THE CHINESE UNIVERSITY OF HONG KONG

Micro-Module Courseware Development Grant

Scheme 1: Basic Scheme

<u>Final Report (2015-16)</u>

Report due 31 December 2016
Please return by email to The Ad hoc Committee on Planning of eLearning Infrastructure
<u>mmcd@cuhk.edu.hk</u>

<u>PART I</u>

Project title: A Flipped Classroom of SAS Programming for Statistical Analysis in Public Health
Principal supervisor: Prof Marc Chong Ka Chun
Co-supervisor(s)
Department / Unit: Division of Biostatistics, JC School of Public Health and Primary Care
Project duration: From January 2016 to December 2016
Date report submitted: 29 December 2016

1. Project objectives

In view of the insufficient class time and out-class support on statistical programming methodologies as an essential skill for public health students, the project aims to develop a flipped classroom model to encourage students gaining SAS programming knowledge outside classroom along with practical biostatistics questions.

The existing BIOS5001 and BIOS 5002 courses have the class time predominately used to teach biostatistics theories supplemented with several tutorials on SPSS – a paid statistical software with limited analytical approaches. Students then had to spend extra time in libraries of CUHK to complete their assignments, causing significant inconvenience to the part-time students with full time jobs during daytime. Despite the inaccessibility of the software, there existed a gap between in-class knowledge acquisition and hand-on practice of real-life problems, as reflected by the students' feedback on the lack of practical examples due to limited teaching duration in lectures.

Based on the two major needs, the micro modules are developed to teach students using the free Statistical Analysis Software (SAS) as a tool for analyzing public health data at home and thus allowing more flexibility in-class teaching from flipped class learning.

According to opinions collected from the students in the interim focus group evaluation, the objectives of the flipped classroom model are well-received and on the right tract, as students

are willing to learn new skills, especially for its assistance on their assignments. Most students gave positive evaluations on the intention of the flipped classroom.

2. Process, outcomes or deliverables

Process

Each micro-module is developed through the process of:

1) Preparing the course content, including both the presentation slides on conceptual background and the screen-recordings for practical SAS problem-solving demonstrations, by the principle supervisor;

2) Producing teaching videos on each module comprising of several statistical methodologies – each with a delivery structure of, first, several presentation slides on background information, usage and syntax, secondly, a screen-recording of SAS program window for practical problem-solving demonstrations on the respective statistical methodology and, thirdly, annotations on the structure, meaning and remarks of the programming statements and analysis results interpretation.

3) Uploading the updated information, teaching videos and related materials – the dataset for each demonstration, for example – to the central webpage specifically set up for micro-modules

Outcomes and deliverables

Upon the establishment of the complete Phase I micro-modules development, seven micro-modules comprised of ten videos have been produced for, disseminated to and accessed by students of BIOS 5001 and PUBH 6001. Each micro-module's topic, content and subpage's link are listed below.

No	Micro-module	Objective and content of the module	Link to subpages
1	Basic SAS programming skills	To teach students some basic SAS programming syntax like DATA steps and operating functions.	http://micromodule16. comuf.com/Chapter% 201_3.html
2	Prepare an analysis-ready dataset for public health research	By using some common problems in medical data (e.g. coding problem and missing data), to demonstrate how student could use SAS DATA steps to prepare their dataset fitted for analysis purposes	http://micromodule16. comuf.com/Chapter% 202.html
3	Compare population means: Blood pressure example	To demonstrate how to use UNIVARIATE, TTEST, and ANOVA procedures in SAS to compare means by t-tests for (i) one population, (ii) two independent population, (iii) two dependent population	http://micromodule16. comuf.com/Chapter% 203.html

