

Coriander room  
3.30-3.55pm

## Fostering interdisciplinarity amongst PhD students using an authentic learning framework: An exploratory study

**Rafi Rashid<sup>1\*</sup> and LIM Mingxun<sup>1&2</sup>**

<sup>1</sup>Graduate School for Integrative Sciences & Engineering, National University of Singapore, Singapore

<sup>2</sup>Department of Political Science, National University of Singapore

\*[ngsrr@nus.edu.sg](mailto:ngsrr@nus.edu.sg)

A typical PhD programme trains its students in a single discipline. However, in a world where problems are complex in nature, we need PhDs who are open-minded enough to look beyond the boundaries of their own disciplines and become effective problem-solvers (Repko, Szostak, & Buchberger, 2017). Given this need, PhD programmes need to be reformed so that students are trained to be critical thinkers rather than mere specialists (Bosch, 2018; Bosch & Casadevall, 2017). At the Graduate School for Integrative Sciences and Engineering, our core curriculum has been characterized by didactic lectures and assessments that focus on students' content knowledge rather than critical thinking and collaboration, which are key 21<sup>st</sup>-century skills that need to be cultivated in PhD students.

As part of our mission to promote collaborative research amongst the various scientific disciplines, we also endeavour to foster a spirit of interdisciplinarity in our students. Interdisciplinarity is a "process of answering a question, solving a problem, or addressing a topic that is too broad or complex to be dealt with adequately by a single discipline, and draws on the disciplines with the goal of integrating their insights to construct a more comprehensive understanding" (Repko & Szostak, 2017). Exposing students to multiple perspectives will make them better problem-solvers. According to Carole L. Palmer (2001, p. vii), "the real-world research problems that scientists address rarely arise within orderly disciplinary categories, and neither do their solutions". Hence, it is important to look for interfaces between disciplines when solving problems.

To address the above issues, we redesigned the first topic of an existing interdisciplinary course using an authentic learning framework based on principles of collaborative learning and interdisciplinarity. The topic was redesigned so as to improve the quality of interdisciplinary reflection that students engage in because "an emerging viewpoint in higher education emphasizes that a thorough understanding of today's real life problems requires interdisciplinary reflection" (Goldsmith, Hamilton, Hornsby, & Wells, 2018). Authentic activities, collaborative construction of knowledge, articulation, and reflection were the features of authentic learning that we designed into our framework (Herrington & Herrington, 2006). We studied the new framework's impact on student learning over one semester.

The framework comprised online and face-to-face activities. The online activities included microlectures about interdisciplinarity, an asynchronous discussion forum to promote interactive engagement between students, scaffolding in the form of instructor and peer feedback, and a peer evaluation exercise. The face-to-face activity was a summative assessment involving presentations conducted by groups of students working on different aspects of the topic, with additional time allotted for questions and feedback at the end. We used three measures to assess the effect of the framework on student learning: a post-study survey, a post-study interview, and group presentation scores. An analysis of the presentation scores revealed that students performed better on the topic supported by the authentic learning framework and blended learning than on topics where such support was absent, and that this enhanced performance was due to improved collaboration and content. The survey and interview responses suggest that the instructor and peer feedback, use of rubrics and peer evaluations, and microlectures promoted interdisciplinary thinking and collaboration. Despite the fact that the students expressed dissatisfaction with the asynchronous discussion forum, and that the posts were relatively superficial, upon closer analysis we found that the quality of posts from the best performing groups was comparatively higher. Overall, our findings suggest that these new instructional strategies had a positive effect on interdisciplinary learning.

### Keywords

blended learning, interdisciplinarity, PhD students, scaffolding, collaboration

### References

- Bosch, G. (2018). Train PhD students to be thinkers not just specialists. *Nature*, 554(7692), 277. doi:10.1038/d41586-018-01853-1
- Bosch, G., & Casadevall, A. (2017). Graduate Biomedical Science Education Needs a New Philosophy. *MBio*, 8(6), e01539-01517. doi:10.1128/mBio.01539-17
- Goldsmith, A., Hamilton, D., Hornsby, K., & Wells, D. (2018). *Interdisciplinary Approaches to Teaching*. Retrieved from <https://serc.carleton.edu/econ/interdisciplinary/index.html>
- Herrington, A., & Herrington, J. (2006). *Authentic Learning Environments in Higher Education*. PA, US: Information Science Publishing.
- Palmer, C. (2001). *Work at the boundaries of science: Information and the interdisciplinary research process*. Boston: Kluwer Academic.
- Repko, A., & Szostak, R. (2017). *Interdisciplinary Research: Process and Theory* (3rd ed.). Los Angeles: SAGE Publications.
- Repko, A., Szostak, R., & Buchberger, M. (2017). *Introduction to Interdisciplinary Studies* (2nd ed.): SAGE Publications, Inc.