THE CHINESE UNIVERSITY OF HONG KONG

Micro-Module Courseware Development Grant

Scheme 2: Studies in Foundation Courses

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: Developing Micro-modules for Virtual Reality Experience in UGFN1000
Principal supervisor: Dr Lo Chun Yeung
Co-supervisor(s): Dr Cheung Hang Cheong Derek, Dr Li Ming Kenneth, Dr Ng Ka Leung Andy, Dr Szeto Wai Man
Department / Unit Office of University General Education
Project duration: From March 2018 to October 2018
Date report submitted: 31 Oct 2018

1. Project objectives

Is the project on track to meet its objectives?

The project is on track to meet its objectives.

Have the objectives been changed as a result of the experience of working on your MMCDG project?

The objectives have not been changed.

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)

A VR mobile application named "VRFN" has been developed. Four modules were produced in total - two of them correspond to Aristotelian Cosmology while the other two correspond to Newtonian Mechanics. The app was used in UGFN1000 course. Two of the modules have been used in the tutorial session on *The Beginnings of Western Sciences* by David C Lindberg.

The other two of the modules have been used in the tutorial session on *Principia* by Newton & *The Birth of a New Physics* by I Bernard Cohen. Each micro-module was used in tutorial classes for 10-15 mins, during which students were provided with VR headset and used the app together to learn the concerned concept together under the guidance of the teacher. Total duration time of all deliverable is around one hour.

Has the nature of the deliverables been changed?

The nature of the deliverables has not been changed.

Have you adjusted your timeline?

The timeline has not been adjusted.

Overall, was the project completed satisfactorily?

Yes, the project was completed satisfactorily. The VR mobile app was successfully developed. All four modules were developed as described in the proposal. The app was successfully implemented in the tutorial session of UGFN1000, where students have used the app to understand scientific concepts under the guidance of teachers. Surveys for evaluating students' understanding are being collected from students who have used the app in this semester. A pre-test survey has also been collected from students who have not used the app in summer term of 2017-18 semester.

3. Evaluation Plan

Have you altered your evaluation plans?

The evaluation plans have not been altered.

What monitoring data did you collect?

In the summer term of 2017-18 semester, a pre-test survey concerning the understanding of Aristotle's and Newton's theory has been collected from students who have not used the apps. In first term of 2018-19 semester, the same survey will be collected from students who have used the app in UGFN1000 tutorial sessions.

Does your evaluation indicate that you have achieved your objectives?

The survey from students who have used the app will be collected within this semester. After the collection of their feedback, we will be able to evaluate the difference between students who have not used the app (pre-test) and students who have used the app.

4. Dissemination, diffusion and impact

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

A poster will be presented in the 2018 Institute on General Education cum Teacher and Student Conference. Poster and oral presentation will also be conducted at the CUHK Teaching and Learning Innovation Expo.

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?

The VR mobile app was used in the tutorial sessions of UGFN1000, engaging around 500 students in 2018-19 Term 1.

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

These micro-modules can be used by other courses that teach Aristotelian Cosmology and Newtonian Mechanics.

PART II

Financial data

Funds available:

Funds awarded from MMCDG $ 100,000

Funds secured from other sources $ 0
(please specify_____)

Total: $ 100,000

Expenditure:

Item	Budget as per application	Expenditure	Balance
Courseware Development • VR development • Audio Recording • 3D model	$76,050.00	$78,570	($2,520)
Purchasing VR Goggle	$15,600.00	$15,965	($365)
Miscellaneous items (i.e. Student helper, Printing of posters…etc)	$8,350	$5,465	$2,885
Total:	$100,000	$100,000	$0

PART III

Lessons learnt from the project

Please describe your way forward.

The VR mobile app will be used in UGFN1000 tutorial sessions taught by the PI and Co-I in the future. This app will also be promoted in the GEF department and could be used by other UGFN teachers to engage more students.

Please describe any of the following item(s) accordingly:

- *Key success factors, if any*

Close collaboration between ITSC and teachers. Teacher have been involved in preparing some of the raw materials (i.e. ideas, 3D model and star map) for app development.

- *Difficulties encountered and remedial actions taken, if any*

No specific difficulty was encountered.

- *The role of other units in providing support, if any*

ITSC has been involved in the development of the VR mobile app.

- *Suggestions to CUHK, if any*
  - *Example: what should be done differently?*

No specific suggestion.

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: Virtual Reality

Keyword 2: Aristotle

Keyword 3: Newton

Keyword 4: Science

(Least relevant) Keyword 5: Nature

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:** *If a publicly accessible project website has been constructed, please provide the URL.*
(b) **Webpage(s):** *https://itunes.apple.com/hk/app/vr-fn/id1435126834?mt=8&ign-mpt=uo%3D4* **https://play.google.com/store/apps/details?id=com.itsc.ge**
(c) **Tools / Services:** *ITSC*
(d) **Pedagogical Uses:** *N/A*
(c) **Others (please specify):** N/A

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**
UGFN1000	*1st term 2018-19*	*500*	*iTunes store / Android store*

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)	*No*
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	*No*
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	*1 (will be presented in Dec 2018)*
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)	*1 (will be presented in 2018 Institute on General Education cum Teacher and Student Conference)*
(e) In international conference	*No*
(f) Others (please specify)	*No*

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	*No*
(b) Project leaflet	*No*
(c) Project booklet	*No*
(d) A section/chapter in a booklet/ book distributed to a limited group of audience	*No*
(e) Conference proceeding	*No*
(f) A chapter in a book accessible internationally	*No*
(g) A paper in a referred journal	*No*
(h) Others (please specify)	*No*

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.

A VR mobile application containing four micro-modules was produced for better teaching and learning in UGFN1000. The first two micro-modules allow students to visualize the relationship between the empirical observations of heavenly bodies from earth, and the model proposed by Aristotle. In the first module, students can see a VR 3D cosmology model of Aristotle, where various planets circle around the earth. In the second module, students can look at the rotating night sky from the viewpoint on earth. This enables them to appreciate the credibility of Aristotle's idea and the significance of the emergence of modern sun-centered model.

The remaining two micro-modules allow students to visualize the separation of motion into horizontal and vertical components. It shows the trajectories of cannon balls shot vertically upward from both a moving train and stationary train. Cannon balls can be shot at various power for students to observe the same phenomenon under different conditions. Students can also pause the 3D animation in order to observe the consistency between the vertical motion of the cannon balls shot from the stationary train and moving train. This helps them understand better Newton's Laws of Motion and appreciate the conceptual change in the explanation of projectile motion from Aristotle to Newton.

The micro-modules were used in the tutorial sessions of text 2 and 3, where students were provided with VR headset and used the VR mobile app together under the guidance of teacher. Approximately 500 students have engaged the app in UGFN1000 in 2018-19 T1. Survey has been designed to study to what extent the apps have improved their understanding of the concerned concepts. It has been taken by students who have not used the app (pre-test) and students who have used the app. Furthermore, the usage of this VR app can potentially be expanded to approximately 1800 students in around 75 UGFN1000 tutorial sessions per semester in the future.

In conclusion, we have successfully developed a VR mobile app for the improvement of learning and teaching in UGFN1000. The apps are successfully implemented in tutorial sessions. Evaluations with student surveys have also been done.