RGC Ref. No.:
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(please insert ref. above)

RESEARCH GRANTS COUNCIL
COMPETITIVE RESEARCH FUNDING SCHEMES FOR
THE LOCAL SELF-FINANCING DEGREE SECTOR

FACULTY DEVELOPMENT SCHEME (FDS)

Completion Report
(*for completed projects only*)

Submission Deadlines:	1. *The unspent balance, if applicable, and auditor's report: within* ***six*** *months of the approved project completion date.*
	2. *Completion report: within* ***twelve*** *months of the approved project completion date.*

Part A: The Project and Investigator(s)

1. Project Title

Evaluating the effectiveness of mobile learning in nursing education

2. Investigator(s) and Academic Department/Units Involved

Research Team	Name / Post	Unit / Department / Institution	Contact Information
Principal Investigator	LI Kam Cheong, Director	University Research Centre, The Open University of Hong Kong	2768-6252 kcli@ouhk.edu.hk
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Others	NA	NA	NA

3. **Project Duration**

	Original	Revised	Date of RGC / Institution Approval (*must be quoted*)
Project Start Date	1 October 2014	NA	NA
Project Completion Date	30 April 2016	NA	NA
Duration (*in month*)	19 months	NA	NA
Deadline for Submission of Completion Report	30 April 2017	NA	NA

Part B: The Final Report

5. Project Objectives

5.1   Objectives as per original application

1. Assess how the use of mobile technologies enhances students' motivation and improve their performance in learning.
2. Determine the extent to which the use of mobile devices is aligned with the FRAME model.
3. Examine the relationship among the process of mobile learning, students' motivation and their learning performance.
4. Analyse how mobile learning could be best implemented in nursing clinical education.
5. Develop instruments for aiding the design, delivery and evaluation of mobile learning in nursing courses.

5.2   Revised objectives

Date of approval from the RGC:	NA
Reasons for the change:	NA

5.3   Realisation of the objectives
(Maximum 1 page; please state how and to what extent the project objectives have been achieved; give reasons for under-achievements and outline attempts to overcome problems, if any)

The realisation of the five project objectives are illustrated as follows:

1. Assess how the use of mobile technologies enhances students' motivation and improve their performance in learning

Seven sessions of semi-structured interviews were conducted in November 2014 to collect qualitative data about the use of mobile devices in nursing courses. The participants included a total of 40 nursing students, the nursing teaching staff and the instructional designer of mobile learning apps. They shared their experiences of and views on the use of mobile devices in classrooms, clinical practicums as well as other learning activities, serving as a basis to interpret the data related to students' motivation and learning performance.

Three questionnaire surveys were conducted (one in December 2014 and two in December 2015) for collecting quantitative data of mobile learning effectiveness, with a total of 158, 205 and 231 valid responses collected from the nursing students, respectively. Also in one of the sections in the survey, the students' motivation was mentioned.

Three tests of students' study performance were conducted in December 2014, October 2015 and December 2015, respectively, for the same group of students participated in the questionnaire surveys. The test results represented the students' study performance before and after implementation of mobile learning.

2. Determine the extent to which the use of mobile devices is aligned with the FRAME model

The interview protocols and survey questionnaires were developed based on the Framework for the Rational Analysis of Mobile Education (FRAME) model, covering the mobile technologies, human learning capacities, and the social aspects of learning in a hypothesised optimal mobile learning context. The interview and survey data revealed different realisations of the FRAME model in the classroom and practicum contexts.

3. Examine the relationship among the process of mobile learning, students' motivation and their learning performance

The interviews, surveys and tests of students' study performance provided the data for achieving this objective. An in-depth analysis of the qualitative data and correlation tests of the quantitative data were carried out to identify the interrelationship among students' motivation, mobile learning process and study performance.

4. Analyse how mobile learning could be best implemented in nursing clinical education

Based on the responses of the interview and survey participants, factors relevant to the effectiveness of mobile learning in nursing courses and ways to facilitate the implementation of mobile learning were identified.

5. Develop instruments for aiding the design, delivery and evaluation of mobile learning in nursing courses

The interview protocols and questionnaires developed in this project can help the relevant teaching staff evaluate and improve the design and delivery of mobile learning in nursing courses. They serve as comprehensive evaluation instruments accounting for the lecture and practicum contexts in which mobile devices are used. The questionnaires were developed following the FRAME model. Prior to the surveys, all questionnaire items were reviewed by relevant experts and pilot tests were conducted on subsets of intended population. Using the survey data, factor analysis and reliability tests were conducted to validate the questionnaires.

