Using Reflection to Assess Learning Outcomes

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Academic Credit for Co-op

- WatPD established in 2006

- Focus on the skills not systematically taught in academic programs but critical for workplace success

- Enhance the learning the occurs in the workplace by providing students with background knowledge/tools to effectively gain workplace skills

- Degree requirement for all co-op students

- Students also write 3-4 work reports for the their faculties; each faculty has their own guidelines

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Work Reports in Chemical Engineering

- Two core PD courses

- Three technical reports

  - Matches previous coop accreditation requirements

- Issues:

  - Limited opportunity for reflection (not best practice in experiential learning)

  - Slow cycle with limited opportunity to apply feedback (not best practice in developing writing)

- Plan:

  - Four reflective work reports

  - Two technical reports but with much enhanced instruction as part of wider communication-related changes

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Reflective Work Report Pilot

- Reflective report integrated with a professional development (PD) course

- Intended Learning Objectives:

  - Articulate skills and identify ongoing skill development needs

  - Articulate learning from the PD course

  - Write good experience records for Professional Engineers Ontario (PEO).

- Program assessment objectives:

  - Measure students' capacity for lifelong learning in terms of their ability to articulate and reflect on skills development.

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Reflection

- Facilitates better academic and workplace learning outcomes (Tsingos-Lucas et al., 2017)

- Improves decision making (Mamede et al., 2008)

- Strengthens professionalism and empathy (Winkel et al., 2017)

- Improves attitude and comfort levels during difficult and complex situations (Winkel et al., 2017)

- Reflection complementary to technical learning enhances "cognitive flexibility" (Alarcão and Moreira, 1993)

- Reflective writing encourages students to analyze their experiences, integrate their knowledge from academics and practice, and critically learn (Carter et al., 2017)

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Student Experience

Benefits of integration with PD course:

- Efficient delivery with existing course and removal of work between COOP and start of academic term (stress reduction)

- Enhances value of PD course by helping students make better connections to the course while on-the-job

- Students can make a plan for using the last few weeks of the job wisely and to their advantage

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Student Experience – Achieving Buy-In

- Colleagues in engineering have had challenges selling students on reflection

- Align reflection with items of value to students

- Based on PEO experience record – students told us they were unsure how to approach these records

  - Side benefit: learn about professional licensure requirements (PEO)

- Work experience description aligned with resume updating

- Skills articulation aligned with interview preparation

- Added a planning piece aligned with identifying future coop placement goals

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Student Support

Skills Articulation

- Resume
- Interview skills

Career Prep and Planning

- Identify gaps
- Practice for licensure

Stress Reduction

- Relevant connections
- Earlier requirement completion

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Course and Work Report

- Frequent, timely, constructive feedback

- Structured opportunities for reflection and learning integration

- Opportunities to discover relevance of learning through real-world applications

- Early access to rubric and instructions

DEAL Model of Reflection

- **D**escribe the event/situation/experience in specific terms. You could focus on one specific event or provide an overview of a situation. You should be as precise as possible in your description.

- **E**xamine the event/situation/experience from the perspective of academic learning, personal growth, or civic responsibility.

- **A**rticulate **L**earning by sharing what you have learned and why this is important for you (academically, personally, or for your civic responsibility). You could articulate what you might do differently in the future.

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Overview of Submitted Reports

- Students typically wrote 4-6 pages. All students that submitted a report passed.

