THE CHINESE UNIVERSITY OF HONG KONG

Micro-Module Courseware Development Grant

Scheme 1: Basic Scheme

Final Report (2017-18) (Additional Call)

Report due 31 October 2018
Please return by email to The Ad hoc Committee on Planning of eLearning Infrastructure mmcd@cuhk.edu.hk

PART I

Project title: PharmD (Pharmacy Hybrid-learning with Augmented Reality on Mobile Devices)
Principal supervisor: Prof. Lee Wing Yan, Vivian
Department / Unit : School of Pharmacy
Project duration: From March 2018 to October 2018
Date report submitted: October 31, 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?

This project aims at producing 12 augmented reality micro modules for enhancing students' medication knowledge. Primary objective of this project has been met. We invited 3 groups of students to conduct 4 of the modules from May to October 2018. On the other hand, we have prepared the outline and set production timeline of the other 8 micro modules, which will be ready for teaching and learning purpose for students who take PHAR3812 in spring 2019. This report will discuss the learning outcome and experience we confront in this project.

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?

Table 1 - Breakdown of the micro modules

Item	Name	Style / Description	Time (minutes)
1	Patient's condition: cardiovascular diseases	AR exercise	5:00
2	Common elderly health problems	AR exercise	5:00
3	Medication safety – common drug issues among elderly	AR exercise	5:00
4	Medication safety – antimicrobial resistance	AR exercise	5:00
5	Interpret the laboratory data to the patient	AR exercise	5:00
6	Patient's condition: dosing adjustment for renal impairment	AR exercise	5:00
7	Interpret the medication usage to the patient	AR exercise	5:00
8	What to pay attention when providing patient consultation	AR exercise	5:00
9	Reporting and emphasizing relevant case results only	AR exercise	5:00
10	Communication with older adults	AR exercise	5:00
11	Understanding the needs of older adults	AR exercise	5:00
12	Providing health education to patients in laymen language	AR exercise	5:00
		Total time	60:00

In light of understaff in the first half of the project, we were only able to produce 4 micro modules and converted them into two case scenarios – Post stroke, and Chronic obstructive pulmonary disease (COPD). Each case featured a patient either undergoing a series of post stroke treatment or suffering COPD. Furthermore, each case involved 2 to 3 pictures that require students to use their mobile device that equipped with an AR scanning app – Layar to scan and view the hidden items on each pictures. The items included audios, texts, drugs photos, and patient health information for students to investigate. The two cases were used in PHAR2018, CU CHAMPION 2018, and PHAR3413. Meanwhile, the other 8 micro modules would be applied in PHAR3812 in spring 2019.

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 altered our original evaluation plan. The table below illustrates where we applied the produced micro modules in the funded period.

Table 2 – The courses / program that involved AR learning

Courses / Items	**PHAR 2018**	**CU CHAMPION 2018**	**PHAR 3413**	**PHAR 3812**
Nature	1 unit elective summer course	Service learning volunteer program	3 units major course	3 units major course
Teaching method	Lecture, E-learning, Community outreach	Workshop, E-learning, Community outreach	Lectures	Lectures
Course objective	Interprofessional Collaboration toward geriatric care	Interprofessional Collaboration toward geriatric care	Train pharmacy students on Pharmacology and Therapeutics	Train pharmacy students on Clinical Assessment and Monitoring
Students	Faulty of Medicine of any year	Faculty of Medicine, Social Work	Year 3 Pharmacy student	Year 3 Pharmacy students
Class size	9	206	55	55
Course Period	Summer term 2018	Summer break 2018	Fall 2018	Spring 2019
When to do AR exercise	During lecture	During workshop	In class + Blackboard	TBC
AR Micro modules (Table 1)	Item 1 – 4	Item 1 – 4	Item 1 – 4	Item 5 – 12
Learning Evaluation	• Group presentation, and • Group project	• Group presentation	• MCQ • Group discussion	• MCQ • Group discussion
User evaluation (number of students responded)	User satisfaction (n=3)	User satisfaction (n=132)	Pre/Post user experience and self evaluation (n=44)	To be conducted in spring
Evaluation survey	Version 1	Version 1	Version 2	Version 2

As the nature and course objectives are quite different among four courses. Thus, we designed two version of survey to evaluate students' satisfaction toward having augmented reality for learning.

