THE CHINESE UNIVERSITY OF HONG KONG

Courseware Development Grant (2016-17)

Final Report

Report due 31 January 2018
Please return by email to Judy Lo judyl@itsc.cuhk.edu.hk

PART I

Project title:

Electronic Training in Practice (*eTip*): A Pilot Study of Flipped Classroom Teaching and Learning in the Techniques for Biomedical Research

Principal supervisor:

- Dr. Florence Tang, School of Biomedical Sciences

Co-supervisor(s), Department / Unit

- Professor Kwan Yiu Wa, School of Biomedical Sciences
- Professor Kingston Mak, School of Biomedical Sciences
- Professor Zhao Hui, School of Biomedical Sciences
- Professor Ellis Fok, School of Biomedical Sciences
- Dr. Dewi Kenneth Rowlands, Laboratory Animal Services Centre
- Dr Olivia Ngan, JC School of Public Health and Primary Care
- Mr Ray Lee, Information Technology Service Center

Project duration: From February 2017 to January 2018

Date report submitted: 31 January, 2018

1. Project objectives

This is the first pilot development of e-learning courseware for improving, enriching, and strengthening technical knowledge in biomedical research, to overcome their frustration in the participation of performing research activities. eTips micro-modules has been built up achieving the following goals:

Students' Beneficial Objectives:

- To enable proactive learning, where the platform enables to revisit learning materials whenever the students want to revise and reassure the personalized
- To provide a medium providing access to revisit and revise laboratories technique, and other broad-based techniques for the research activities;
- To motivate the student to do the formative assessment to reflect their understanding after the lecture

Teachers' Beneficial Objectives:

- To improve the quality of teaching and encourage active learning among students;
- To provide a new pedagogical approach to deliver the training differently during the practical session
- To engage after-class discussion between students and teachers, rather than a one-way effort.

2. Process, outcomes or deliverables

The milestone of the eTips platform falls slightly behind schedule as our teammates needed to solve some technical problem about the AR and VR technology during the developmental process. The barriers had been overcome eTips completed in Dec 2017. The eTips platform as shown in Figure 1 has been launched at CUHK via the link of http://137.189.27.142.etips/ for the trial run in this academic year 2017-18.

A total of **seven** deliverable courseware were developed and adopted for the course of *SBMS 2105 Techniques in Biomedical Research*, including

(1) Lab safety
(2) Animal Handling
(3) Electrophysiology
(4) Cell Culture
(5) Flow Cytometry
(6) Basic Histology; and

(7) Gene Editing

Figure 1 The eTips platform has been built up for motivation students' learning.

Our courseware and content are readily accessible to the students with a smartphone in either Android or iOS, which allow them to access learning materials anytime and anywhere. As a result, students increase their learning opportunities without any restriction and limitation. The use of communication technology, e.g., AR technology, is to motivate students in the learning process with self-efficacy and self-worth.

Overall, the team meets the goals and delivers the courseware satisfactorily.

3. Evaluation Plan

The objective of this evaluation is to assess attitudes towards the courseware among students. An e-survey on the laboratory safety course of the eTips was conducted among fourteen participants including the biomedical students, teachers, researchers and other discipline students. A group interview has also been conducted assessing attitudes towards the content. Figure 2 and 3, respectively, are the summary of the survey and interview results.

Figure 2 Summary of quantitative results from the eSurvey and focus group interview.