4	Compare proportions: Chemotherapy adverse events example	To demonstrate how to use FREQ procedure in SAS to compare proportions by independent groups (chi- square test) and dependent groups (McNemar test)	http://micromodule16.comuf.com/Chapter%204.html
5	Hypothesis testing for small samples: Applications in genetic studies	To show how to use FREQ procedure in SAS to compare proportions by Fisher's exact test and use NPAR1WAY procedure to perform the rank-sum and sign-rank tests	http://micromodule16.comuf.com/Chapter%205.html
6	Linear regressions: Applications in measuring the relationships between ages and medical	By making use of a public health research, to demonstrate how to use REG and GLM procedures in SAS to draw simple linear regression between medical expenses and age, and multiple linear regression for multiple predictors.	http://micromodule16.comuf.com/Chapter%206.html
7	Adjust baseline covariates using analysis of covariance (ANCOVA): An acupuncture clinical trial example	In most of clinical trials, adjusting baseline covariates is a common method to provide independent effects on associations. This module aims to demonstrate how to apply GLM procedure in SAS to draw a regression analysis.	http://micromodule16.comuf.com/Chapter%207.html

Conclusion

Overall speaking, the micro-modules development – spanned from the course material preparation, online video production to dissemination platform set-up – has been completed satisfactorily.

3. Evaluation Plan

In the interim focus group comprised of 3 professors and 4 students, feedbacks were generally positive with sufficient evidence to ascertain that course objectives had been achieved. Among several improvement suggestions on the video's duration, subtitle provisions and hard-copy notes provisions, adjustments on shortening the video's durations have been made.

A course-based questionnaire had been distributed to students of BIOS 5001 - users whom the micro-modules have been primarily designed for – on their knowledge, usage and need for the flipped classroom. On general knowledge on and access to the micro-module homepage, 39% (n=49) of respondents had previous knowledge on the flipped classroom, among whom 37% (n=18) had accessed the micro-module homepage and watched the teaching videos, prompting a call for more promotions to be done on both the SAS software and the micro-module on the basis of related student comments, low usage rate and software

installation rate (n=25; 20%). Despite the practical need for more accessible software – as 57% (n=65) of respondents have spent extra time staying in CUHK's faculties for assignment completion while 55% (n=61) agree that the free SAS software can help such assignment completion process, only a small proportion (n=10; 9%) has used the software to complete assignments, indicating that the micro-module shall be further promoted with a stronger academic incentive on SAS usage being provided.

On content deliverance, 86% and 79% of the respondents (n=14) respectively agree that the micro-modules can explain concepts clearly and that they are well-organized and prepared, confirming that an appropriate structure for content deliverance is adopted. On the flipped classroom pedagogy, 76% (n=13), 64% (n=9) and 59% (n=10) agree that micro-modules give additional knowledge outside classroom, that they increase students' interest in the related field of studies, and that they enhance understandings on the existing lectures respectively, ascertaining that the objective on the flipped classroom bridging in-class knowledge acquisition and outside-classroom learning has been considerably achieved. Overall speaking, the micro-modules are easy to use (n=12; 67%) and yield an overall satisfactory rate of 79%.

During the University's Teaching and Learning Innovation Expo 2016 where this flipped classroom model is also presented, other presenters had also acknowledged the micro-modules' objectives and methodologies in addressing the above-mentioned teaching needs.

4. Dissemination, diffusion and impact
Course material - spanned each module's objectives, ten online videos in total, dataset and references – are available on a one-stop central webpage with seven subpages for each module: http://micromodule17.comuf.com/

Given the link to the central webpage, students in relevant public health disciplines – by enrollment of BIOS 5001 and PUBH 6001 – can gain full access to the online videos on SAS programming techniques and related material.

Despite the course material deliverance to students, the micro-module pedagogies are summarized and presented as one of the poster exhibitors in the CUHK Teaching and Learning Innovation Expo 2016 from 16 Dec 2016 to 23 Dec 2016, whereas the online version of the poster can be found on https://drive.google.com/file/d/0B8ihXpMZnI52aVJWZnlPVHRFSEE/view?usp=sharing.

With the course content based on essential statistical analysis skills applicable to many evidence-based fields, not only can the modules be used for other students' needs, but the

module's organization, video production methodology and material dissemination platform can be adopted by related courses in needs of a flipped classroom bridging the gap between in-class knowledge acquisition and outside-classroom problem-solving.

