Title: An Activity-based and Blended Approach in Teaching and Learning Research Methods and Statistics

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(a) Educational/pedagogical/systemic issues that the project was set out to tackle and how the intervention piloted

RS2050 (Research Methods and Statistics) is a course designed for full-time students in the BSc (Hons) Physiotherapy and BSc (Hons) Occupational Therapy programs. The previous structure of the course consists of 24 hours of mass lectures, 14 hours of tutorials and 12 hours of laboratory sessions. Many challenges were encountered when teaching this course in previous years, including limited teaching hours (change from a total of 4 credits to 3 credits in the 4-year curriculum), large class size (200 students), and difficulty in linking research theory to clinical practice.

The funded project titled "Learning research methods and statistical concepts using multimedia: an interactive blended learning model". The proposed project aims to solve the above problems by adopting the blended learning approach, with the use of multimedia. The key features of the revised course curriculum include:

- (1) E-lectures: The lectures are delivered using the e-learning platform with the use of multimedia, animation and interactive features to replace the face-to-face mass lectures. The students can learn a specific topic in their own place at their own time. To encourage the students to use the e-lectures, there are several online quizzes during the semester period, which contribute to part of the formative assessment. Biweekly review sessions are also scheduled throughout the semester to reinforce the concepts learned, before the students attempt the online quizzes.
- (2) Online clinical-based learning tasks: Selected lectures are supplemented with online clinical-based scenarios. Video clips are used to illustrate these scenarios to make the learning experience more interesting. The students are required to analyze the information presented and provide solutions to the scenarios. This approach is intended to facilitate deep thinking and problem-solving, and help the students appreciate the relevance of research to clinical practice. These video-based scenarios are also used in laboratory sessions to reinforce the concepts learned in the online lectures.
- (3) Activity-based laboratory sessions: Led by a facilitator, the students engage in various tasks in helping them learn a specific topic in a small group of 6. The students thus have more interactions with the course material, their peers and instructor through experiential learning.

In summary, the course team decided to adopt a blended learning approach; students study fundamental concepts online at their own pace before attending face-to-face laboratory sessions. The content, format and proportion of laboratory sessions are also reconstructed. A task-based approach is used and tasks are aligned with online lectures to enable theory application. In addition, biweekly on-campus review sessions are threaded into the schedule for review of key concepts and clarification of online materials. This redesigned course was also the first official blended learning experience on core knowledge in the curriculum for the students (year 2, semester 1).

Before the production of the online material, we conducted a focus group interview to gather the students' view on online learning. The information gained would be useful in guiding the design of our teaching and learning material for the project. Fifteen participants volunteered to join the focus group and three separate interviews were conducted. Each group interview lasted approximately one hour and was audio recorded and transcribed verbatim.

Four common themes from pre-course interviews are identified:

1. Learning encompasses multiple dimensions: Participants defined learning not only from an academic angle but also from a broader life aspect. Some participants referred learning as changing existing

thoughts and applying knowledge. The need to integrate and apply probably precipitates a different view of learning, from simply drawing knowledge to applying what they learn and redevelop new knowledge according to experiences.

- 2. Teacher is an important determinant of students' learning: Teachers bear an important role in students' learning, be it face-to-face or online learning. Participants viewed instructional and presentation skills as the essential basis for quality teaching yet appreciated teachers whom guide, motivate and inspire them than those who only deliver knowledge. In rehabilitation education where clinical expertise is highly valued, students expect teachers to share their clinical experience and help them to evolve in their professional identity. Specific to online learning, participants stated an environment where students can openly ask questions and teachers provide frequent feedback is facilitatory to their learning. Participants indicated they valued motivating and inspiring teachers and appreciated an openly communicative environment both in face-to-face and online environments.
- 3. *Student-peer interaction in the learning process:* Whilst there are individual learner responsibilities namely class preparation or self-reflection, participants clearly highlighted the value of peer learning.
- 4. Balancing online and traditional learning: Participants reported mix feelings about online learning and believed a balance between online and traditional learning is imperative. The perceived challenges included technical issues and quality, concentration difficulty and fear of no interaction between students, peers and teachers. Participants also stated online learning is "good for factual information". This may imply the convenience and flexibility of learning online outweigh the benefits of traditional lectures for certain types of knowledge. Social interaction and connectedness, on the other hand, may be better achieved by meeting face-to-face for higher cognitive skills (discussion and integration of knowledge). Together, participants feel that a balance between online and traditional learning is important to subserve different learning objectives and match the needs of various learning styles.

Two online lectures and clinical-based teaching video were produced as a pilot. Feedback was obtained from a few students who had taken the course. Based on the positive feedback, the subject team continued to work on the production of the online lectures, teaching videos and online quizzes. The editing of the material produced was completed in August 2015, and the full implementation of the project commenced in semester 1 of the 2015/16 academic year when the subject RS2050 was offered.

(b) Recap briefly the methodology adopted for evaluating impact on teaching and learning (or for conducting the investigation if it is a study project) and report and interpret the findings in suitable detail.

We have used several approaches in evaluating the impact on teaching and learning of the project.

