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focus

on university teaching and learning

Note From the Director

Accreditation or Program Reviews are common starting points for curriculum mapping, development and renewal. Yet Faculties often discover that these processes open the door to further conversations about teaching and learning that enhance the student experience. In this issue, our contributors share their curriculum development processes and highlight opportunities they will be exploring for future development of their Programs.

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DALHOUSIE
UNIVERSITY
Inspiring Minds

Curriculum Development and Renewal: A Faculty-Driven and Evidence Informed Approach

Brad Wuetherick, Executive Director, Centre for Learning and Teaching

"*Curricular assessment and development are exceedingly important activities that faculty will be increasingly expected to champion and support.*" (Christensen Hughes, 2007).

Calls for strategic curriculum change, focused on ensuring a coherent 'networked' curriculum that enhance student learning outcomes, have been echoed around the world (Blackmore and Kandiko, 2012; Bamber, Trowler, Saunders, & Knight, 2009; Wolf and Christensen Hughes, 2007). These calls accompany more philosophical explorations of the purpose of universities, and the role of curriculum development in shaping the future of universities (Barnett and Coate, 2005; Barnett, 2011). How might universities, and the faculty and students that make up a university as a social institution, come to 'know', 'act' and 'be' in the world? How does a given curriculum develop students' dispositions towards knowledge, towards how they 'act' in the greater world, and towards themselves as learners and as global citizens?

Globally, there are three main drivers for institutions and programs to engage in curriculum renewal. First, there may be a quality assurance mandate imposed on a program or an institution, by a government or professional accreditation body, to ensure a minimum standard across and between institutions or disciplines. Second, there might be a commitment to quality enhancement processes, which are often more intrinsically motivated, to improve the experience and development of students across a program or institution. And third, there might be an interest in using our improved understanding of evidence-based teaching and learning practices in higher education to inform academic innovation at the level of individual courses or across an entire program. These three reasons for engaging in curriculum development may well be interconnected with one another, rather than standing alone.

Whatever the impetus for curriculum development and/or renewal, the process, according to Wolf (2007), should be driven by the faculty members who teach in the program, informed by data and evidence about the program's effectiveness, and supported by teaching and learning specialists working in teaching and learning in higher education. Wolf (2007) argues for an ongoing curriculum renewal process that includes examining the intended outcomes for the program, what is already offered, how well the intended outcomes are being met, and how to change the program to better meet those outcomes. Approaches to curriculum development and renewal can and will differ across academic units and institutions, shaped by external accreditation requirements or institutional planning requirements, but key to any of these approaches should be a commitment to being faculty-driven and evidence informed.

There are a variety of different models for approaching curriculum development. Bernstein (2000) argues that curriculum can be viewed through four different lenses:

1. What do we say we will do? … the "planned or intended curriculum" often most directly documented through course syllabi.

2. What do we do in practice? … the "created or delivered curriculum" which is how intentions are translated into practice in the actual teaching of courses.

3. What students get out of it? … the "received or understood curriculum" referring to the way the intended and delivered curriculum is understood by the students.

4. What else are we doing? … the "hidden or tacit curriculum" where additional knowledge, skills or values are conveyed, even though they are not formally or explicitly part of the curriculum. (Bens, 2013)

In exploring Bernstein's lenses, Blackmore and Kandiko (2012), point out that it is usually the first two questions (and often just the first question) that occupy curriculum committees with little to no attention to the latter two (or three).

One curriculum development and renewal model I was involved with reinforces the importance of a faculty-driven and evidence informed process (See Figure 1). The model includes a six-step curriculum innovation cycle and includes efforts to explore the 'hidden curriculum' and evaluate the 'received curriculum', in addition to the 'planned curriculum' and 'delivered curriculum':

1. Informed Imagining – What do you want for your program? – exploring the vision for the program (in particular, articulating the intended outcomes of the program for students).

2. Inventory – What does your program offer now? – gathering the data about the program, including mapping the existing curriculum.