PART II

Financial data

Funds available:

Funds awarded from MMCDG	$	39,740.00
Funds secured from other sources (please specify_____)	$	0.00
Total:	$	39,740.00

Expenditure:

Item	Budget as per application	Expenditure	Balance
Student helper	$31,324.16	$31,185.00	$139.16
Camtasia Studio	$1,417.84	$1,417.84	$0.00
Touchscreen laptop	$6,998.00	$6,998.00	$0.00
Total:	$39,740.00	$39,600.84	$139.16

PART III

Lessons learnt from the project

The way forward: Subsequent to the complete establishment of the Phase 1 micro-modules development based on statistical analysis techniques relevant to theories taught in BIOS 5001 and BIOS 5002, the micro-modules are to be disseminated and adopted for a boarder spectrum of courses offered by the Jockey Club School of Public Health and Primary Care if positive responses have been well-received.

The role of other units in providing support:

1. Seven openings of each module have been recorded with the impressive and professional recording services from the Centre for eLearning Innovation and Technology (ELITE) in Jan 2016.

2. Equipment purchase: one laptop was purchased from ITSC and the software license of Camtasia Studio was purchased after consultations with ELITE.

3. Teaching pedagogy workshop: A workshop on usages of Camtasia Studio as a versatile pedagogical tool for flipped classroom development are conducted, with detailed and interactive introduction on all the relevant functions, including the video-recording, editing and SCORM package dissemination features, needed for modules development.

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: flipped classroom

Keyword 2: biostatistics

Keyword 3: statistical analysis

Keyword 4: SAS programming

(Least relevant)   Keyword 5: public health

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:** http://micromodule17.comuf.com/
(b) **Webpage(s):** *Nil, yet a brief introduction has been included in the above-given homepage of project website.*
(c) **Tools / Services:** The software specially designed for screen-recording named Camtasia Studio is used for the video production spanned from recording of the presentation slides and SAS programming window, editing, annotating and publishing the video into readable files. Adobe Dreamweaver was used for setting up the central webpage as course material dissemination hub, where modules are organized into seven subpages – each comprised of the objectives, online teaching video shared through the Youtube plug-ins available on the webpages and relevant downloadable datasets.

Professional recording services for each module's opening addresses given by the principle supervisor are provided by the Centre for eLearning Innovation and Technology (ELITE).

(d) **Pedagogical Uses:**

A flipped classroom model is adopted. Given the main objectives as to encourage students gaining SAS programming knowledge outside classroom along with practical biostatistics questions with better accessibility and flexibility, teaching material contents – both the background information and practical problem-solving examples for each statistical analysis skill – are embedded in ten online videos for seven micro-modules, which are made available on a central webpage for full accessibility.

(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>
BIOS 5001	1st term 2016	115	Website
PUBH 6001	1st term 2016	13	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)	Nil
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	Nil
(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)	Nil
(e) In international conference	Nil
(f) Others (please specify)	Nil

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

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.

Background and Motivation
Given the paramount significance of data analysis in all evidence-based studies, empowering students with both the statistical theories and their applications is undoubtedly crucial. an interactive course is therefore developed in form of a flipped classroom, where the back-and-forth conceptual understandings and practices of statistical analysis skills are facilitated through easily accessible course material and free statistical software.

The Flipped Classroom Approach
Based on self-paced online videos and the widely-used Statistical Analysis System (SAS) software, which is freely available to every student, the Flipped Classroom of SAS Programming on Statistical Analysis in Public Health consists of seven micro-modules about statistical methodologies. The micro-module first describes the concepts, uses and syntax of each statistical theory, and is followed by the respective programming demonstration as a practical example on the SAS usage. The videos for each micro-module and the datasets used in the demonstrations have been made available on the flipped classroom's central webpage (http://micromodule16.comuf.com/Index.html).

Structure of Online Video
Each online video is structured as follows: 1) statistical concepts are first introduced; 2) their applications in SAS are illustrated through presentation slides describing the methodological background; 3) practical programming demonstrations on the SAS software interface. The videos are sound-illustrated and recorded by screen-capturing software, after which color-coded annotations are added to explain the motivation, structure and syntax of each program statement. Last but not least, data interpretations on the software are made for the clear delivery of SAS programming procedures and their statistical meanings.
Once complete, the videos are uploaded to a micro-module webpage, which has specifically been set-up as a central hub with all seven micro-modules and their related material instantly

available to the students of relevant need of the analysis skills.

A short video introducing the micro-module development is available at:
https://youtu.be/5TT83PK0kZ8