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: A Flipped Classroom of System Dynamics Modelling for Public Health
Principal supervisor: Prof. Chong Ka Chun
Co-supervisor(s): Prof Benny Zee, Prof Maggie Wang, Prof Chung Pui-hong
Department / Unit: The Jockey Club School of Public Health & Primary Care
Project duration: From May 2017 to April 2018
Date report submitted: 27.5.2018

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?
The primary objectives of this series of micro-modules are to let students understand: 1. concepts in system dynamics (SD) methodologies, 2. how system dynamics modeling can approach public health issues and 3. how to use SD modeling to answer real-world research questions.

The flipped classroom can meet its objectives. Our online tutorials can i. introduce basic system dynamics concepts (Objective 1), and ii. demonstrate and explain how the SD modeling approach could answer questions on public health policy evaluation, which covered disease transmission dynamics, population growth and emergency service utilization (Objective 2 & 3).

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?

Totally 5 micro-modules are produced. They are used by two courses mainly, namely the Introduction to Biostatistics (PUBH6001/BIOS5001) and Health System and Policy (PUBH6003). The former teaches basic knowledge of using statistical methods on their research, and the latter teaches principles of health policy and healthcare management. Yet, students found i. it was hard to apply statistical knowledge to health research problems, ii. a lack of connections between two disciplines – biostatistics and policy research.

We would teach the system dynamics (SD) modeling approach for solving public health issues. SD modeling can approach the dynamics that characterizes a public health issue, and is easy to use and widely used in addressing questions on health policy and interventions. Our micro-modules can address the two issues (i, ii).

The deliverable for each module is an online video, which i. introduces SD concepts and/or skills, and/or ii. pose a public health research question/ scenario of an issue and demonstrate how to address it by SD modeling on a free software Vensim. The duration of each module is summarized below:

No.	**Micro-module**	**Duration of each module (min:sec)**
1	Basic concepts of system dynamics models	11:09
2	System dynamics in infectious diseases transmission (I) - causal loop diagram	08:42
3	System dynamics in infectious diseases transmission (II) - stock and flow	19:52
4	Population model	08:48
5	Patient flows in an emergency department	15:10
	Total	1 hour 3 min 41 sec

The nature of our main deliverable has not been changed, as we have taught SD modeling concepts and demonstrated how to apply them using a free software, all of which were delivered through online videos. Yet on the platform for video release, we set up a central webpage hosting the micro-modules instead of releasing them on Blackboard, and thus the videos can be accessed without account names and passwords. The main way to practice SD modeling is to download the software, follow our instructions on the video and get the results of SD modeling themselves.

The timeline of micro-module production have been partially adjusted. For modules 1-3, they have been produced and released timely (i.e. on October). For modules 4-5, they were to be

produced on December, as the proposal indicated, yet they were produced and disseminated finally on early-May, 2018. The whole series of 5 micro-module were produced.

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 is two-fold, consisting of the interim evaluation and the final evaluation. The interim evaluation was completed as proposed: 5 students were invited to provide opinions on 6 pre-set facets of the micro-module. Details on the interim evaluation can be found in the interim report and the feedback are summarized here. Feedback indicated that overall, the first three micro-modules were practical, well-organized and illustrated clearly, yet improvements could be made on content delivery (e.g. outline and subtitles) and visual impacts (e.g. focus on small or vague diagrams was needed).

In view of students' needs for outlines, bullet points (instructions) and handouts, we have, in the new module 4 and 5, added word boxes on i. titles for sub-section, ii. structure of the program, and iii. step-by-step instructions such that they can understand the modules' structure and program's instructions. These annotations are comprehensive and serve to illustrate the module as handouts do. For modules 4-5, titles are made smaller and icons in the software demonstration are magnified.

For final evaluation, contrary to the proposal, we did not conduct a survey but collect students' feedback by inviting them to leave their comments on the 6 pre-set facets after watching the videos. Ten students have provided detailed and comprehensive comments in a more rigorous manner than ordinary students in a survey would.