5.4   Summary of objectives addressed to date

Objectives *(as per 5.1/5.2 above)*	Addressed *(please tick)*	Percentage achieved *(please estimate)*
1. Assess how the use of mobile technologies enhances students' motivation and improve their performance in learning.	√	100%
2. Determine the extent to which the use of mobile devices is aligned with the FRAME model.	√	100%
3. Examine the relationship among the process of mobile learning, students' motivation and their learning performance.	√	100%
4. Analyse how mobile learning could be best implemented in nursing clinical education.	√	100%
5. Develop instruments for aiding the design, delivery and evaluation of mobile learning in nursing courses.	√	100%

6. Research Outcome

6.1 Major findings and research outcome
(Maximum 1 page; please make reference to Part C where necessary)

The major findings and research outcome, which were presented, published or submitted for publication as in Part C, are as follows:

1. Students' motivation to engage in mobile learning

The students were mildly motivated to engage in mobile learning. The interview and survey findings showed their active use of mobile apps for reviewing learning materials and sharing learning resources among peers. They found useful the provision of supplementary learning materials through the apps, which had been devised to address their learning difficulties, and had a lot of multimedia content to facilitate their understanding and review of course contents.

2. Students' study performance

The students performed better after practising mobile learning in a test specially designed for this research, in terms of comprehension and application of nursing concepts. This finding applied to the same class of students taking the test in both October and December 2015, i.e. before and after mobile learning. Comparing the students' test performance in two cohorts — 2014 (without mobile learning) and 2015 (with mobile learning), the 2015 cohort students performed better in terms of application of nursing concepts.

3. Alignment of mobile learning practices with the FRAME model

The mobile learning practices in the OUHK nursing courses in general have covered all aspects of the FRAME model. These include the uses of mobile apps developed by OUHK for providing learning materials and conducting clinical assessments, as well as the students' own engagement in mobile communication. The two surveys focusing on the classroom and practicum contexts presented different realisations of the FRAME model according to the results of factor analysis. The number of factors extracted was different from that of the model, which suggests further studies on context-specific applications of the model.

4. Interrelationship among students' motivation, mobile learning process and study performance

A strong positive correlation was found between students' motivation and their mobile learning process. Only a relatively weak correlation was found between these two variables with the students' study performance. While an improvement in the students' study performance was shown after practising mobile learning, the results suggest other variables that influence study performance, as well as other ways to represent the effectiveness of mobile learning.

5. Effective implementation of mobile learning in nursing education

The research findings point to a number of ways to facilitate the implementation of mobile learning in nursing education, particularly in the areas of institutional support and classroom teaching. Enhancement of institutional support, in areas such as technical support of the devices and user training, was highly recommended by the students. The mobile apps developed by OUHK can help teaching staff to conduct in-class activities to support classroom teaching, which will alleviate the limitations of the classroom context, such as insufficient student participation and class interaction.

6. Development of instruments for evaluating mobile learning effectiveness

Two sets of survey questionnaires and interview protocols were developed for evaluation of the effectiveness of mobile learning in the classroom and practicum contexts, respectively. They can facilitate the evaluation of mobile learning practices sharing a similar context, or serve as a foundation for adaptation to other disciplines.

6.2   Potential for further development of the research and the proposed course of action
(Maximum half a page)

This research provided the first set of comprehensive empirical data and findings about the adoption of the FRAME model for evaluating the effectiveness of mobile learning in nursing education. The model is generic in nature and needs adaptation to specific contexts when applying it to particular disciplines. A potential further development of the research lies in adapting the model to other disciplines which share similar characteristics of nursing education (a kind of professional education which involves not only acquisition of conceptual knowledge but also a substantial set of practical skills), as well as disciplines with a different set of characteristics (e.g. more knowledge-oriented).

The proposed course of action for this further development includes examination of how learning and teaching, especially mobile learning, are carried out in the disciplines. It may adopt a methodology similar to this research project — conducting interviews and surveys with relevant teaching staff and students — so that it can benefit from the groundwork laid out in the current project where research instruments such as interview protocols and questionnaires were developed for adaptation. Following this direction of development, the FRAME model can be extended to advance mobile learning delivery addressing the specificity of various disciplines.

7. **Layman's Summary**
    (Describe <u>in layman's language</u> the nature, significance and value of the research project, in no more than 200 words)

This research project aimed to evaluate the effectiveness of mobile learning in undergraduate nursing courses. It followed the Framework for the Rational Analysis of Mobile Education (FRAME) model which construes mobile learning as a process resulting from the interaction of mobile technologies, human learning capacities, and the social aspects of learning. The evaluation focused on students' learning motivation, their mobile learning process, and study performance in nursing courses. The research contributed to filling the knowledge gap in understanding the relevant factors affecting the effectiveness of mobile learning in nursing courses, and offered effective instruments for evaluation and use in such a context. The research outcomes support instructional designers and teachers in designing and implementing quality mobile learning in nursing courses with a sound theoretical basis. The evaluation instruments of mobile learning effectiveness can be utilized for alerting teachers to potential problems of students' engagement in mobile learning, and for identifying directions for solving problems.

Part C: Research Output

8. **Peer-reviewed journal publication(s) arising <u>directly</u> from this research project**
   (Please attach a copy of the publication and/or the letter of acceptance if not yet submitted in the previous progress report(s).   All listed publications must acknowledge RGC's funding support by quoting the specific grant reference.)