I. Post-course focus group interview:

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A post-course focus group interview involving 8 students was conducted in January 2016. Four themes were identified:

1. A new and enlightening blended learning experience but it is not for all: Participants described the blended experience as enjoyable and enlightening and it has either met or exceeded their expectations. The benefits of online learning of convenience, flexibility and repeatability were mentioned again in the post-course interviews. Moreover, participants experienced an additional benefit of online learning - the lectures can be downloaded and saved for revision and future reference when they conduct their final year research project, indicating the merits of blended learning is beyond the immediate academic need. The challenges mentioned by participants were again similar to their expectation, for examples, difficulty with concentration and questionable technical quality of online videos. The concept of self-regulation, self-discipline and self-motivation. Nevertheless, some participants commented blended learning as a very enjoyable experience and hope "it will be used in other courses". Overall, this blended learning course created a new and refreshing learning experience despite the challenges faced during the process.

- 2. Defining online and face-to-face components in blended learning: Participants appreciated the diversity of online and task-oriented face-to-face activities covering various learning objectives and how the components supplemented each other to facilitate progressive learning. Participants thought the percentage of time allocated to each component is appropriate.
- 3. Assessment serves as an important component in blended learning: The course assessment included online quizzes, a group statistic assignment, a group critical analysis presentation and a final examination. Participants overwhelmingly enjoyed the online quizzes as they motivated them to study the online lectures. Also, the quizzes were scheduled after the review sessions; participants thought the arrangement helped with knowledge consolidation. Although online quizzes only address cognitive presence, the deep level of assessment motivated and engaged students for deep learning.
- 4. *Incorporating skills into practice:* The last theme provided insights into how a carefully planned blended learning course may facilitate deep learning. Participants felt the knowledge they learnt in each component of the course supplemented well with each other and can be applied to other courses and future clinical practice.

II. Online survey:

An online survey was conducted in January 2016 to collect feedback from the students. The following table shows the key results:

Item	Percentage of
	students who
	strongly
	agree/agree:
1. I have good understanding of the content after the course.	77%
2. The course content is helpful to achieve the course	60%
objectives.	
3. The online MCQ questions are useful in assessing my	86%
level of understanding of the course content.	
4. The difficulty level of the online MCQ questions is	67%
appropriate.	
5. The online lectures are useful for enhancing my learning.	69%
6. The biweekly review sessions are useful for enhancing my	86%
learning.	
7. The statistical review sessions are useful for enhancing	74%
my learning.	
8. The activity-based laboratory sessions are useful for	86%
enhancing my learning.	
9. The lab activities in the laboratory sessions are engaging	86%
and interactive.	
10. The use of multimedia (e.g., teaching videos) in the MCQ	83%
questions, review sessions and laboratory sessions is	
effective and facilitates my learning.	
11. The self-guided tutorial manual is informative and has	69%
enabled me to learn statistics independently.	
12. Overall, I enjoyed the online learning.	67%

III. Online learning material statistics:

The following table highlights the access statistics of the 11 online lectures in the month of December 2015. The total number of access ranged from 3100-3400. As there were 190 students enrolled in the course, the results indicated that each student on average accessed each online lecture 16-18 times in a given month.

The following table shows the total number of access for each lecture during the month of December 2015:

Online	1	2	3	4	5	6	7	8	9	10	11
lecture		_									
Access	3139	3120	3122	3159	3196	3218	3243	3267	3235	3399	3260

IV. Student GPA:

The mean GPA obtained by both the PT students and OT students was slightly better than their counterparts in the last cohort, as shown in the following table.

	PT students	OT students
This cohort (revised curriculum)	3.00	3.28
Last cohort (old curriculum)	2.88	3.19

V. e-SFQ:

The course e-SFQ obtained (4.1) was comparable to the previous cohort (4.2).

(c) Discuss the implications of the findings and offer recommendations on applying the deliverables, adopting the practice, and/or other system level strategies/developments/improvements.

Overall, the subject team has succeeded in implementing the project as described in the original proposal. For the most part, the online material was used frequently by the students. The intended learning outcomes were better achieved, as reflected by the increased GPA attained. The students in general had a positive view on the new blended learning approach. In subsequent years, the course will continue to be delivered using a blended learning approach.

Based on the student feedback, few refinements will be made to the course delivery:

- 1. To increase the degree of interactivity, more animation features and video-based scenarios will be embedded into the online lectures. In addition, the student will also be able to see the instructor delivering the lecture in the online lecture video files.
- 2. The frequency of response (currently once a week) to questions raised in the discussion board will be increased to 3 times a week to facilitate teaching presence and encourage full utilization of the discussion board.
- 3. An introductory laboratory session on statistics will be added to provide the students with more guidance in the initial stages on how to use the self-guided tutorial manual and computer software so that they could better use the material to learn statistical techniques independently.

The course delivery model can potentially be implemented in other courses. We recommend developing a provisional guideline on blended learning that addresses topics on component diversity and weighting, appropriately challenging contents, learning activity diversity, optimal use of discussion boards and technology. Faculty and student training should be transformational in order to move away from teacher-directed learning and to create a collaborative deep learning environment. After all, shared visions with buy-in from all stakeholders are key for success in any initiatives.