Overall, the micro-modules give a first impression that contents are simple and easy to understand, with a clear layout. After watching the online video, they could understand the SD modeling concepts and how to apply SD modeling skills using software. The workload is appropriate and moderate. Some expect themselves using the modeling skills in future similar problems. Strengths are found on the contents being simple and useful, the concepts clearly explained, and software applications, which are based on diverse examples, being clearly illustrated with step-by-step instructions given (Ch 4 and 5). Yet weaknesses are found on some diagrams being too vague and some examples being difficult. Suggestions mainly focused on clearer diagrams and on provisions of useful web links, literature and exercises after each chapter. Details of the feedback are provided below:

Assessment criteria	Comments
First impression	1. A useful and practical topic 2. The content is simple and easy to understand 3. Software demonstration is easy to follow 4. The layout is clear
Impacts to their learning	1. Able to understand the concepts, principles and skills of SD modeling quickly 2. Able to learn how to apply SD modeling approach in the software Vensim for their research
Workload	1. Appropriate and moderate 2. Short duration, but more time is needed to understand the concepts and applications
Strength and weakness	**Strength:** **Software application:** 1. Clear step-by-step instructions on using software 2. Example problems for software demonstrations are well-chosen **Content:** 1. Content is simple, straightforward, clearly explained and very useful 2. Thorough explanation of terms 3. Examples for software demonstration are well-chosen 4. The flow of contents is good **Overall:** 1. Practical and relaxing 2. Good and understandable 3. Useful material covered 4. Help acquiring knowledge and skills quickly 5. Accessible and convenient 6. Clear deliverance of information **Weakness:** **Visual presentation:** 1. Diagrams are too complicated 2. Diagrams are vaguely shown sometimes 3. Words are quite small occasionally **Content:** 1. Some examples in Ch3 and Ch5 are hard to understand, in terms of the SD modeling concepts and applications; some in Ch1 are hard to comprehend as well

	2. Wordings are too complicated for non-major students 3. Speaking speed may be too fast occasionally
Expectations	1. Able to use SD modeling in similar problems in later public health research 2. Able to be familiar with the usage of software
Additional comments and improvements	**Visual presentation:** 1. Clearer and larger diagrams 2. More diagrams to be added in the introduction 3. Magnify the screenshot for chapter 2 and 3 **Content:** 1. Explain with examples after definition 2. Briefly show the expected outcome of the application at the beginning 3. Add more examples of SD modeling **Additional provisions:** 1. Useful links to webpage and literatures to be added after video 2. Exercise and answers to be provided after video 3. Script and catalog to be provided

Students expressed that after watching the online video, they could understand SD modeling concepts and principles. Through the online micro-modules our Objective 1 on enabling students to learn concepts was achieved. They also expressed that they learnt SD modeling skills and how to apply them to the example problems. They would expect themselves using the skills to their future research. Thus our Objective 2 and 3 on enabling students to understand application of SD modeling and to use the skills on software to solve real-world problems, respectively, were also achieved.

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.

Dissemination

The series of micro-modules, in the form of online tutorial, are disseminated through a central webpage (http://micromodule17.comuf.com/Ch1_DM.html), with one subpage for each

chapter. To encourage targeted students (PUBH6001/BIOS5001 and PUBH6003) to access the video, links of the subpage were provided to them through email and in class.

To encourage more fellow staff and school mates to understand our pedagogy, we made a same-titled poster for exhibition on the Teaching and Learning Innovation Expo 2018.

Diffusion

The major platform for diffusion to organizations and personnel external to our School would be through the Teaching and Learning Innovation Expo 2018 and the derived online poster.

Impact

The SD modeling techniques we taught can model the dynamics of a system, which can be health-related (e.g. disease dynamics, care management, A&E service flow) or non-health-related. The principles were the same for all discipline, so as the procedures of modeling in the software Vensim.

Although the questions we solved by using SD modeling in Vensim are all health-related, students from other disciplines where service delivery models are concerned would find our way of modeling the A&E service and analyzing its simulation result useful. Even when some teaching staff may not find the content useful, the way we structure the modules, the delivery style and dissemination mode would also cast some light on how to set up a micro-module on SD modeling for their own disciplines, as long as they need to solve issues that shall be approached from the perspective of system dynamics (e.g. ecology).

PART II

Financial data

Funds available:

Funds awarded from MMCDG	$	52,898.00
Funds secured from other sources (please specify_____)	$	0.00
Total:	$	52,898.00

Expenditure:

Item	Budget as per application	Expenditure	Balance
Student helper	50,634.00	50,630.95	3.05
Computer Accessories	2,264.00	2,263.80	0.20
Total:	52,898.00	52,894.75	3.25

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?*

With this series of micro-modules produced, we would continue encouraging students from PUBH6001/BIOS5001 and PUBH6003 to learn the SD modeling technique outside classroom. We would further refine our modules if substantial factors affecting courseware delivery were identified.

Instructors' experience in the SD modeling field was the main key success factor. He was responsible for delivery of SD concepts and demonstration of software application. Thus the concepts could be taught and the techniques demonstrated clearly, partially thanks to the user-friendliness of the software, simplicity of the example demonstrated and the brevity of the concepts that are chosen to be included in this micro-module.