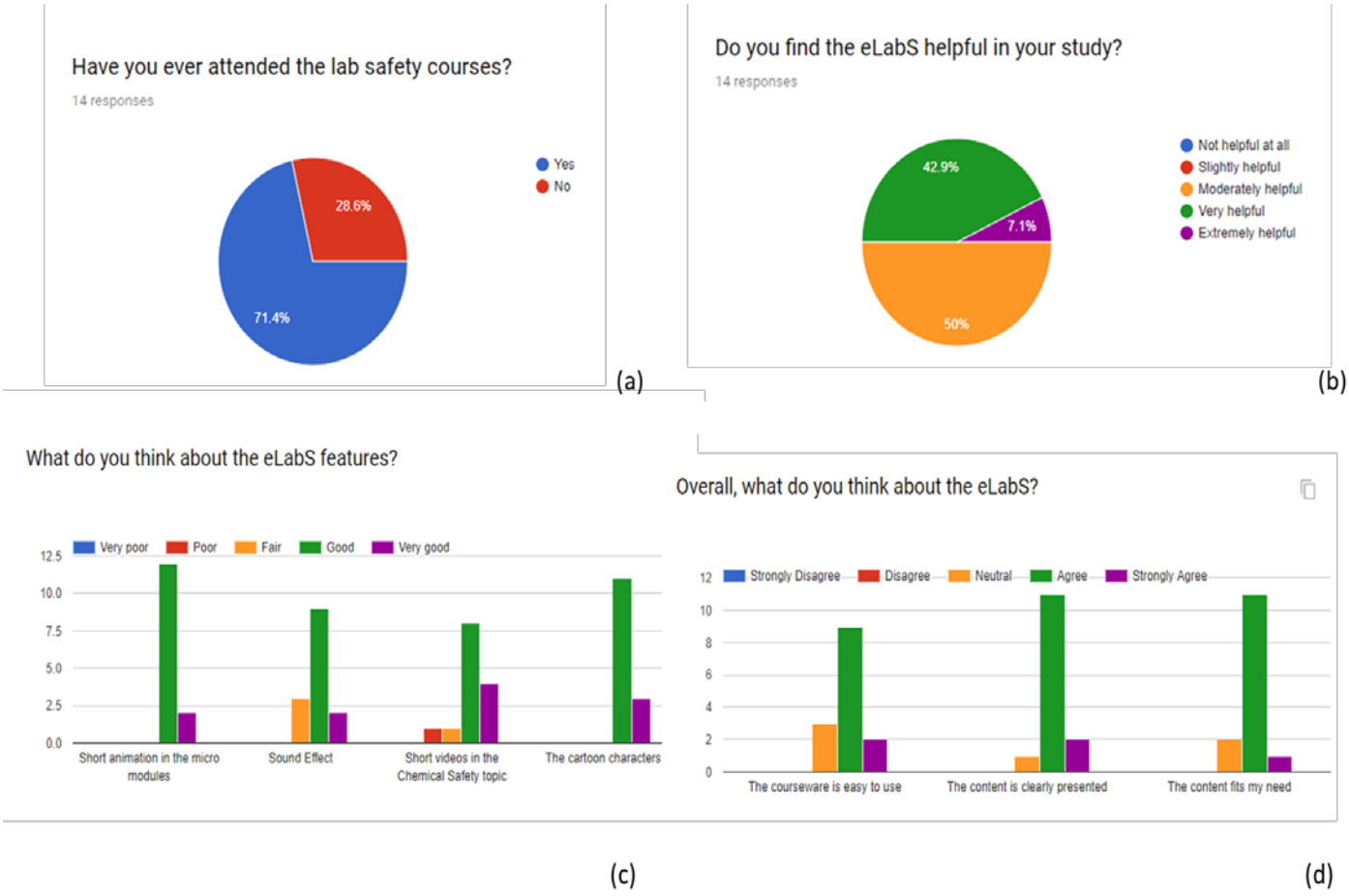
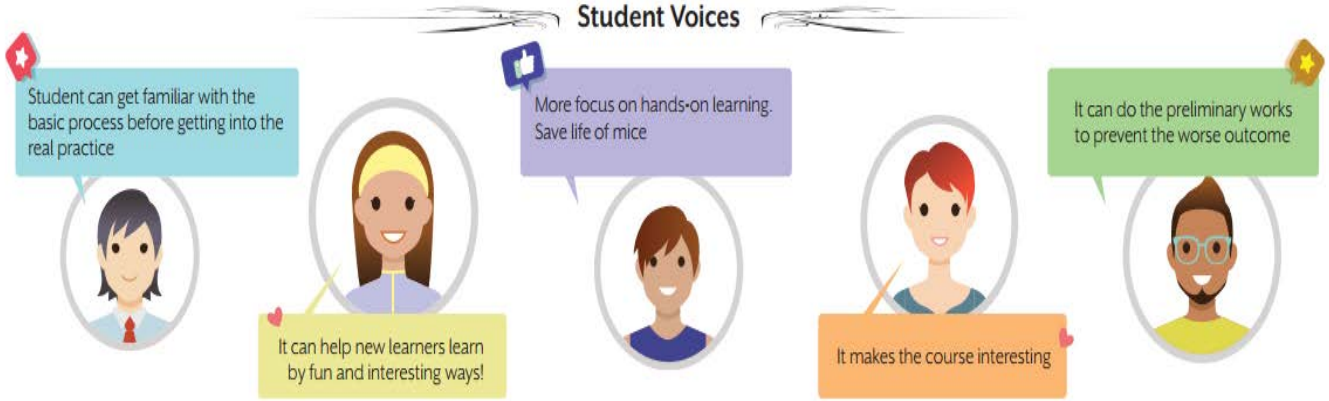


Figure 3 Students voices from the group interview



Based on the evaluation, the team will further modify the content developed courseware according to the feedback.

