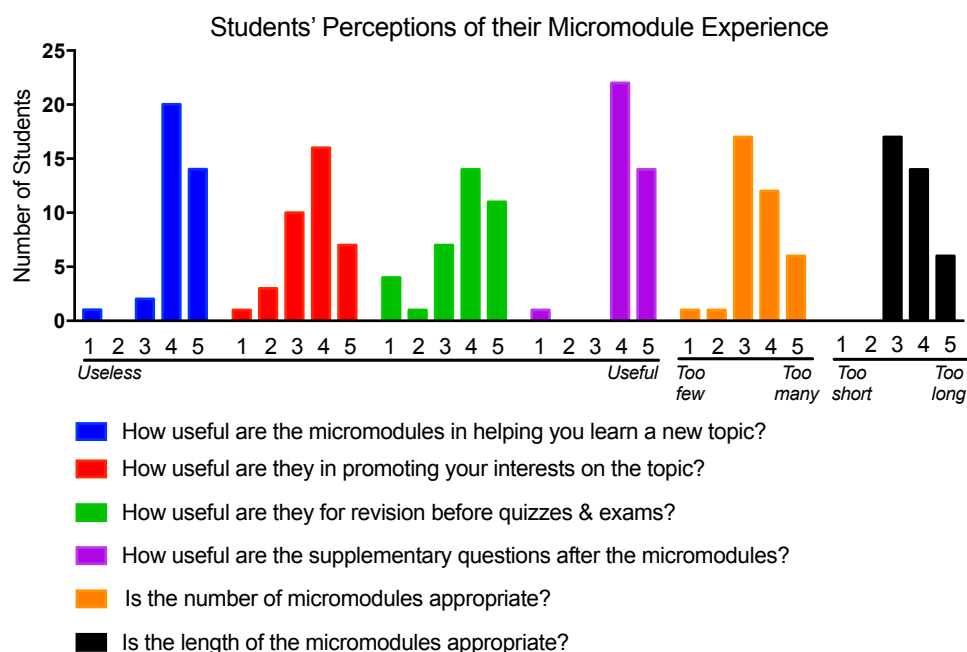
Many students commented favorably on the micromodules. Some of what they enjoyed most includes flexible time management, ability to pause and replay as many times as they like, more in-depth explanation provided in the videos, and ease of use via the online system. However, when asked what they enjoyed the least about the micromodules, students indicated that watching the micromodules increased their workload outside of class, and it was difficult to maintain focus while watching the videos. A few students felt very strongly against the micromodules in BCHE4060 because they believe all the course contents should be covered only during lectures and watching the micromodules inevitably doubled the workload in the course.

Data collected from the Panopto tracking statistics and the in-house survey are summarized and plotted below.

Total Number of Minutes Viewed by Students in BCHE4060



**Figure 1:** Histogram showing the frequency distribution of total view time in minutes by students in BCHE4060.



**Figure 2:** Histogram showing the frequency distribution of students' responses to survey on their perceptions of the BCHE4060 micromodules.

#### 4. Dissemination, diffusion and impact

All the micromodules have been uploaded to the Panopto video system for sharing. The micromodules are made freely accessible and easily searchable by anyone at CUHK on Panopto so any colleague who find the teaching materials useful are free to use them. In addition, knowledge on video processing and editing gained from this project and the resources gathered have been applied to produce micromodules for another course I teach, CMBI3010 Cell and Molecular Biology Laboratory in the School of Life Sciences. These micromodules, which were also uploaded to Panopto, illustrate science research techniques in the form of lab demonstration. Notably, one of these micromodules has also been adapted and used in a Summer Course on Cell and Developmental Biology Research held in July 2017 and organized by the School of Life Sciences that teaches post-graduate students laboratory techniques used in life science research. Finally, the experience and knowledge gained from this project have been shared with colleagues in my School, who have also recently secured the MMCD grants and have begun to produce micromodules for use in their own courses.

#### PART II

##### Financial data

Funds available:

Funds awarded from MMCDG	\$ 58,000
Funds secured from other sources (please specify _____)	\$ N/A
Total:	\$ 58,000

Expenditure:

Item	Budget as per application	Expenditure	Balance
Computer workstation and accessories that allow drawing-on-screen functions	\$15,000	\$23,148	-\$8,148
Software and license subscription	\$6,000	\$4,488	\$1,512
Staff costs (eg. Student Helpers, RPG, Summer Interns)	\$20,000	\$14,410	\$5,590
Course materials and Laboratory consumables for demonstrative purposes	\$15,000	\$10,845.74	\$4,154.26
Stationeries and rental charges	\$2,000	\$1,399	\$601
Total:	\$58,000	\$54,290.74	\$3709.26

