THE CHINESE UNIVERSITY OF HONG KONG

Micro-Module Courseware Development Grant

Scheme 2: Studies in Foundation Courses

Final Report (2017-18)

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: Meeting safety needs through virtual reality apps

Principal supervisor: Prof. Cho Lee Wong

Co-supervisor(s): Ms Hau Yi Ngan and Mr Hai Kiu Cheng

Department / Unit: The Nethersole School of Nursing

Project duration: From December 2017 to October 2018

Date report submitted: 31 October 2018

1. Project objectives

This project aimed to develop four micro-modules that covered two major topics in a first-year nursing course, "Fundamentals of Nursing I". The objectives of this project were (1) maximize students' learning by allowing them to learn at their own pace with the use of micro-modules; (2) support flipped classroom implementation in the course; and (3) engage students in an active learning environment. The two topics were "Meeting safety needs" and "Ensuring a safe and comfortable environment for care". These two topics were chosen because they contained a mixture of knowledge and concepts which were more appropriate to learn by engagement in problem-solving scenarios and interactive activities.

The project has been completed and the project objectives have not been changed.

2. Process, outcomes or deliverables

The project has been completed satisfactorily. Four micro-modules that covered two major topics "meeting safety needs" and "ensuring a safe and comfortable environment for care" have been produced and used in the course NURS 1162 Fundamentals of Nursing I. Besides, one of the micro-module (identify extrinsic factors for fall in home setting) was also introduced and used in the course NURS 1151 Development of Nursing. The four micro-modules and duration of each in terms of students online contact hours were described as below.

Topic: Meeting safety needs

Meeting safety needs of patients is the fundamental concern of all health care professionals. In particular, fall and related injuries are an important issue across the care continuum. The objective of the micro-modules were to enable students to identify risk factors, conduct assessment, and implement measures to prevent patients from fall in the hospital settings and at home. The objectives were consistent with the aims of the course which was to equip students with the foundational knowledge and essential nursing skills for promoting the health and wellness of clients. Three micro-modules were related to this topic.

Micro-module 1: Identify intrinsic factors for fall

A four minutes cartoon animation (with narration) has been produced. In this animation, there was a cartoon character (83-year-old lady) presented with various problems (e.g. impaired mobility, polypharmacy, and fear of fall). Students were required to identify her intrinsic factors for falls. This micro-module covered 30 minutes of online contact hour in the form of eLearning.

Micro-module 2: Conduct fall risk assessment

A five minute animation was produced to guide students step-by-step in conducting the "Morse Fall Scale" for a patient. This component covered 30 minutes of online contact hour in the form of eLearning.

A virtual reality (VR) application was produced. The VR application consisted of micro-module 3 and 4.

Micro-module 3: Identify extrinsic factors for fall in home setting

For micro-module 3, it was presented in the VR application which included a virtual home environment demonstrating various extrinsic factors for falls. Students were required to identify these factors and to consider appropriate interventions for each. This micro-module covered 1 hour of online contact hour in the form of eLearning.

Topic: Ensuring a safe and comfortable environment for care

Identifying the risks to health care providers' health and safety in healthcare settings are very important. The objectives of this micro-module was to enable students to understand various risks in hospital that may threaten their health and to implement strategies to ensure a safe environment for care. The objective was consistent with another aim of the course to promote students understanding of the application of basic principles and knowledge underlying the performance of essential nursing skills. The details of the micro-module was described below.

Micro-module 4: Identify various risks that threatened patients and health care providers' health in hospital setting

For micro-module 4, it was presented in the VR application which included a virtual hospital environment demonstrating various risks for patients and health care providers. Students were required to identify these factors and to implement appropriate interventions to reduce the risks. This micro-module covered 1 hour of online contact hour in the form of eLearning for this topic. The virtual reality (VR) application is available on respective app stores.

Apps on Google Play

https://play.google.com/store/apps/details?id=hk.edu.cuhk.med.safetynurses

itunes.apple.com

https://itunes.apple.com/us/app/safety-nurses/id1437490728?ls=1&mt=8

3. Evaluation Plan

The evaluation plan comprised quantitative surveys and qualitative interviews. Quantitative survey was designed and delivered to students after completion of the course. However, as the VR application were not yet ready for use before the scheduled lecture, so that the quantitative survey for the evaluation of perception and satisfaction of micro-modules did not cover the VR application. Nevertheless, qualitative data related to the perception of the developed micro-modules (including the VR application) were collected by interviews. Students were deliberately asked to reflect on their general perception and satisfaction toward the developed micro-modules as well as flipped classroom teaching, and to make suggestions for change.

