Research Output/Impact/Knowledge Transfer Prize
for the Dean's Research Fund 2019/20

Brief Introduction of Awardee's
Research/KT Publication/Study/Output and Future Research/KT Development

Awardee (Dept):	Dr Song Yanjie, Assistant Professor (MIT)
Publication Title/KT project:	Improving primary students' collaborative problem solving competency in project-based science learning with productive failure instructional design in a seamless learning environment

A. Briefly introduce your research/KT publication/study/output for which you have received the prize.

Research output: Song, Y. (2018). Improving primary students' collaborative problem solving competency in project-based science learning with productive failure instructional design in a seamless learning environment. Educational Technology Research and Development, 66(4), 979-1008.

This article reports on a quasi-experimental study in comparing the "video watching and practice" pedagogical design with the "productive failure" pedagogical design in flipped classroom for a 2-week curricular unit on polynomials in a Hong Kong Secondary school. Different from traditional flipped classroom where students are provided video clips with new concepts and associated procedures to review at home before solving problems in class, the "productive failure" pedagogical design in the flipped classroom worked the other way around. Supported by mobile technologies, students solved problems and shared their results first in class even though they might come across failures, followed by consolidating the newly learned concepts and associated procedures using video clips at home. The pedagogical design is referred to as "productive failure-based flipped classroom" in this study. The research results show that students using the new pedagogical design performed better than those in flipped classroom in problem solving. This suggests that the "productive failure" pedagogical design may be better able to improve students' problem solving skills.

The major contribution of this article is to develop and implement an innovative pedagogical model - "Productive Failure-based Flipped Classroom". It identified and addressed the issues of existing flipped classroom pedagogical design: (1) Few studies have reported how to

develop school students' problem solving skills and enhance their conceptual understanding in flipped classroom; and (2) The pedagogical design adopted in traditional flipped classroom, in many cases, intends to be in "watching video and practice" direct instructional mode, in which students make use of videos as lecture instruction out of class time and practice activities in class time, but is lack of theoretical framework to guide the design and implementation of the learning activities.

B. How you used/will use your prize and perhaps its usefulness to your research/KT development?

1. **The research prize will be used for:**
   (1) Hired services: I will invite the GRF[1] Co-PI Prof. Hiroaki Ogata from University of Kyoto to visit EdUHK for GRF project (Ref. 18611019) Consultation and discussion of a journal paper writing related to the project *(HK$ 39,000)*;
   (2) Equipment: A laptop and accessories will be purchased *(HK$ 11,000)* for project use.

2. **The research prize's usefulness to my research development:**
   (1) The consultation service provided by the GRF Co-PI Prof. Hiroaki Ogata will help modify the learning platform - a mobile-user-generated-content tool for the GRF project to run more smoothly and generate more rigorous findings. The learning plaform was originally developed by Prof. Hiroaki Ogata's team. However, due to the compatibility issues, we need to refine the system so that it can be better applied to students in Hong Kong. In addition, the researcher will discuss with the Co-PI about a journal paper related to the project in more detail.
   (2) The laptop will help the researcher to make project orientation to school teachers and students; The researcher can use the laptop to access and try the a mobile-user-generated-content tool anywhere, anytime and identify problems to be solved just-in-time; and the laptop can also help the researcher to share the research findings and exchange research ideas with local and international scholars.

C. Expected research/KT outcomes/outputs/impacts arising from this prize.

1. It is expected that an article co-authored with the GRF Co-PI Prof. Hiroaki Ogata can be published in 2021 or early 2022;
2. It is also expected that the mobile-user-generated-content tool can be further modified and scaled up to a more schools in Hong Kong.

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[1] GRF (Ref. 18611019): A Self-regulated Vocabulary Learning Approach Supported by a Mobile-user-generated-content Tool for Pupils in Hong Kong