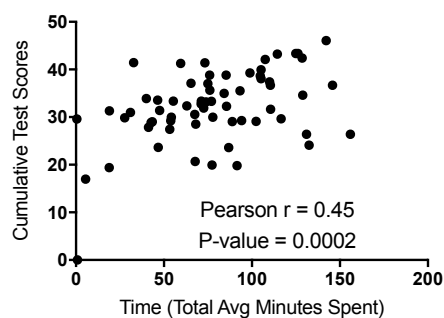
## PART III

### Lessons learnt from the project

This project primarily focused on using a blended approach composed of online voice-over mini-lectures to teach an upper-level undergraduate course on Immunology, BCHE4060 Basic and Applied Immunology. Basic course content was moved online as out-of-class learning activity to make way for more interactive and intellectually engaging content during face-to-face class time.

Through the tracking statistics provided by the Panopto platform, we found out that as much as 94% of students in the course watched the five micromodules produced specifically for this course, with a median view time of 131.6 minutes (the number of minutes recorded in the five micromodules combined totaled 102 minutes). Furthermore, we found a positive correlation between the average time students spent on the micromodules and their course scores. These data suggest that while all students received the same sets of lecture notes covering course contents delivered online or in-class, those spending on average a longer time watching the micromodules tend to perform better academically in this course.

Correlation between Scores and Average Time Spent on the Micromodules



**Figure 3.** Relationship between scores obtained in the course (quizzes and final exam combined) and the total average time spent on viewing all the micromodules.

Potential reasons for the high participation rate are two-fold. Firstly, students were notified at the beginning of the course that all the content covered in the micromodules would appear on exams and quizzes. Although class notes covering the video content were posted to Blackboard, the micromodules provided more in-depth explanation comparing to reading the notes alone. Secondly, the micromodules offer flexibility and individualization. It is worth noting that the micromodule participation rate (94%) is far higher than the regular lecture attendance rate, which was estimated to be around 80% - 85% except on the days of quizzes. This observation suggests that even students who didn't come to class regularly would still watch the micromodules posted online, likely because online learning is self-paced and highly accessible anywhere and at any time.

Although the majority of students surveyed indicated that the micromodules benefited their learning, some issues were encountered. Firstly, recall that students were asked to watch the micromodules before coming to class. During class, part of the face-to-face lecture time was devoted to answering questions from students regarding the online content and discussing supplementary questions the instruction designed based on the online contents so as to consolidate students' understanding. However, students' responses during these in-class activities were disappointing, potentially because they had not yet watched the micromodules before class, or that they were intimidated by the large class-size (>50 students) that hindered

discussions. In the future, ways that encourage students to watch the micromodules on time and engage in class discussion need to be devised so they can benefit from the interactive activities during face-to-face lecture time.

Secondly, results from the university's CTE exercise and the in-house survey indicate that a small group of students strongly resented the micromodules and complained that the additional workload out-of-class was unreasonable. Potential explanation for this resentment maybe that students are not used to spending out-of-class time doing course-related works since few other Science lecture courses have regular tutorials and/or online learning that requires this level of engagement. Furthermore, it appears that the traditional, one-size-fit-all learning model of *knowledge being delivered by the instructor in a classroom* is still quite heavily rooted among undergraduate students taking this course. Since the course targets Year-3 and Year-4 undergraduate students, it remains possible that these students are less used to the blended learning approach compared to more junior students. In the future, students' expectations on the tuition approach (incorporation of self-study and the idea that teachers are facilitators of learning) need to be adjusted when using a blended learning approach. Ways that promote students' interests on the micromodules and allow them to stay focus longer should also be devised (eg. split longer micromodules into 2 parts, incorporate quizzes and/or games in between the videos, etc.) so that students are more conducive to this blended learning approach.

## 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 micromodules/pedagogies adopted.*

(Most relevant)      Keyword 1: Immune system mini-lectures

Keyword 2: Vaccine strategies

Keyword 3: Allergy and hypersensitivity

Keyword 4: The complement system

(Least relevant)      Keyword 5: Immunodeficiency

### **2. Summary**

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

**Table 1: Publicly accessible online resources (if any)**

**(a) Project website:**

**(b) Webpage(s):**

Panopto Video Platform (Accessible to anyone at CUHK)

<https://panopto.cuhk.edu.hk/Panopto/Pages/Viewer.aspx?id=6f53748b-a256-4054-a421-b23ca8279364>

<https://panopto.cuhk.edu.hk/Panopto/Pages/Viewer.aspx?id=e2e396ee-0fbb-471b-9244-a65f1d4d5d4c>

<https://panopto.cuhk.edu.hk/Panopto/Pages/Viewer.aspx?id=e3ddc1e2-ff93-49a8-b70b-9b116a5e1c7c>