Table 3 – Evaluation survey : Version 1 (Responded agree or fully agree)

	Questions	PHAR 2018 (n=3)	CU CHAMPION 2018 (n=132)
1	Augmented reality (AR) was useful for case discussion in training workshop / lecture.	66.66%	41.7%
2	I am satisfied with the use of AR in workshop.	100%	44.7%

3	I am positive on using AR for teaching and learning activities.	66.66%	58.3%

- We asked students to conduct these questions in order to evaluate their views on above mentioned items.
- Only 3 out of 9 PHAR2018 students responded to the survey.
- 132 out of 206 CU CHAMPION student volunteers responded to the survey, 19 of them indicated that they did not participate in the workshop, which was the only occasion we let the students to conduct the AR exercise.

Table 4 – Evaluation survey : Version 2 (Responded agree or fully agree)

	Questions about user experience	PRE (n=50)	Post (n=44)	Changes
1	AR case studies can enhance my interest in learning certain disease topics.	54%	30%	-16%
2	AR supports authentic learning.	54%	27%	-27%
3	AR allows me to experience patient cases which would be impossible to generate in normal classroom environments.	58%	39%	-19%
4	AR develops an immersive learning experience.	50%	32%	-18%
5	I enjoy using AR as a learning tool.	42%	30%	-12%
	Questions about knowledge			
6	I am familiar with COPD.	20%	23%	+3%
7	I am familiar with post stroke.	14%	16%	+2%
8	I am confident to give a consultation to a COPD patient.	16%	16%	0
9	I am confident to give a consultation to a post stroke patient.	12%	16%	+4%
10	Generally speaking, I am very confident with my patient consultation skills.	12%	16%	+4%

We asked students to conduct Pre and Post survey in order to see the changes on above mentioned items.

PHAR2018 students were the first student group to conduct the AR exercise. The course consisted of a compulsory lecture (on May 19), self learning on Blackboard, and participate service learning in the community. The students were instructed to use their mobile devices to scan and view the AR courseware materials during the lecture with an app called Layar. The embedded information on the materials would be useful resources for their group discussion and case presentation on the same day. In addition, they had to make a service plan for a community patient as their group project, according to their findings from the AR exercise. (Program photos and group project would be available in the project summary video).

CU CHAMPION 2018 student volunteers followed the same instruction as in PHAR2018 with the exemption of group project. The outreach program comprised of a larger student group size : Among 206 students joining the volunteer program, 113 of them attended the

training workshops held in May and June.

PHAR3413 comprised of year 3 pharmacy students. They would be taking PHA3812 as well in Spring 2019. We asked the students to complete a pre and post survey to evaluate their user experience on AR as a learning tool, and the changes of knowledge level toward two healthcare topics. The learning outcome evaluation approach was slightly difference than in PHAR2018 and CU CHAMPION 2018. PHAR3413 students would complete a multiple choice question sheet after viewing each micro module. They would work together with their group-mates to discuss assigned case questions on each modules.

The survey result indicated that PHAR2018 and CU CHAMPION 2018 student volunteers had average and mild satisfaction toward the use of AR in workshop and discussion. Some positive comments included

Positive:

"it was fun", "interesting", "eye opening experience"

Negative :

"hardly to scan the item", "not able to listen and view the augmented items after leaving the sight of the AR photos", "the app did not work on my phone"

On the other hand, students of PHAR3413 did not satisfy the use of AR in class. Some replied as

Positive:

"I think it is good, since it is in outreach settings, some medical information about the patient cannot be obtained, and we have to analyse the case based on limited information, which is quite realistic"

"It seems pretty good overall."

Negative:

"Many of us cannot scan very well, especially in BMS LT 2. "

"Take too much time scanning, but actually can put the images on Blackboard in advance. In this way, we can scan on our laptop during class."

"May be just of similar use with case study"

"Personally I think my experience in VR is better than in AR"

"it is not truly necessary to have an AR exericse as opposed to an audio track posted on Blackboard."