The Latest Status of Publications				Author(s) *(denote the corresponding author with an asterisk*)*	Title and Journal/Book *(with the volume, pages and other necessary publishing details specified)*	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this report *(Yes or No)*	Acknowledged the support of RGC *(Yes or No)*	Accessible from the institutional repository *(Yes or No)*
Year of publication	Year of Acceptance (For paper accepted but not yet published)	Under Review	Under Preparation (optional)						
		√		*Kam Cheong Li, Linda Yin King Lee, Suet Lai Wong, Ivy Sui Yu Yau and Billy Tak Ming Wong	'The effects of mobile learning for nursing students: An integrative evaluation of learning process, learning motivation, and study performance', *International Journal of Mobile Learning and Organisation*	No	Yes [Attachment 1]	Yes	Yes
		√		*Kam Cheong Li, Linda Yin King Lee, Suet Lai Wong, Ivy Sui Yu Yau and Billy Tak Ming Wong	'Evaluation of the use of mobile devices for clinical practicum in nursing education', *International Journal of Mobile and Blended Learning*	No	Yes [Attachment 2]	Yes	Yes
		√		*Kam Cheong Li and Billy Tak Ming M Wong	'Indicators of success in mobile learning', *Advances in Open and Innovative Education: Research and Practices*, Springer (Book chapter)	No	Yes [Attachment 3]	Yes	Yes
	2017			*Kam Cheong Li, Linda Yin King Lee, Suet Lai Wong, Ivy Sui Yu Yau and Billy Tak Ming Wong	'Mobile learning in nursing education: Catering for students and teachers' needs', *Asian Association of Open Universities Journal*	No	Yes [Attachment 4]	Yes	Yes

| 2017 | | | *Kam Cheong Li, Linda Yin King Lee, Suet Lai Wong, Ivy Sui Yu Yau and Billy Tak Ming Wong | 'Effects of mobile apps on learning motivation and study performance of nursing students', *Blended Learning: New Challenges and Innovative Practices*, Springer (Book chapter) | No | Yes [Attachment 5] | Yes | Yes |
| 2016 | | | *Kam Cheong Li, Linda Yin King Lee, Suet Lai Wong, Ivy Sui Yu Yau and Billy Tak Ming Wong | 'Preference and readiness of nursing students for mobile learning', *Innovations in Open and Flexible Education*, Springer (Book chapter) | No | Yes [Attachment 6] | Yes | Yes |

9. Recognized international conference(s) in which paper(s) related to this research project was / were delivered   *(Please attach a copy of each conference abstract)*

Month / Year / Place	Title	Conference Name	Submitted to RGC *(indicate the year ending of the relevant progress report)*	Attached to this report *(Yes or No)*	Acknowledged the support of RGC *(Yes or No)*	Accessible from the institutional repository *(Yes or No)*
October 2016, Philippines	The effects of mobile learning on students' learning motivation and study performance	The 30th Annual Conference of the Asian Association of Open Universities	No	Yes [Attachment 7]	Yes	Yes
July 2016, Hong Kong	A review of indicators of success in mobile learning	The 3rd International Conference on Open and Flexible Education	No	Yes [Attachment 8]	Yes	Yes
November 2015, Malaysia	Preparing for mobile learning in nursing education: Perspectives of students and teacher	The 29th Annual Conference of the Asian Association of Open Universities	No	Yes [Attachment 9]	Yes	Yes
July 2015, Hong Kong	Mobile learning in nursing education: Preference and readiness of nursing students	The 2nd International Conference on Open and Flexible Education	Yes (2015)	Yes [Attachment 10]	Yes	Yes

10. Whether research experience and new knowledge has transferred /contributed to teaching and learning   *(Please elaborate.)*

As this project aimed to evaluate the effectiveness of mobile learning practice in the nursing courses of the Open University of Hong Kong, relevant materials and findings were made available to the academics responsible for the courses. The materials and findings have helped them to review and improve the design and delivery of mobile learning in the nursing courses. In particular, this study revealed how mobile learning could be effectively integrated into a conventional classroom setting following a blended education mode, which is the current practice in nursing education at the University. This has helped to solve problems such as determining, in the case of course planning, what course content to deliver through the mobile setting and what to deliver through the classroom or another setting, and how the content could be presented in the mobile apps, so as to achieve a high level of learning effectiveness.

11. Student(s) trained *(Please attach a copy of the title page of the thesis)*

Name	Degree registered for	Date of registration	Date of thesis submission / graduation
NA	NA	NA	NA

12. Other impact
(e.g. award of patents or prizes, collaboration with other research institutions, technology transfer, teaching enhancement, etc.)

The findings of this research have contributed to advancing the mobile learning delivery in the nursing education of the Open University of Hong Kong. The development of new materials and features of the mobile apps for nursing courses has taken into consideration the results of this project.

13. Public access of completion report
(Please specify the information, if any, that cannot be provided for public access and give the reasons.)

Information that cannot be provided for public access	Reasons
NA	NA

Note: Principal Investigators of projects approved in 2010/2011 onwards are required to release the completion reports to the public through the RGC website. Completion reports containing information such as abstracts in non-technical terms, objectives, research output including the list of conference papers / publications / journals and research findings and contact information of PIs should be open to public access.