- Adding experience to your engineering resume

  - Very well done by most

- Articulating engineering experience

  - Very well done by most

- Identifying gaps in knowledge or skills

  - More variability, done well by about 2/3 of with 1/3 developing

- Planning for future coop

  - Again, more variability, done well by about 2/3 with 1/3 developing

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Gathering Feedback (Quality Assurance and Tools)

- 58 students (about 2/3 of those enrolled) provided feedback through a survey

- Nearly all students were satisfied or very satisfied with report instructions and rubric

- Median time spent on report: 6 h

  - Compare to >20 h reported for technical reports

- Students mostly reported medium to good awareness of the PEO and its academic and experience requirements, with the report contributing "a little" to their awareness around the experience

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As a result of writing this report, I am better able to...
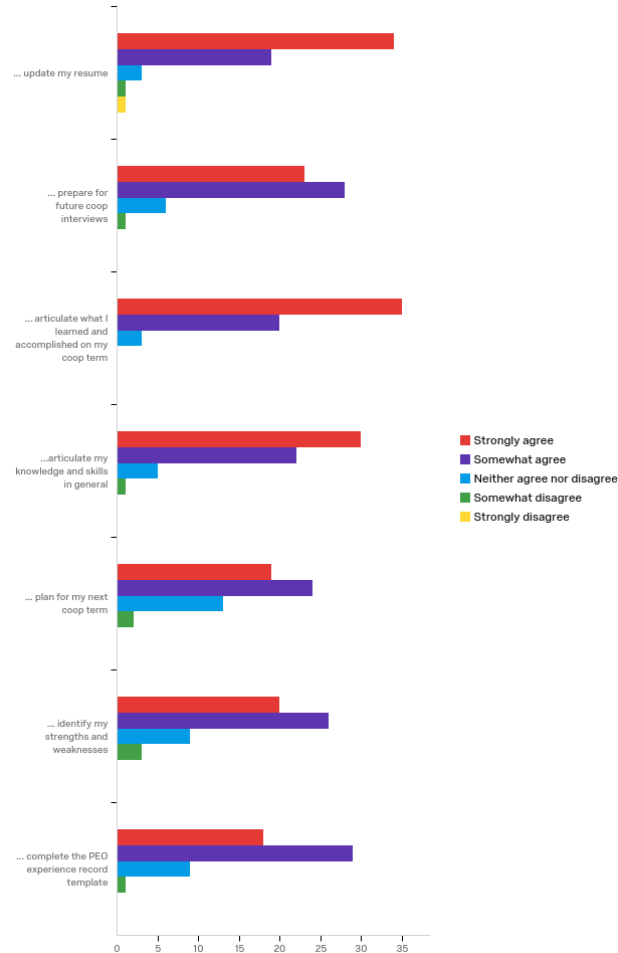
Nearly all agree or strongly agree!

- Update my resume

- Prepare for future coop interviews

- Articulate what I learned and accomplished...

- Articulate my knowledge and skills in general

- Plan for my next coop term

- Identify my strengths and weaknesses

- Complete the PEO experience record

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Student Feedback

- No negative comments! 100% of students are somewhat likely or very likely to recommend reflective work reports embedded in PD courses

"I liked how the response to the work term report will help me in future interviews. It really helped me to think about transferable skills and how to apply what I have learn for future engineering situations. I believe it makes more sense as compared to the traditional work term reports that are more structure and formatting oriented."

"I was still able to reflect on what I had learned this term and how it would help me-far more than writing a long work term report about a specific project. Last term was incredibly stressful, especially near the end of the term to complete the report and edit it. This reduced the stress and improved relating the workterm to engineering fundamentals and my resume and interview responses."

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Program-level Continuous Improvement

- Lifelong Learning Graduate Attribute

  - *An ability to identify and to address their own educational needs in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge*

- Operational Definition through program indicators, a student should be able to...

  - Identify gaps in their knowledge, skills and abilities

  - Obtain and evaluate training from appropriate sources

  - Reflect on the use of information obtained

- Combined with:

  - Student performance evaluations: "ability to learn" item

  - End of coop term surveys: identify most important technical and non-technical skills and how they were able to perform for each

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Next Steps

- Implementation of sequence of four reflective reports:

  - Development of training and resource materials

  - Monitor longitudinal progress

  - Explore integration with ePortfolio

  - Explore potential for continuity: do they subsequently develop the skills they identify as a priority?

- Make the connection to PEO more explicit

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