

THE CHINESE UNIVERSITY OF HONG KONG

Courseware Development Grant (2018-19)

Final Report

Report due 31 May 2019

Please return by email to CUHK cdgs@cuhk.edu.hk

PART I

Project title: [Learning of practical skills in microbiology with VR technologies](#)

1. Principal supervisor: [Dr. FH Lo & Dr. Patrick Ngai](#)

Co-supervisor(s): [NA](#)

Department / Unit: [School of Life Sciences](#)

Project duration: From September 2018 to May 2019

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 CDG project?

[The project was conducted smoothly and its intended objectives were achieved without change.](#)

2. Process, outcomes or deliverables

Please specify the number of different types of deliverables produced, and the course(s) (with course codes and titles) that have used the deliverables in Part IV, and provide more detailed descriptions here.

Has the nature of the deliverables been changed?

Have you adjusted your timeline?

Overall, was the project completed satisfactorily?

[A virtual lab \(with the use of virtual reality technology\) courseware was successfully produced. The virtual lab has been tried in BCHE4830 Medical Biochemistry Laboratory in Term 2; where the same courseware will continue to be used in other LSCI basic laboratory courses in Term 1.](#)

[Overall, the deliverables of the project remained the same; where project was](#)

completed on time satisfactorily.

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 remained the same: a standard evaluation procedure in the laboratory course was conducted to collect the feedbacks from our students. Specifically, a questionnaire survey together with a focus group study were carried out to evaluate the teaching effectiveness of the virtual lab. Our results obviously indicated that our students enjoyed the virtual lab experience; where the majority of our students agreed that the virtual lab enhanced their understanding of the objectives and procedures of the experiments.

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 can be adapted to other disciplines.

A video for e-Learning activities, including the present virtual laboratory, in the Biochemistry Programme has been produced. Moreover, the present virtual laboratory project has been presented in overseas conference in the United Kingdom* and Thailand**.

* Details of the presentation

Conference name: 7th Teaching & Education Conference

Date: 21 to 24 May 2019

Venue: University of London, London, The United Kingdom

Abstract title: Blended Learning for Bioethics Education in Genetic Engineering.

** Details of the presentation

Conference name: eLearning Forum Asia 2019

Date: 29 to 31 May 2019

Venue: Chulalongkorn University, Bangkok, Thailand

Abstract title: eLearning with virtual reality in Biochemistry education

On the other hand, the present virtual laboratory has set up a model example of the development of VR contents for laboratory teaching; after this project, several similar projects have been initiated in SLS to develop VR contents for laboratory teaching.

In terms of the impact, the virtual laboratory developed can be adopted for the education of the qualification training required by the medical laboratory technologists (<http://www.smp-council.org.hk/mlt/en/intro.php>).

PART II

Financial data

Funds available:

Funds awarded from CDG	\$ 90,000
Funds secured from other sources (please specify _____)	\$ _____
Total:	\$ _____

Expenditure:

Item	Budget as per application	Expenditure	Balance
MSI VR ONE 7RE Computer	19,300	19,300	0
ITSC Courseware Development Service	77,580	70,700	6,880
Other expenses	3,120	0	3,120
Total:	100,000	10,000	10,000

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 continue to be inspired by the development and use of VR technologies for education purposes; VR provides us with a new horizon on what we can do and teach in the classroom. With the aid of VR, all students become able to learn to conduct high risk microbiology experiments, which were otherwise risky, if not impossible, in the past. After this project, we will continue to develop more virtual laboratory and build up a library of VR teaching contents.

Moreover, as an extension of the virtual lab project, we are planning to explore other possibilities of the applications of VR technology, in particular, the ‘flipped-classroom’ of laboratory courses, in which some pre-lab exercise courseware can further allow our students to practise and rehearse the experiments at home before class.

