

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

PART I

Project title: Interactive Micro-Modules for Flipped Classroom Learning of Remote Sensing

Principal supervisor: Wong Kwan Kit, Frankie

Co-supervisor(s)

Department / Unit: Geography and Resource Management

Project duration: From May 2017 to April 2018

Date report submitted: 30 April 2018

1. Project objectives

The project intend to develop six micro-modules for students' understanding and self-learning about the concepts, skills and application of remote sensing. Each module will achieve an objective and link with lecture contents in the UGC-funded courses. The micro-modules will facilitate the implementation of flipped classroom pedagogy in the courses.

The contents of micro-modules will be supplemented with narration, animated graphics and videos. Interactive activities are designed to allow students to explore. Some of these activities are in the format of short quizzes to test students' understanding of the contents and they are embedded in the learning process. The project objectives are achieved.

2. Process, outcomes or deliverables

A total of six micro-modules were produced and they were used in GRMD3104 Satellite Image Analysis. The duration of each micro micro-module is about 10-15 minutes. Students have to spend 2 to 2.5 hours to go through all the modules. The nature of the deliverables remains unchanged. The timeline was adjusted to further improve the micro-modules. Overall, the project was completed satisfactorily.

3. Evaluation Plan

A centralized questionnaire-based evaluation was conducted by the faculty of Social Science to evaluate the effectiveness of the micro-modules towards teaching enhancement. The data is

still under process while this report is being drafted. A sample of questionnaire is attached in *Appendix I*.

Apart from the term-end questionnaire, feedbacks were continuously received throughout the whole course in form of personal conversations with students. Overall, they are satisfied with the micro-modules as they can acquire basic knowledge first before they come to the class. Besides, some constructive comments were also received to improve the micro-modules.

4. Dissemination, diffusion and impact

The micro-modules were hosted in departmental web server and were disseminated through the following web-links:

Module 1: Image Histogram

<http://www.grm.cuhk.edu.hk/~kkit/elearn/m7histogram/story.html>

Module 2: Image Enhancement

<http://www.grm.cuhk.edu.hk/~kkit/elearn/m8enhancement/story.html>

Module 3: Geometric Correction

<http://www.grm.cuhk.edu.hk/~kkit/elearn/m9geometric/story.html>

Module 4: Radiometric Correction

<http://www.grm.cuhk.edu.hk/~kkit/elearn/m10radiometric/story.html>

Module 5: Image Statistics

<http://www.grm.cuhk.edu.hk/~kkit/elearn/m11statistics/story.html>

Module 6: Matrix Algebra

<http://www.grm.cuhk.edu.hk/~kkit/elearn/m12matrix/story.html>

The six micro-modules cover the basic concepts in three lectures (30 Jan, 6 Feb and 27 Feb 2018) in GRMD3104.

It is compulsory for students to go through the micro-modules before they come to class. A flipped classroom pedagogy was adopted to further enhance and advance the understanding of lecture contents.

PART II

Financial data

Funds available:

Funds awarded from MMCDG	\$ 80,000
Funds secured from other sources (please specify: <u>GRM</u>)	\$ 20,000
Total:	\$ 100,000

Expenditure:

Item	Budget as per application	Expenditure	Balance
Hardware	20,000	7,600	12,400
Research Assistant (Part-time)	60,000	76,200	(16,200)
Total:	80,000	67,600	(3,800)

PART III

Lessons learnt from the project

The immediate way forward is to review the feedbacks from students in order to understand from the perspective of users/ students. Their feedbacks will be used to evaluate aspects including contents, style, presentation method, usefulness and effectiveness of learning, based on which to improve the current micro-modules as well as to shed some lights on the direction for micro-modules development in the future. While the questionnaire data were still under processing, this will be done afterwards.

But through personal conversation with students in class, inserting subtitles into the micro-modules can enhance the content understanding. Hence, an immediate action is taken to improve the current micro-modules by inserting subtitles. An additional fund (refer to Part II) was applied from the Department to take care of the cost. And the formal approval from MMCDG evaluation committee was received to extend the project period to 31 August 2018.

PART IV

Information for public access

Remote sensing data are collected and recorded in the form of images, either by satellite or by plane. These images are then further processed, analyzed and applied to various aspects of

geography. Image data enhancement, processing and transformation are important image analysis procedures to facilitate visual image interpretation and digital image analysis. The designed interactive micro-modules share the fundamental principles in six topics including (i) image histogram; (ii) image enhancement; (iii) geometric correction; (iv) radiometric correction; (v) image statistics; and (iv) image algebra. The first two micro-modules are fundamental for visual image interpretation while the other four focus on digital image processing and analysis. The designed modules provide animated and interactive learning materials supplemented with narration. Visual elements, including animated graphs, figures and video extracts, are used to enhance the learning experience of students. In each module, students are required to review the material carefully. In addition, for some of the content, students must explore the concept or materials through some interactive activities. The duration of each micro-module is about 10-15 minutes. These modules were deployed in a course GRMD3104 Satellite Image Analysis offered in 2017-18 spring. A questionnaire survey was conducted in the end of the semester to understand students' learning experiences and their satisfaction about the micro-modules. The feedbacks will be used to enhance the micro-modules as well as to shed some lights on the direction for micro-modules development in the future.

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: Image processing
 Keyword 2: Remote sensing
 Keyword 3: Image histogram
 Keyword 4: Image correction
 (Least relevant) Keyword 5: Image transformation

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: Nil
(b) Webpage(s): Refer to session 4 of Part I of the report.

