

# Enhancing the Educational Value of Co-op Work Terms



Anne Marie Coolen, Director  
Engineering and  
Computer Science Co-op

It is often said that experience is the best teacher, but it should also be said that learning from experience is not automatic. Experiential learning programs like co-operative education, service learning, apprenticeship, and internship have many things in common, not the least of which is the fundamental and significant challenge of creating mechanisms to ensure that the intended learning is derived from the experiences. This article will explore that challenge as it relates to the Engineering Co-operative Education Program at Dalhousie.

Co-operative Education Programs, to be successful, must balance the educational objectives of the faculty, the human resource requirements of a diverse base of employers, and the career and learning expectations of students. Each of the 600 employer organizations we deal with annually has its own unique set of needs, expectations, and processes. These employers invest an average of \$10,000 per student in recruitment, salary, and training costs,

so they are looking for a return on their investment. Our 700 students also place an extremely high value on their co-op experiences, which they view as the gateway to their career success, a means to finance their studies, and an opportunity to test drive their classroom knowledge. The third element in this balancing act is the unique set of educational goals that each of the 10 different academic programs bring to bear on the process. Work terms must contain enough discipline-related work experience in order to qualify for co-op.

Meeting the needs of these three diverse partner groups is operationally complex. Most co-op programs across the country focus the bulk of their resources on developing co-op jobs, preparing students to compete for the jobs, and managing the process of matching students to those jobs. The educational aspects of our programs become secondary to that 'placement process' in part because, unless a student secures a placement the educational component is moot,

but also because developing ways to predict, control, measure and maintain the quantity and quality of learning that occurs is extremely challenging.

Fortunately, the Engineering Co-op program is now well positioned to turn its focus to increasing the educational value of co-op work terms. To accomplish this challenging goal we put together a small committee which has been drawing heavily on the expertise of the Centre for Learning and Teaching to develop a new curriculum for students to follow while on their work terms.

We started the design process with the following goal in mind—to create an experience-based learning curriculum with assignments that are:

1. Authentic and meaningful to students
  2. Embedded rather than added on at the end
  3. Reflect the Engineer-in-Training (EIT) program used for the Professional Engineering (P.Eng) designation
  4. Develop technical writing skills
  5. Teach the habit of self-directed professional learning
  6. Balance the student's academic work load with the placement work load
- Next, we explored the pedagogy of experiential learning conceived as learning through reflection on doing: reflection for action, reflection in action, and reflection upon action (Schon, 1983). Effective experiential learning requires a concrete



Photo by Allison Chua, Mechanical Engineering Co-op.  
Used with permission

experience, observation and reflection on that experience, formation of abstract concepts based upon the reflection and testing new concepts (Kolb, 1984). The conditions for experiential learning include:

- structured opportunities to reflect
- time to reflect on one's own
- a sense of safety about the reflective process
- time to talk in a reflective manner with colleagues, mentors, supervisors
- opportunity to engage in structured observation

(Richert, 1990)

Using these ideas, we developed a curriculum that requires students to create a Professional Practice Portfolio based on assignments that move from reflecting for action by setting learning goals, to reflecting in action by keeping monthly experience records, to reflection upon action by writing a final capstone report. In each assignment the student describes significant learning events they have experienced during the prescribed time period and generates a critical analysis of what they learned from the event, both in relation to their learning goals and other learning, and how they will use that knowledge in the future.

To assist the students with developing appropriate learning goals, we developed a matrix of generic engineering goals that dovetails with the types of work experience required for the P.Eng designation. From this matrix, students select five generic goals that are appropriate for their specific work term and develop them into specific goals which are then approved by the employing supervisor. To allow for the broad spectrum of work experience, the

matrix offers a wide range of goals that become increasingly more advanced as work terms progress.

The curriculum also includes a work performance review completed by the employment supervisor at the end of the work term. Students must include a reflection on what was learned from the review in the capstone report. Upon return to campus there is a 'debriefing' session where students network with their classmates and share their learning experiences.

In order to find out if the new curriculum was on the right track, we delivered it as a pilot to three groups of students over the past year. Our goals for the pilot were to determine the following:

- whether the student's work term experience is enhanced by the new curriculum
- in what ways, and to what degree the work term experience is enhanced
- the average time required for students to complete the curriculum
- any challenges the student had with the curriculum
- the effectiveness of each component of the curriculum as it related to their learning
- the time and resources required to administer the curriculum
- the impact of the curriculum on the student's work supervisors

The early results of the pilot indicate that we are on the right track. For example, the students who completed the pilot reported a significant increase over the non-

pilot students in their understanding of how much they achieved on their work term. And, they rated the time invested in their assignments as more worthwhile to them than the non-pilot group. When asked if they would recommend the work term assignments to their peers, only 34% of the non-pilot group said yes, while 74% of the pilot group said they would.

*“Academic programs in Engineering include: Biological, Chemical, Civil, Computer, Electrical, Environmental, Industrial, Materials, Mechanical and Mining.”*

Our next steps are to complete the analysis and draft our recommendations for the new curriculum and funding requirements for Engineering Faculty to review by Fall 2010. We are also exploring ways to incorporate

some of these curriculum elements into the Computer Science Co-op Program. If you would like more detailed information on any aspect of this project, please contact me at [amc@dal.ca](mailto:amc@dal.ca)

#### References:

Kolb, D. A. (1984) *Experiential Learning: Experience as the Source of Learning and Development*. Englewood Cliffs, N. J.: Prentice Hall.

Richert, A. (1990) Teaching Teachers to Reflect: A consideration of professional structure. *Journal of Curriculum Studies*, 22(6), 509-527.

Schon, D. (1983) *The Reflective Practitioner: How professionals think in action*. New York: Basic Books.