Data analysis has been conducted and indicated that the objectives of this project have been achieved. A brief summary of the results were shown as below.

Results of student surveys:

The "Satisfaction with Micro-modules and Flipped Classroom" is a self-developed questionnaire employed to evaluate the students' perception and satisfaction toward developed micro-modules and the flipped classroom teaching. It consists of 10 items and the responses are gathered using 5-point Likert scale ranging from (5) 'strongly agree' to (1) 'strongly disagree'. Students were invited to complete an evaluation of this questionnaire at the end of the course. SPSS version 24.0 (SPSS, Chicago, IL, USA) was used for data analysis.

There were 193 students enrolled in this course. One hundred and sixty-seven valid responses (79.1%) were received. The below table showed the satisfaction with micro-modules and flipped classroom as rated by the participants. In general, students found that the micro-modules enhanced their understanding on designated topics and helped them to learn at their own pace. Overall, they were satisfied with the implementation of flipped classroom. A majority of participants (88.6%) agreed that the micro-modules helped them to gain a better understanding of nursing knowledge and skills on the designated topics, and most of them (84.5%) agreed that the micro-modules helped them to learn at their own pace. Majority of students agreed that more micro-modules should be produced in the future.

	Strongly disagree (%)	**Disagree (%)**	**Neither agree nor disagree (%)**	**Agree (%)**	**Strongly agree (%)**
I enjoy viewing the micro-modules.	0.6	2.3	23.4	69.7	4.0
I usually view the micro-modules before coming to class.	1.7	20.0	32.6	41.1	4.6
The micro-modules help me to gain a better understanding of nursing knowledge and skills on the designated topics.	0	0.6	10.8	74.9	13.7
The micro-modules help me to learn at my own pace.	0.6	1.1	13.7	73.1	11.4
Knowledge gain through the micro-modules help me to contribute my views in class.	0.6	4.6	20.5	62.3	12.0
More micro-modules should be produced in the future.	1.1	5.7	30.3	50.9	12.0
The various in-class activities enhance my understanding on the designated topics.	0	1.1	12.0	72.0	14.9
The flipped classroom approach is more engaging and interesting in comparison to traditional lecture.	0.6	5.1	21.1	67.4	5.8
More flipped classroom teaching should be adopted in the future.	0	5.1	25.1	62.3	7.5
Overall, I am satisfied with the implementation of flipped classroom in the course.	0	1.1	10.3	77.7	10.9

Results of interviews:

A convenience sample of 20 students were recruited on a voluntary basis for the interview. These interviews were conducted between August to September 2018 after the course completed. Interviews were arranged at times convenient for those who agreed to participate. The interview captured the students' experience of flipped classroom and perception of micro-modules. Interview questions included "What is the most pleasurable aspect of the micro-modules?", "How the micro-modules facilitate your understanding of the concept in each topic?". All the interviews were conducted in Cantonese and tape-recorded. After the interview, the tape was transcribed verbatim by student helpers. Two categories emerged from the data: increased interest in learning and preferred format of micro-modules.

Increased interest in learning

A majority of students appreciated the flipped classroom approach and commented that '*I enjoy flipped classroom',* and '*This new approach is good for our learning*'.

When asked about the reasons they liked flipped classroom, many students said that they appreciated the interaction and communication between teachers and students during lectures. In addition, students commented that the class became less boring with flipped classroom. According to the students, they used to sit in the classroom and listen to what the teachers said. Thus, chances for them to express their views and ask questions are low. However, with the utilisation of flipped classroom, they could take an active role in class.

Some students mentioned that the process of interactive discussion helped them think and analysed the information learnt in the pre-class study, which was useful in their application of knowledge to the discussion scenarios and even in future real clinical situations. Students also enjoyed receiving immediate feedback from teachers because misinterpretations of the topics could be identified and corrected. Nevertheless, few students expressed that they were in favour of the traditional teaching approach instead of flipped classroom because they preferred teachers taught and listed the key concepts of each topic.