After the completion of the project, we learnt about the key success factor: it could be to identify the problem(s) and need(s) of our teaching. Once the problem(s) or need(s) were clearly defined, we were able to analyze how VR might play its role to solve the problem(s) or to satisfy the need(s). Technically speaking, Mr Ray Lee from ITSC provided expert advice for us to develop the VR contents. He helped us to solve almost all the difficulties, where the development process ran smoothly from the beginning till the end. With the accumulation of experience in the use of VR, some more advanced application, such as flipped classroom and robotics, can be further designed to facilitate the T&L effectiveness.

If there is a suggestion to CUHK, we wish CUHK could provide us with sufficient support and time until we have developed a comprehensive library of VR teaching materials, which is necessary for us to learn about the most effective use of the most relevant VR contents for our T&L activities.

PART IV

Information for public access

Summary information and brief write-ups of individual projects will be uploaded to a publicly accessible CUHK CDG website. Please extract from Part I the relevant information to facilitate the compilation of the publicly accessible website and reports.

Virtual Reality (VR) is a technology allowing the users to enter an artificial environment that cannot be reached in the real world easily. In this project, we aim at applying VR to create a virtual laboratory, such that our students are able to get access to and try using two high risk experiments dealing with some highly infectious bacterial species, which was impossible in the past. In this virtual laboratory, students can practise and experience the standard microbiology procedures to handle the bacteria isolated from clinical samples.

1. Keywords

Please provide five keywords (in the order of relevance to your project) to describe your project.

(Most relevant) Keyword 1: [Virtual Laboratory](#)

Keyword 2: [Virtual Reality](#)

Keyword 3: [Microbiology](#)

Keyword 4: [Bacteria](#)

(Least relevant) Keyword 5: [Clinical Samples](#)

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: <i>If a publicly accessible project website has been constructed, please provide the URL</i>
(b) Webpage(s): <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) in here</i>
(c) Others (please specify):

Table 2: Resource accessible to a target group of students (if any)
<i>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.</i>

<u>Course Code/ Target Students</u>	<u>Term & Year of offering</u>	<u>Approximate No. of students</u>	<u>Platform</u>
<i>LSCI2002/School of Life Sciences</i>	<i>All 2nd year students</i>	<i>250</i>	<i>Virtual reality</i>
<i>BCHE4830/Biochemistry Programme</i>	<i>~30 4th year students</i>	<i>30</i>	<i>Virtual reality</i>

Table 3: Presentation (if any)	
<i>Please classify each of the (oral/poster) presentations into one and only one of the following categories</i>	Number
(a) In workshop/retreat within your unit (e.g. department, faculty)	<i>Please insert no</i>
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	<i>Please insert no</i>
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	<i>To be presented in 2019/20</i>
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)	<i>Please insert no</i>
(e) In international conference	<i>Two presentations in 2018/19</i>
(f) Others (please specify)	<i>Please insert no</i>

Table 4: Publication (if any)	
<i>Please classify each piece of publications into one and only one of the following categories</i>	Number
(a) Project CD/DVD	<i>Please insert no</i>
(b) Project leaflet	<i>Please insert no</i>
(c) Project booklet	<i>Please insert no</i>
(d) A section/chapter in a booklet/book distributed to a limited group of audience	<i>Please insert no</i>
(e) Conference proceeding	<i>Two proceedings in 2018/19</i>

(f) A chapter in a book accessible internationally	<i>Please insert no</i>
(g) A paper in refereed journal	<i>Please insert no</i>
(h) Others (please specify)	<i>Please insert no</i>

3. A one-page brief write up

Please provide a one-page brief write-up of no more than 500 words for posting on the CDG website.

Virtual Reality (VR) is a technology allowing the users to enter an artificial environment that cannot be reached in the real world easily. In this project, we aim at applying VR to create a virtual laboratory, such that our students are able to get access to and try using two high risk experiments dealing with some highly infectious bacterial species, which was impossible in the past. In this virtual laboratory, students can practise and experience the standard microbiology procedures to handle the bacteria isolated from clinical samples.