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Hijacking *All* The Courses: A Transdisciplinary Learning Experience for Undergraduate Students

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Abstract

The skills-based shift in focus of our post-secondary education system requires fundamental changes in our academic framework to facilitate transdisciplinary learning environments that can teach students about the innovation process. Here we describe the creation of ICON (IdeasCONgress), a truly transdisciplinary upper year undergraduate learning opportunity for students from all programs. We worked within the traditional framework, satisfying all of the requirements of the courses utilised, to allow students to participate in ICON while achieving credit value towards their degree majors. In this way we have created value, opportunity, and the potential for transdisciplinary innovation in our classroom.

Keywords: transdisciplinary education, knowledge translation and transfer

Employers in both Canada (Canadian Council of Chief Executives, 2014) and the United States (Adams, 2014) identified the following top three required skills among future entry-level hires: (a) ability to work on a team/people skills, (b) decision making and problem solving skills, and (c) communication both within and outside the organisation. Though our undergraduate programs tend to provide a curriculum focused largely on discipline specific knowledge acquisition and skills, these were ranked only at position six and seven respectively by employers looking to hire thousands of new graduates.

A review of transdisciplinary learning and research programs offered by other Canadian institutions revealed that they are either not readily available to undergraduate students or not truly transdisciplinary (defined as a team of people from different disciplines working together at all times such that the process of working together differs from discipline-specific methods). With transdisciplinarity and in-demand entry-level employment skills in mind, we developed Ideas Congress (ICON), a transdisciplinary learning and research experience for undergraduate students at the University of Guelph. ICON's goals are to (a) facilitate transdisciplinary learning and research, (b) strengthen discipline specific knowledge by providing students with the appropriate platform and tools to act as a teacher, and (c) engage students in community supported research and challenge them to make their work relevant and accessible to all stake holders. To ensure that our program would attract students from a diversity of degree majors, we proposed that rather than creating a new elective course, we instead allow students enrolled in all single-semester independent study courses to be given a choice: follow the traditional offering of the course or work with ICON to achieve the learning outcomes and assessment requirements.

Context and Methods

Using a consultative process with faculty and administration, we designed a pilot program that focused on the teaching of knowledge translation and transfer theory (see, for example, Pentland et al, 2011; Thompson, Estabrooks, & Degner, 2004; Tricco, Tetzlaff, & Moher, 2011), and then challenged students to apply their learned skills to solve a community problem. A series

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of open meetings were scheduled eight months prior to the first offering of ICON. We invited all university faculty and relevant administrators to attend. During these meetings we presented a proposed framework for ICON and then spent the majority of the time discussing challenges and taking suggestions. All concerns and suggestions were documented and taken into consideration. The concerns centered around whether there were courses flexible enough to allow students to use the ICON model to demonstrate the achievement of the associated learning outcomes. We conducted a thorough review of all third and fourth year one-semester independent study courses offered in all seven colleges. Fifty-six of these courses contained the flexibility required for use by ICON. The revised framework was then circulated to all department chairs, including a list of potential courses that could be accessed by students wishing to participate.

Students attempted to obtain the necessary consent from both a faculty advisor and course coordinator. If all parties were willing to allow the student to meet the requirements of the course using the ICON curriculum, students and their faculty advisors were required to agree on an evaluation scheme that met the learning outcomes and assessment scheme of the course. To simplify this process, each faculty advisor was provided with a proposed ICON rubric that was designed to be flexible. The ICON assessments included assignments on audience analysis, information translation, problem analysis, and critical thinking. Academic advisors could add or subtract elements from the rubric to achieve the learning outcomes required of the specific course. Some department administrators opted to not participate in ICON thus denying student access to a course code. In this case, students were brought into ICON using courses from other departments that would still allow them to obtain the required number of credits towards their area of study rather than using the university-level course. Only one student could not find a suitable course code and chose to audit without credit. Most administrators were very supportive of the initiative and granted full access to the flexible courses offered. Twenty-five students from 14 majors registered in five colleges accessed twelve courses with 13 faculty advisors. One student commuted from a satellite campus to participate.

