

An Academically-Oriented *Forward with Integrity* Initiative for Enhancing the Undergraduate Thesis Experience

This initiative describes a collaborative, interdisciplinary program aimed at connecting undergraduate thesis students from across the McMaster campus in an immersive and interdisciplinary research environment, which focuses on the generation and application of knowledge to health professions education. In this program, students are challenged to extend their home discipline training beyond the generation of new theoretical knowledge into a realm where they could also ask how these fundamental ideas are applicable to the benefit of the greater community; in particular, the education of health professionals (i.e., physicians, nurses, occupational therapists, midwives, etc.). In this way, this initiative offers a dual-perspective (i.e., theoretical and applied) research experience as well as unique exposure to the innovation and knowledge translation aspects of research that are too often overlooked in undergraduate student research education.

At the forefront of McMaster University's medical education research efforts is the Faculty of Health Sciences' (FHS) Program for Educational Research and Development (PERD). This program represents a cross-faculty resource for educational scholarship, research advances, and curricular improvement as it pertains to teaching and learning in the health professions. PERD emulates the "evidence-based" philosophy that is now very prominent throughout the various medical research disciplines. This approach requires careful consideration for the empirical knowledge generated across the spectrum of theoretical inquiry. In this regard, conceptual advances in disciplines such as Kinesiology, Psychology, Sociology, Economics, and Engineering provide the foundation on which innovations can support, transform, and enhance the educational experience of trainees in the many health professions.

Over the past year, this program has been successful in developing formal undergraduate theses collaborations between PERD and departments across campus – beginning with the Department of Kinesiology. Kinesiology is a natural partner for developing the foundational framework for this interdisciplinary program because it is a multi-dimensional discipline, which informs many aspects of human performance through a number of research perspectives including, motor control and learning, human factors, physiology, biomechanics, and sociology. Each of these theoretical perspectives is particularly relevant to health professions education. For instance, theories of motor control and learning can describe the sensory-perceptual and cognitive constraints associated with performing precision clinical tasks in uncertain, unstable and/or highly stressful environments. In particular, the work of the program's first students has shown how these ideas might emerge as very important to the development of effective surgical skills curricula.

Importantly, the program was successful in engaging 4 (2 Kinesiology (STIER, WELSHER); 1 Faculty of Science (LEMQADEM); 1 Faculty Health Sciences (LIU)) independent undergraduate students in senior thesis projects concerned with the optimal use and theoretical implications of simulation-based minimal access surgery (i.e., laparoscopy) educational interventions. Specifically, these projects investigated the influence of biologically-relevant sex differences on the acquisition of laparoscopic expertise; the role of working memory in the control of precision minimal access movements; and the relevance of contextual interference to mixed-model (i.e., expert surgeon models vs. novice surgeon models) presentations of observational practice. In addition to acquiring new research skills and experience in a dynamic applied research environment, all four students have demonstrated a level of success in their research that will facilitate their career development in the health professions and/or health professions education research. To date, to some degree, each of these independent research endeavors has been presented by the associated student at local and/or national academic meetings, and it is anticipated that all project manuscripts will be submitted for publication in peer-reviewed journals. Most impressively, we are proud to report that 2 of these students (STIER; LEMQADEM) have moved on from their undergraduate experiences to pursue graduate level work, in the health professions and research sciences respectively, and at least one of

the remaining students (LIU) has submitted applications for post graduate studies in the coming year.

Beyond the direct student achievement outcomes associated with this program, the initiative has also been successful in establishing a number of indirect, capacity-building outcomes. For example, we were able to use a portion of the FWI funds to hire a part-time research assistant (POTTRUFF), that serves as interdepartmental liaison from the initiate, developing a database of all undergraduate thesis courses at McMaster and managing ongoing collaborations. The efforts of this individual were instrumental in paving the way for new undergraduate theses collaborations between PERD and a number of theoretically-grounded disciplines housed in departments across campus; including, Linguistics, Anthropology, and Arts & Science. For instance, this program is now in position to move forward with new collaborative work involving the Departments of Kinesiology, Linguistics, and Family Medicine, in which undergraduate Linguistics students will work closely with kinesiology scientists and clinician researchers to investigate the relationship between motor coordination and reading ability. The findings from this inquiry will be relevant to our understanding of health disorders (i.e., dyslexia) and literacy in at-risk communities. Such a cross-disciplinary research undertaking would have been unlikely at best without the opportunities afforded by this FWI initiative. As connections continue to develop, we foresee numerous opportunities for students to be involved in health professions education research: engineering students may apply independent research efforts to innovative technology development; psychology students might explore concepts of cognition as they pertain to diagnostic training; economics students may apply optimization modeling to determine the best return on learning investments; and on and on. The program plan involves continued outreach to undergraduate thesis coordinators across campus in hopes of fostering exactly these types of research opportunities for undergraduate students.

The long-term goal of this proposal is to build a program of undergraduate research opportunities that span a breadth of disciplines and offer valuable insight into our understanding of best practices in health professions education. In line with the mandate outlined in the *Moving Forward with Integrity* document, this integrated learner-researcher program deepens the University's interdisciplinary collaboration in a way that supports knowledge-driven innovation within health professions education; locally, nationally, and internationally. Furthermore, it enhances the student experience through exposure to an environment wherein the translation and integration of knowledge and techniques of the scientific, business, humanities, and engineering disciplines is essential to the delivery of exceptional health care education and, in turn, health care. The hope is that students and faculty will look at health professions problems with their own unique perspectives and, through collaboration, generate thesis outcomes that contribute to the academy of knowledge.