We faced difficulties in producing all the micro-modules in a timely manner, as the proposed deadline for the production of modules 4 and 5 were not met. Fortunately, modules 4 and 5 were case examples for which skills taught in modules 1 to 3 were demonstrated, with few if not none additional new skills taught. In view of the delay, we produced 4 and 5 within in a short period of time while enhancing some features as the interim suggested.

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: System dynamics modeling

Keyword 2: Public health

Keyword 3: Health policy research

Keyword 4: Online tutorials

(Least relevant) Keyword 5: Software application demonstration

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.* http://micromodule17.comuf.com/Ch1_DM.html
(b) **Webpage(s):** *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.* http://micromodule17.comuf.com/index.html
(c) **Tools / Services:** *If you have used any tools or services for the project, please provide names of the tools or services in here.* 1. A laptop (re-using from previous MMCDG project) for video production 2. Software Camtasia Studio for desktop screen recording and video editing 3. A free webpage host (000webhost) for hosting courseware website
(d) **Pedagogical Uses:** *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.* The flipped classroom consists of a series of online tutorials on system dynamics (SD) modeling. The mode of teaching is mainly unilateral deliverance of course content and software demonstration, which might involve students downloading their own version of software and practicing the examples themselves. Online videos, the main deliverables, teaches concepts and demonstrates examples, and allow students to access them outside classroom, at any time of their convenience. Learning the SD modeling techniques in the flipped classroom, where the course contents are

delivered in the same structure of a face-to-face class, allows students to follow the instructions more closely by pausing the video as they wish.
(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.

Course Code/ Target Students	**Term & Year of offering**	**Approximate No. of students**	**Platform**
PUBH6001/BIOS5001	All 1st year postgraduate students	130	Micro-module 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)	0
(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	1
(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**
(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) Poster	1

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.

Introduction

The Flipped Classroom of System Dynamics Modelling for Public Health is a series of micro-modules on concepts and applications of the much-needed system dynamics modeling techniques, delivered through online videos on a central webpage.

Rationale and objectives

In the JC School of Public Health and Primary Care, postgraduate students take PUBH 6001: Introduction to Biostatistics and PUBH 6003: Health System and Policy, but they found it hard to apply statistical techniques to policy health research questions, as practical applications of statistical tools to health policy evaluations are indeed lacked. Students also need more connections between the two disciplines.

As a result, we teach the system dynamics (SD) modeling approach for solving public health issues. SD modeling can approach the dynamics that characterizes an event or intervention, and is widely used in addressing health policy questions.

The primary objectives are to let students understand: 1.concepts in system dynamics (SD) methodologies, 2.how system dynamics modeling can approach public health issues and 3.how to use SD modeling to answer real-world research questions.

Deliverables and outcomes in achieving the objectives

We teaches SD techniques through online videos. Five chapters are produced and uploaded to a central webpage (http://micromodule17.comuf.com/Ch1_DM.html).

Outcome

In each of the video, we i. introduce SD concepts and skills, and/or ii. pose a public health research question/ scenario of an issue and then demonstrate how to address it by SD modeling on a free software Vensim. Thus our objectives on i. introducing basic concepts (Objective 1) and ii. demonstrating applications (Objectives 2 and 3) can be achieved.

Timeline

For modules 1-3, they were produced timely on October, 2017. For modules 4-5, they were produced on early-May, 2018, in contrast to December as proposed. Fortunately, modules 4 and 5 were case examples for demonstration of previously-taught skills.

Evaluations

We have conducted both interim evaluation and final evaluation. Ten students gave comprehensive written comments for final evaluation. Overall, contents are simple and easy to understand, with a clear layout. After watching the online video, they can understand the SD modeling concepts and how to apply SD modeling skills using software. The workload is appropriate and moderate. Some expect themselves using the modeling skills in future similar problems. Strengths are found on contents being simple and useful, concepts clearly explained, and software applications being clearly illustrated with step-by-step instructions given (Ch 4 and 5). Yet weaknesses include some diagrams being too vague and some examples being difficult. Suggestions mainly focused on clearer diagrams and on provisions of useful web links, literature and exercises after each chapter.

Dissemination and diffusion

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Conclusion

We teaches SD modeling skills and its applications through online tutorials. The flipped classroom provides student an opportunity to learn outside classroom with their own pace and help them understanding basic and general concepts and applying skills to practice.

Video

The video report can be found on: https://youtu.be/dKZJyxAiwg8.