Table 5 – PHAR2018 students case assessment result – multiple choice exercise

	COPD (n=44)	**Post Stroke (n=49)**
Mean score	4.1 / 5	4 / 5
Highest	5	4
Lowest	3	1

PHAR 2018 students conducted the COPD case AR exercise first in September and followed by the Post stroke case exercise in October. We also uploaded the source files of the augmented materials on Blackboard for students to complete the multiple-choice exercise at home, as some complained that they failed to scan the items in class. On the other hand, the students had to discuss both case with their peers. The completion rate of group discussion was 86%.

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.

We plan to revise our production plan in AR learning before stepping into the dissemination stage. We will consider all positive and negative comments from students and make necessary changes in our AR teaching and learning scheme. It is certain that we will overcome the shortcomings we confront in this project. In addition, we will share our experience and seek advices from colleagues from colleagues of other CUHK departments or even external parties.

PART II

Financial data

Funds available:

Funds awarded from MMCDG $ 80,398

Funds secured from other sources $ 0
(please specify_____)

Total: $ 80,398

Expenditure:

Item	Budget as per application	Expenditure	Balance
Layar (online application to produce	$ 11,200	$ 11,367.77	

augmented reality items)			
Quizlet and Noun project	$ 484	$ 480.02	
External Hard disk x 2	$ 2,256	$ 2,120	
Junior Research Assistant	$ 66,020	$ 78,525	
Total:	$ 80,078	92492.79	-12,094.79

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?*

Primary objective of this project has been met – we have learned from students' feedback and expectation. Improving students' learning experience has always been our team's objective. We will modify the methodology of AR usage in PHAR3812 in Spring 2019 and make good use of the other 8 micro modules to enhance students' learning.

The key success factor in this project is that students were able to learn pharmacy education in a different way. With augmented reality courseware, they can have an immersive experience to go through a clinical case.

One of the difficulties we encountered was technical problem. Students complained that they were unable to view or listen to the augmented materials in class. As a result, we uploaded all the original file source of the audio tracks, photos, and documents on Blackboard for their revision at home.

We received mixed feedbacks from students about using AR as a learning tool. Even though nearly all students own a smart phone that support the use of viewing AR items nowadays, we learned that it was also the first time of many of them experiencing AR as a learning tool in school. AR learning is still new in education, we will definitely rely more on it in the coming days. In addition, improvements on content and technical aspects are necessary for betterment in the learning experience. We wish the university can provide more funding for us to secure budget for staffing cost in order to invest more time to work on and improve the teaching and learning methodology of this technology, which will in turn benefit students'

learning experience in the long run.

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.

(c) **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: Augmented Reality

Keyword 2: Pharmacy education

Keyword 3: Mobile learning

Keyword 4: Layar

(Least relevant) Keyword 5: *CU CHAMPION*

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:** N/A *If a publicly accessible project website has been constructed, please provide the URL.*
(b) **Webpage(s):** N/A *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.*
(c) **Tools / Services:** Layar *If you have used any tools or services for the project, please provide names of the tools or services in here.*

(d) **Pedagogical Uses:**

Augmented Reality Mobile learning

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.

© **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.

Course Code/ Target Students	**Term & Year of offering**	**Approximate No. of students**	**Platform**
PHAR 2018	*Summer term 2018*	*9*	*Blackboard*
CU CHAMPION 2018	*Summer 2018*	*206*	*Blackboard*
PHAR3413	*1st term 2018*	*55*	*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)	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	1 (in preparation)
(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	1 (in preparation)
(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	**Number**

(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	1 (in preparation)
(h) Others (please specify)	N/A

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.

In this project, our team produced augmented reality (AR) micro modules in order to enhance Faculty of Medicine students' medication knowledge. These micro modules will examine the effectiveness of AR eLearning in enhancing students' knowledge and competence in clinical case assessment and providing health education to patients in the community, with the aid of various assessment methods.

The key success factor in this project is that students were able to learn pharmacy education in a different way. With augmented reality courseware, they can have an immersive experience to go through a clinical case. We invited 3 groups of students to conduct 4 of the modules from May to October 2018. On the other hand, we have prepared the outline and set production timeline of the other 8 micro modules, which will be ready for teaching and learning purpose for students who take PHAR3812 in spring 2019.