<https://panopto.cuhk.edu.hk/Panopto/Pages/Viewer.aspx?id=9431fa75-75fc-491f-ba71-9f5f973f2908>

<https://panopto.cuhk.edu.hk/Panopto/Pages/Viewer.aspx?id=7353648d-1cd9-4d08-ac13-4e5aaf08765e>

<https://panopto.cuhk.edu.hk/Panopto/Pages/Viewer.aspx?id=6c0f4da4-f168-43d9-9e46-3ead65e56381>

<https://panopto.cuhk.edu.hk/Panopto/Pages/Viewer.aspx?id=3c62b70a-cb7e-4247-8d6d-31073a95e017>

**(c) Tools / Services:**

- Camtasia studio screen recording & video editing software
- CUHK's Panopto Video Platform
- Blackboard eLearning system
- Self-recoding Studio at ELITE at CUHK

*If you have used any tools or services for the project, please provide names of the tools or services in here.*

**(d) Pedagogical Uses:**

- Blended learning approach
- Semi-flipped-classroom

Students were asked to watch the micromodules available online before attending class covering basic content in the lecture materials. Part of the class was devoted to answering students' questions on the micromodules, completing supplementary exercises specifically designed to cover contents of the micromodules, and discussing the answers together.

**(c) Others (please specify):**

**Table 2: Resources accessible to a target group of students (if any)**

*If resources (e.g. software) have been developed for a target group of students (e.g. in a 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>BCHE4060</i>	<i>1<sup>st</sup> term 2017</i>	<i>68</i>	<i>Blackboard &amp; Panotpo Video</i>
<i>CMBI3010</i>	<i>1<sup>st</sup> term 2017</i>	<i>19</i>	<i>Blackboard &amp; Panotpo Video</i>

**Table 3: Presentation (if any)**

*Please classify each of the (oral/poster) presentations into one and only one of the following categories*

	<b>Number</b>
(a) In workshop/retreat within your unit (e.g. department, faculty)	N/A
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	N/A
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	N/A
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)	N/A
(e) In international conference	N/A
(f) Others (please specify)	N/A

**Table 4: Publication (if any)**

*Please classify each piece of publication into one and only one of the following categories*

	<b>Number</b>
(a) Project CD/DVD	N/A
(b) Project leaflet	N/A
(c) Project booklet	N/A
(d) A section/chapter in a booklet/ book distributed to a limited group of audience	N/A
(e) Conference proceeding	N/A
(f) A chapter in a book accessible internationally	N/A
(g) A paper in a referred journal	N/A
(h) Others (please specify)	N/A



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

Challenges faced by undergraduate students learning immunology include vocabulary barrier, lack of exposure through secondary schools and the multi-disciplinary nature of this field. This project aimed at developing a series of micromodules that introduce foundational concepts of immunology to undergraduate students to help them break the enormous entry barrier required for learning and applying concepts in the specialized field of immunology. Basic concepts are delivered online to make way for more engaging and intellectual stimulating course content during face-to-face lecture time.

A total of five micromodules consisting of voice-over mini-lectures on immunological concepts have been produced. Two additional micromodules that introduce students to common laboratory techniques in life science research have also been developed. These micromodules altogether offered 114 minutes of online contact time for Year 3 and Year 4 undergraduate students in the School of Life Sciences at CUHK. The micromodules were uploaded to the Panopto video platform linked to the course website in the CU Blackboard eLearning system.

Topics covered in the micromodules represent part of a wider scope of knowledge normally delivered only during lecture periods in the past. Using a blended learning approach, students were asked to watch the micromodules before attending lectures. Supplementary follow-up questions were designed to accompany each micromodule to promote students' understanding and comprehension of the online content. In this way, more basic course content was moved online as out-of-class activity so that the instructor could utilize the extra face-to-face class time to focus on more intellectually engaging content and help students apply new knowledge in ways that advance their conceptual understanding.

Students' engagement was evaluated by gathering statistics from the Panopto video platform that tracks viewing activity of the micromodules. Analysis of the video metrics data indicates that 94% of students in the course watched the micromodules with a median view time of 131.6 minutes. We also observed a positive correlation between students' performance in the course (in terms of quiz and exam scores) and their total average time spent on the micromodules.

Students' feedback and perception on their learning experience were further collected by an evaluation survey on the micromodules at the end of course. Most students found the micromodules useful in learning a new topic in this course. They also appreciated the convenience, flexibility and the ability to self-pace their own studies. However, students also complained that watching videos significantly increased their workload outside of class and it was hard to stay attentive while watching the videos. Future efforts should be directed at devising new ways that motivate students to self-study and help them stay focused longer when using the micromodules. Efforts also need to be made to adjust students' expectations on entering a blended learning course to help them understand what the micromodules would mean to them and how they would need to adapt to the change.