Preferred format of micro-modules

Many students (n=15) indicated their preferences for flipped classroom modules. They also provided suggestions for increasing the attractiveness of the modules. For instance, many students preferred and liked viewing the animations because these tailor-made animations were interesting. They said that the narrated animations were enjoyable because they enhanced their understanding on 'Morse Fall Scale' and helped them '*visualise the steps*' in performing fall assessments for the patients. With the use of animations, they were likely to view the modules completely.

Most students expressed they enjoyed using the VR application. Students commented that "*It is very interesting and entertaining*", and "*It is attractive! The home environment looks quite real*". With the use of VR application, they could interact with the virtual environment and apply what they have learnt. For examples, one student said the VR home scenario helped

her to think about the areas that she has to pay more attention to when conducting the home visits. Some students liked the messages that "pop-out" after selecting the correct answers because they helped them to understand and memorize the interventions. Few students suggested that more VR applications should be developed and the content could focus on nursing skills such as wound dressing or intravenous infusion.

4. Dissemination, diffusion and impact

The micro-modules produced in this project have been used in a Year 1 Term 2 course titled NURS 1162 Fundamentals of Nursing I. One of the micro-module related to meeting safety needs has also been shared and used in another Year 1 Term 1 course titled NURS 1151 Development of Nursing in this academic year. In addition, the micro-module of "conduct fall risk assessment" can be shared in other nursing clinical courses to provide opportunities for students to review before clinical practicum. Besides, the micro-modules can be used in other post-graduate nursing courses. For instance, the developed micro-modules in this project will be used in a Year 1 course titled NURS 6202 Fundamentals of Nursing II in the coming academic year.

As flipped classroom will continue to be implemented, the results of the current project will provide important information and help motivate teachers to produce micro-modules to facilitate flipped classroom implementation in other nursing courses. As the micro-modules will be uploaded to the CUHK eLearning platform, they also help promote the use of eLearning in foundation courses to address the diverse learning needs of students. Students can make use of the eLearning platform to view the contents of the micro-modules at the own time and their own pace. Therefore, the micro-modules enable students to familiarize themselves with the use of eLearning in their studies.

We will continue to share our experiences in flipped classroom implementation and micro-modules development in local, regional, and international conferences. Poster and oral presentations have been submitted to the CUHK "Teaching and Learning Innovation Expo 2018". The title of the presentation is: Meeting safety needs through virtual reality apps. Another abstract will also be submitted to an international conference related to Medical Education.

PART II

Financial data

Funds available:

Funds awarded from MMCDG	$	$65,560
Funds secured from other sources	$	0
(please specify_____)		
Total:	$	$65,560

Expenditure:

Item	Budget as per application	Expenditure	Balance
Courseware development service (by ITSC)			
Two animations	$ 39,060	$ 39,060	0
VR App development with 2 scenarios	$ 19,800	$ 19,800	0
VR googles for demo	$ 330	$ 290	$ 40
Poster and PowerPoint template design	$ 2,520	$ 2,520	0
Others			
Student helpers to collect quantitative data and transcribing qualitative data	$ 3,850	$ 3,291.75	$ 558.25
Total:	$ 65,560	$ 598.25	$ 598.25

PART III

Lessons learnt from the project

With the experiences gained from this project, we will continue to produce micro-modules in other nursing courses to support flipped classroom implementation. Workshops have also been conducted by the IT team of the School to introduce user-friendly software for producing and recording mini-lectures.

The success of this project lies on the effort of our dedicated course teachers. We have spent long time to draft the content and scripts for the animations and VR application. Besides, we have good planning prior to the project commenced. For instances, several teaching team meetings were held before the course commenced to determine the format of micro-modules (eg. videos, scenarios, annotated lectures, discussion questions, quizzes). Another purpose of these meetings was to discuss how flipped classroom could be implemented and other in-class activities that could facilitate flipped classroom implementation. On the other hand, the students were informed that they would attend innovative and interactive lectures instead of the traditional didactic lectures during course introduction. The expected learning activities were also outlined. The students were reminded to study their pre-class learning materials before attending their classes.

However, we have encountered some difficulties in producing the micro-modules. We underestimated the time required to produce the animations and VR application. As we took months to draft and design the VR scenarios, the production of VR application was delayed and the application could not be employed in this academic year. To solve this problem, we used lecture notes and role play to replace the content of the application. Nevertheless, the VR application has been shared and used in a Term 1 course of this academic year for Year 1 students. Informal feedback from the students indicated that they found the content

interesting and could enhance their understanding and awareness on safety for patients as well as health care professionals.