4. Dissemination, diffusion, and impact

As eTips is an innovative e-learning platform including different varieties of courseware for the training in techniques in biomedical research, our team has participated in local and international conferences for the dissemination and presentations as follows:

Members	Event/Awards
Florence Tang, Yiu Wa Kwan, Hui Zhao, Ellis Fok, Dewi Kenneth Rowlands, Olivia Ngan, Ray Lee and Taylor Tang	**Oral & Poster Presentation** Title: Effective or Ineffective: The Application of Virtual Reality (VR) Technology in the Development of the Innovative Learning Tool for Experimental Skills Training. **Conference organizer:** Teaching & Learning Innovation Expo 2015, organized by CUHK, Dec 7, 2017 **Awards:** - Poster Award in Teaching & Learning Innovation Expo 2016, CUHK - People's Prize Certificate in Teaching & Learning Innovation Expo 2016, CUHK
Florence Tang, Yiu Wa Kwan, Hui Zhao, Ellis Fok, Dewi Kenneth Rowlands, Olivia Ngan, Ray Lee and Taylor Tang	**Oral Presentation** Title: The Pilot Study of the Application of Augmented Reality Technology in Biomedical Sciences Teaching 教學研究：運用擴增實境教授生物醫學 **Conference organizer:** Learning & Teaching Expo 2017, organized by Diversified Communication and supported by Hong Kong Education Bureau in Hong Kong Convention & Exhibition Centre, Dec 15, 2017
Florence Tang, Kwan Yiu Wa, Zhao Hui, Ellis Fok, Dewi Kenneth	**Poster Presentation** Title: The New Innovative Pedagogy: Refinements In Training Biomedical Students In The Handling Of Experimental Mice Using

Rowlands, Olivia Ngan, Ray Lee, Taylor Tang and Roy Szeto	Virtual Reality Technology **Conference Organizer:** 15th Asia Pacific Medical Education Conference – Technology: Enhancing Education for Improvement of Patient Care, National University of Singapore, Singapore, 12-13 Jan, 2018.

PART II

Financial data

Funds available:

Funds awarded from CDG $ 73,500.00

Funds secured from other sources $ _____

(please specify_____)

Total: $ 73,500.00

Expenditure:

The balance sheet as at 31 January 2018 is listed below for reference:

Project ID : 4170522
Responsible Cost Centre : SBS
Responsible Person : TANG Mei Kuen
Bursary Contact Person : Rita Chu/Kimmy Ng
Start date : 03.02.17 End date : 31.01.18

THE CHINESE UNIVERSITY OF HONG KONG
INCOME AND EXPENDITURE STATEMENT
FROM 01.07.17 TO 31.01.18

Date 31.01.18 Page 2
Time 10:27:03 ZJIE0300 / Q9934M

TDLEG 2016-19 - Courseware Development Grant - A Pilot Study of FlippedClassroom Teaching and Learning in the Techniques for Biomedical Research: Electronic Training in Practice (eTip)

	Balance at b/f	Year-to-date Actual payment	Commitment	Outstanding PR	Total	Accumulated Balance	Overall Budget	Available Budget Balance
Expenditure								
Printing,Stationary & Supplies	861.00	4,969.00	0.00	0.00	4,969.00	5,830.00	0.00	(5,830.00)
Books & Book Binding	0.00	1,562.00	0.00	0.00	1,562.00	1,562.00	0.00	(1,562.00)
Service Charges	0.00	5,219.35	0.00	0.00	5,219.35	5,219.35	0.00	(5,219.35)
Other Expenses	1,292.50	1,724.94	0.00	0.00	1,724.94	3,017.44	73,500.00	70,482.56
	2,153.50	13,475.29	0.00	0.00	13,475.29	15,628.79	73,500.00	57,871.21
Total Expenditure	2,153.50	13,475.29	0.00	0.00	13,475.29	15,628.79	73,500.00	57,871.21 *
TOTAL FUND BALANCES	(2,153.50)	(13,475.29)	0.00	0.00	(13,475.29)	(15,628.79)	(73,500.00)	

The commitment includes the staff cost commitment for three years or up to the employment contract end date. The budget holder is responsible to solicit funds from other sources to cover any deficit of the project, taking into account any approved budget to be released to the project in future years.