(c) Tools / Services:

Nil

(d) Pedagogical Uses:

The six micro-modules give background knowledge of image data processing and analysis from which students can learn interactively and acquire fundamental concepts before class. Half of the lecture time was flipped to offer chances for students to discuss under the guidance of teacher through which students gain a deeper understanding of the topics covered in the three lectures.

(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 & Year of offering</u>	<u>Approximate No. of students</u>	<u>Platform</u>
GRMD 3104	2 nd term 2017-18	18	Website
GISM 5022	1 st term 2018-19	30	Website

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)	2
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	0
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	0
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)	0
(e) In international conference	0
(f) Others (please specify)	0

Table 4: Publication (if any)

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

	Number
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(a) Project CD/DVD	0
(b) Project leaflet	0
(c) Project booklet	0
(d) A section/chapter in a booklet/ book distributed to a limited group of audience	0
(e) Conference proceeding	0
(f) A chapter in a book accessible internationally	0
(g) A paper in a referred journal	0
(h) Others (please specify)	0

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.








Six interactive micro-modules were developed by the Department of Geography and Resource Management for students' understanding and self-learning about the basic principles of remotely-sensed image processing. The micro-modules covers six topics including (i) image histogram; (ii) image enhancement; (iii) geometric correction; (iv) radiometric correction; (v) image statistics; and (iv) matrix algebra. The first two micro-modules are fundamental for visual image interpretation while the other four focus on digital image processing and analysis. The designed modules provide animated and interactive learning materials supplemented with narration. Visual elements, including animated graphs, figures and video extracts, are used to enhance the learning experience of students. Each module last for 10 – 15 minutes. The modules are all animated graphics supplemented with images, videos and narrations to enhance students' learning experiences. The modules are hosted to department's server and students can access the materials online using desktop computer or mobile devices. Other than watching the materials passively, interactive activities are designed to allow student to learn by exploring. After a theory or a concept was explained in the modules, students are required to explore through these activities and to gain a deeper understanding.


































































The six micro-modules provide basic knowledges related to three lectures in GRMD3104 Satellite Image Analysis. Students were provided web links to gain access to the micro-modules and they were required to study the contents before a particular lecture. During lecture time, a flipped classroom pedagogy was adopted for half teaching period to allow discussion among students on related topics in order to gain better and thorough understanding of contents covered in the micro-modules.

In the end of the semester, an centralized questionnaire survey was conducted to collect feedbacks and comments from students in form of open- and closed-end questions. Apart from questionnaire, feedbacks were collected through personal talk with students in some lectures. One important feedback from students is to add subtitles to enhance learning experiences. Additional time and financial resources were applied to accomplish the task.

Questionnaire Survey for E-Learning

Study Programme	<input type="checkbox"/> Undergraduate <input type="checkbox"/> Postgraduate
Year of Study	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> Others
Gender	<input type="checkbox"/> Male <input type="checkbox"/> Female
Major	
Course Code	
Course Name	
E-Learning Components Experienced in Course	<input type="checkbox"/> Bloomberg Terminal <input type="checkbox"/> Digital fabrication tools <input type="checkbox"/> E-workshops <input type="checkbox"/> UReply <input type="checkbox"/> Location-based mobile assisted learning <input type="checkbox"/> Studio-based learning <input type="checkbox"/> Video-taped lectures <input type="checkbox"/> Micro-modules <input type="checkbox"/> Others (Please specify): _____

Please shade the most appropriate answer       

Please select the option that best matches your e-learning experience		Strongly Agree				Strongly Disagree
1.	E-learning materials made the course interesting.					
2.	E-learning materials have provided me with basic understanding of the subject.					
3.	E-learning materials are necessary.					
4.	E-learning materials have helped me track my learning progress.					
5.	E-learning materials have facilitated in-class discussions and activities.					
6.	E-learning materials have motivated me to learn more about the subject.					
7.	E-learning materials applied in the course were comprehensive.					
8.	E-learning materials have helped me achieve my learning goals.					
9.	I applied knowledge learned from the e-learning materials to my studies.					
10.	I know how to locate additional learning materials.					
11.	I enjoyed using the e-learning materials.					
12.	The university is equipped with sufficient facilities to enable access to the e-learning materials.					
13.	I have discussed the e-learning materials with peers.					

Please rank your satisfaction for each of the areas about the e-learning components		Highly Satisfied		Highly Unsatisfied		Not Applicable	
14.	Length						<input type="checkbox"/>
15.	Speed						<input type="checkbox"/>
16.	Easiness in using						<input type="checkbox"/>
17.	Graphics and animation						<input type="checkbox"/>
18.	Narration						<input type="checkbox"/>
19.	Interactive activities						<input type="checkbox"/>
20.	Assessments / Quizzes						<input type="checkbox"/>

21. Circle **three** most relevant words from the following terms that you think reflect your e-learning experience.

Time-consuming	High-tech	Interactive	Effective
Interesting	Boring	Fun	Confusing
Informative	Useful	Low-tech	Motivational
Unrelated	Distracting	Dull	Repetitive

22. Have you shared the e-learning materials with students from other departments / faculties / divisions?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> Not Applicable
23. Have you discussed the e-learning materials with students from other departments / faculties / divisions?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
24. Would you recommend the course to other students because of the e-learning materials?	<input type="checkbox"/> Yes	<input type="checkbox"/> No	
25. Do you prefer using your computer or mobile phone to access the e-learning materials?	<input type="checkbox"/> Computer	<input type="checkbox"/> Mobile Phone	<input type="checkbox"/> Not Applicable

26. What do you like most about the e-learning materials?

27. In which area(s) do you think the e-learning materials can improve?

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End of Questionnaire