We would like to suggest to CUHK that the project duration could be longer so that the project team could have more time to prepare and produce the micro-modules.

PART IV

Information for public access

1. Keywords

(Most relevant)	Keyword 1: Micro-modules
	Keyword 2: virtual reality
	Keyword 3: flipped classroom
	Keyword 4: nursing
(Least relevant)	Keyword 5: e-learning

2. Summary

Table 1: Publicly accessible online resources (if any)
(a) **Project website:** NA
(b) **Webpage(s):** NA
(c) **Tools / Services:** Tools: Storyline, Photoshop, Illustrator, After effect, Sound Forge, Animation, Muse, and Unreal game engine Services: From ITSC
(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 four micro-modules aim at facilitating students to gain preliminary concepts in the topics before class and support flipped classroom. The students were required to view the micro-modules before attending their classes to obtain a brief overview of the fundamental concepts that would be covered in the lecture. During the first 15 minutes of the lecture, the teachers reviewed all the important points presented in the micro-modules. The students were then divided into smaller groups to work collaboratively in discussing the content of the micro-modules. This session usually lasted between 15-20 minutes to allow the students to share their ideas and learn from peers. Afterward, one to two representatives from each group would be invited to present their group's findings to the class. Following the presentation, the teachers provided feedback to their students. Finally, the teachers presented a short yet in-depth summary of the discussed topic. With the use of micro-modules to support flipped

classroom implementation, course teachers can then make use of the class-time to further elaborate the contents and engage students to do in-class activities such as discussion and presentation thereby consolidating their knowledge.

(c) **Others (please specify):**
The virtual reality (VR) application "Safety+Nurses" is available on app stores including Google Play and itunes.apple.com.

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**
NURS 1162/ Undergraduate nursing students	Year 1 Term 2 (2017-2018/ 2018-2019)	200	Blackboard
NURS 6202/ Master of nursing students (pre-registration)	Year 1 Term 2 (2018-2019)	80	Blackboard and app stores
NURS 3159/ Undergraduate nursing students	Year 4 Summer term (2018-2019)	250	Blackboard
NURS 4122/ Undergraduate nursing students	Year 5 Term 1 (2018-2019)	250	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)	NA
(b) In workshop/retreat organized for CUHK teachers (e.g. CLEAR workshop, workshop organized by other CUHK units)	NA
(c) In CUHK ExPo jointly organized by CLEAR and ITSC	Will submit an abstract to CUHK ExPo
(d) In any other event held in HK (e.g. UGC symposium, talks delivered to units of other institutions)	NA
(e) In international conference	Will submit an abstract
(f) Others (please specify)	NA

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

3. A one-page brief write up

With support from the Micro-module Courseware Development Grant, four micro-modules that covered two major topics in a first-year nursing course, “Fundamentals of Nursing I”, were developed to facilitate flipped classroom implementation. The two topics included: “Meeting safety needs” and “Ensuring a safe and comfortable environment for care”. Contents of the micro-modules were presented as animations or scenarios in virtual reality application.

The micro-modules aimed at facilitating students to gain preliminary concepts in the topics before class and support flipped classroom implementation. On the other hand, the “presence” offered in the VR application provided students with the opportunity to be an active participant in the simulated home and hospital environment. These experiences were difficult to be presented and described in the lectures. With the developed micro-modules, the course teachers could make use of the class time to revisit the important concepts described in the micro-modules and clarify any misunderstandings that arouse. At the same time, students were expected to participate in various in-class activities, such as discussions, to consolidate what they learned in the micro-modules. All these helped the students to apply their knowledge and practice their critical thinking skills.

To date, the project has been evaluated by student surveys and qualitative interviews. The surveys indicated that 88.6% of the students agreed that the micro-modules helped them to gain a better understanding of nursing knowledge and skills on the designated topics. Most of them (84.5%) agreed that the micro-modules helped them to learn at their own pace. Majority of students agreed that more micro-modules should be produced in the future. The qualitative interviews indicated that majority of students liked the developed micro-modules because the animations and VR application make learning more engaging and interesting. Most

importantly, these micro-modules helped them enhance their understanding and awareness on safety for patients as well as health care professionals.

The evaluation indicated that the project has achieved its objectives effectively and completely.