*The outstanding payment is now being in progress by the Bursary.

PART III

Lessons learnt from the project

It was our team's honor that the one of the micro-module, i.e., Virtual Animal House was selected and presented to our Vice-Chancellor and President of CUHK, Professor S Rocky Tuan in the Centre for eLearning Innovation and Technology on 3 Jan 2018. This micro-module embedded with gamified VR element give a high impact in the didactic teaching.

More importantly, it can inspire students to acquire the skill training activities but still gaining the hands-on experience; allows teaching to become more proficiently in complimentary with blended learning; motivate their critical thinking and stimulate their problem-based learning.

PART IV

Information for public access

Science in Biomedical Sciences Programme (JS4550) was launched since the academic year 2016 by School of Biomedical Sciences, Faculty of Medicine. Biomedical research is the study of investigation of the new solutions to cure human illness. To strength the broad-based knowledge in biomedical sciences, teaching in research techniques, including animal handling, theories in electrophysiology, cell cultures, basic histology, transgenic technology and proteomic, are essential to introduce students before the laboratory induction. The laboratory safety, the use of advanced instruments and animals in experiments are standard training in clinical laboratory research. Concerning the experimental animals, it raises concerns related to animal welfare and ethics in animal research. This programme is consistent with worldwide ethical standards and contributes to animal welfare and the humane use of animals in useful biomedical research, i.e., it teaches the 3Rs (Replacement, Reduction, and Refinement).

This learning courseware has been embedded into our project which aims to develop a lively learning environment and mobile application, called "electronic techniques in practice (eTips)." Regarding the animal ethics, the experimental animals are suggested to reduce their usage number, especially for the laboratory skills practicing. The micro-modules format, AR, and VR technology are applied to create an alternative training environment.

We adapted the HTC Vive® immersive system comprising; the back-pack computer let the user move freely; the headset with two miniatures display makes the user having stereo

physical sensation; motion tracker detect the user's position, and the controller trigger leads the user to respond interactively in the virtual environment. Here show you some of the demonstrations. The benefit of this virtual animal holding training courseware to students can facilitate more active learning, speed up the training process without unexpected accident happen, e.g., students may be bitten by the mice and most importantly execute the concept of 3R. Students' voices using HTC Vive® immersive system for the animal handling are very positive, they like it and feel interesting while they are learning the challenging technique.

We have performed the courseware evaluation which is based on questionnaires and group interviews and explored that it

- can be applied and used as an educational tool for the training the technical skills;
- can facilitate and deepen the experiential experience of the new learners; and
- can make students' awareness of the concept of animal ethics, i.e., 3Rs (Reduce, Replace and Refine) in their future research study.

1. Keywords

(Most relevant) Keyword 1: Virtual Reality Technology
Keyword 2: Argument Reality Technology
Keyword 3: Animal Handling
Keyword 4: Laboratory Safety
(Least relevant) Keyword 5: Techniques in Biomedical Research

2. Summary statistics

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:** http://137.189.27.142.etips/
(b) **Webpage(s):** *If information of your project is summarized in a webpage (say a page on the department's or faculty's website), please provide the URL(s) in here*
(c) **Others (please specify):** The short video of our project entitled "Effective or Ineffective: The Application of Virtual Reality (VR) Technology in the Development of the Innovative Learning Tool for Experimental Skills Training" has been launched in the website of Teaching and Learning Innovation Expo 2017, CUHK for public to access as listed: https://panopto.cuhk.edu.hk/Panopto/Pages/Viewer.aspx?id=aa5a4ff1-9446-42a4-8fdb-807e129a4945

Table 2: Resource 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. CU Learning Management System (Blackboard), facebook), please specify.			
Course Code/ Target Students	**Term & Year of offering**	**Approximate No. of students**	**Platform**
SBMS2105	All 2nd year students	27	Blackboard
Exchange students from other University for the short term attachment in the School of Biomedical Sciences	Different year students or postgraduates	varies	Blackboard

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 (e.g. department, faculty)	Nil
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	Nil
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	1
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)	1
(e) In international conference	1
(f) Others (please specify): Showcase to vice president, Professor S Rocky Tuan on 3 January, 2018	1

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	Nil
(b) Project leaflet	Nil
(c) Project booklet	Nil
(d) A section/chapter in a booklet/book distributed to a limited group of audience	Nil

(e) Conference proceeding	3
(f) A chapter in a book accessible internationally	Nil
(g) A paper in refereed journal	Nil
(h) Others (please specify)	Nil