ICON was taught using a student-centred active learning model. No lectures were offered. Each of the first five weeks of the course was assigned a theme and students engaged in activities or assignments that would help them acquire the relevant skill. Our selected themes were: knowledge translation and transfer, knowing your audience, facilitating decision making, problem identification and analysis, and introduction to our community challenge. Assignments were self-guided with specific skills-based learning outcomes. To allow for each student to meet any course code requirement, a couple of our assignments were not associated with a specific format. Therefore, if a student accessed a course code in which a writing exercise was required, he/she would use the medium of writing to complete the ICON assignment.

During these first five weeks, students learned how to translate their discipline-specific information in a way that was meaningful to their colleagues in different disciplines and to audiences outside of academia. They learned how to identify a problem, establish a plan to solve it, and how to work on a transdisciplinary team. We noted that in the first weeks, students were challenged in understanding each other, in working together, and in producing meaningful results when presented with a task. Students expressed these challenges by informing the instructors that there was not enough communication, course structure, or that some students were not contributing as much as others. The instructors did not immediately intervene to fix the problem but, rather, lead a discussion about working as a team, developing milestones, and being

accountable. With two weeks, there was noticeable improvement and cohesion among the students.

The remaining weeks of the course were devoted to solving our community partner's problem. We selected a project that would allow for a transdisciplinary approach where each student could act both as expert and novice. In this way, a student enrolled in a French language course, took on the responsibility of translating all the material that her group produced and providing a Quebecois cultural perspective. A student enrolled in a statistics course with a requirement to provide a statistical analysis of a historical data set contributed the results of this analysis to her group to inform the direction of their proposal. Some students were required to participate in their courses' oral presentations. Though the topic was often quite different from the rest of the presentations, there was no negative feedback and all ICON students performed to expectation.

Results

By the end of our 12 weeks together, our students presented clear, professional, and innovative solutions to our community partner's problem. Our community partner commented on the high quality of the proposed solutions and asked to follow up with two groups because their presentations were in line with the approach that this company was exploring. Feedback from our students was informative and encouraging. Most students identified having acquired skills that could be used after graduation and a newfound appreciation for other disciplines and the challenge of transferring knowledge among them.

Conclusion

Here we demonstrate that a truly transdisciplinary learning experience is possible within the traditional academic framework with only minor adjustments. We show that the creation of a new course code (therefore removing the possibility of getting credit towards respective majors) is not necessary and that our approach may have contributed to attracting such a diverse group of students. We also demonstrate how it is possible to increase student access to undergraduate research opportunities that are traditionally offered at a one-to-one faculty-student ratio. In this pilot offering, we achieved a ratio of 1 faculty:12 students. With the success of this pilot program, ICON will now be offered in two academic semesters with approximately 45 students per offering. With increasing student enrolment, declining access to one-on-one undergraduate research opportunities, and employer demand for transferable skills, models such as ICON may be an innovative way of providing students with greater access to research experiences and the flexibility required to respond to the society's changing needs of their graduates.

References

Adams, S. (2014). The 10 skills employers most want in 2015 graduates. *Forbes*. Retrieved from http://www.forbes.com/sites/susanadams/2014/11/12/the-10-skills-employers-most-want-in-2015-graduates/#4c154a2e19f6

Canadian Council of Chief Executives. (2014). *Preliminary survey report : the skill needs of major Canadian employers*. Retrieved from http://www.ceocouncil.ca/wp-content/uploads/2014/01/Preliminary-report-on-skills-survey-Jan-20-2014-2.pdf

Estabrooks, C. A., Thompson, D. S., Lovely, J. J. E., & Hofmeyer, A. (2006). A guide to knowledge

translation theory. *Journal Of Continuing Education In The Health Professions, 26*(1), 25-36.

Pentland, D., Forsyth, K., Maciver, D., Walsh, M., Murray, R., Irvine, L., & Sikora, S. (2011). Key characteristics of knowledge transfer and exchange in healthcare: integrative literature review. *Journal of Advanced Nursing, 67*(7), 1408-1425.

Thompson, G. N., Estabrooks, C. A., Degner, L. F. (2006). Clarifying the concepts in knowledge transfer: a literature review. *Journal of Advanced Nursing*, *53*(6), 691-701.

Tricco, A. C., Tetzlaff, J., & Moher, D. (2011). The art and science of knowledge synthesis. *Journal of Clinical Epidemiology, 64*(1), 11-20.