3. Identify Congruencies – How does what you have match what you want? – looking at the interplay between the vision for the program and the evidence about the program as it currently exists.

4. Implement – What is practically needed to enact identified changes? – initiating academic innovations to improve the learning environment for students in line with the vision for the program, and the identified gaps in the program.

5. Investigate Impact – How are the changes working? – committing to evaluating the effectiveness of the program in a meaningful, sustained, and systematic manner.

6. Re-Imagine – What next? – using the outcomes of the program evaluation to inform a re-visioning process that initiates the ongoing curriculum renewal process.

(Mills and Bens, 2012)

Figure 1: Curriculum Innovation and Renewal Cycle

This cycle of a continuous development and renewal should be embedded in university programs today to meet the ever-changing learning needs of our students and our broader communities.

The Centre for Learning and Teaching at Dalhousie, particularly through our soon-to-be-filled Associate Director of Curriculum Planning, can provide ongoing support for this entire process. That support can come in the form of:

- *Process coaching*: work with curriculum committee (or curriculum leader) to help design the process and provide behind-the-scenes support.

- *Process resource support*: provide background resources as requested, and in particular serve as a bridge to the evidence-based practices identified in the higher education teaching and learning literature.

- *Process facilitation*: work with the entire department to facilitate the curriculum renewal process.

For more information about the curriculum development support provided at Dalhousie, please contact the Centre for Learning and Teaching at clt@dal.ca.

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Accreditation and 'Assurance of Learning' at the Rowe School of Business

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What is accreditation?

Educational accreditation, in the field of business, is essentially a form of voluntary quality assurance in which an external agency (the accrediting body) assesses various factors including an institution's programs, faculty, students, governance, financial management, etc. Universities are increasingly seeking accreditation as an external form of validation regarding the quality of their programs and qualifications of their faculty members. Accreditation is often now a prerequisite for faculty members in choosing a university for their careers and for students in choosing a program of study. If the institution maintains acceptable standards according to the demands of the accrediting body, it is granted recognition in the form of accreditation. The process of granting or renewing accreditation generally involves preparation of a detailed report, self-evaluations, evidence of strategic planning, and a site visit by a peer review team as well as the submission of annual update reports.

Accreditation in the Rowe School of Business

Graduate and undergraduate programs delivered by Dalhousie's Rowe School of Business (formerly the School of Business Administration) have been accredited by the Association to Advance Collegiate Schools of Business (AACSB) since Dalhousie's initial application for accreditation in 2003. These accredited programs include the Corporate Residency MBA (CRMBA), the MBA Financial Services (MBA-FS), the Bachelor of Commerce (BComm), and the Bachelor of Management (BMgmt) programs. AACSB accreditation is a recognized global standard that confirms that a School is meeting the needs of its key stakeholders (such as students and employers) while aligning its financial and other resources to effectively pursue its vision, mission, and related strategies. It is a valuable tool in recruiting high quality students and faculty in a competitive market.

Accreditation and curriculum review in theory

According to Lattuca, Strauss, and Sukhbaatar (2004), many educational accreditation agencies have shifted their focus from meeting quantitative standards (such as baseline institutional resources and students' scores on standardized tests) "to an emphasis on the use of student assessment results to demonstrate educational effectiveness" (p.2). This is certainly true for AACSB. In its 2003 Accreditation Standards (http://www. aacsb.edu/accreditation/business/standards/), AACSB made clear the expectation that accreditation would be based, in part, on a school's ability to demonstrate "assurance of learning" or AoL. In the AoL plans, accredited programs must articulate their educational goals, and demonstrate the alignment of these goals with the School's mission and strategic plan as well as with the needs of the profession.

AACSB does not prescribe learning goals. Rather, each program specifies its own set of 4-5 broad learning goals which are then further subdivided into more specific measureable learning objectives. AACSB does not explicitly identify foci for goals and objectives, however they do suggest that learning goals reflect the school's mission, the program level goals (bachelor, master, PhD), and the stakeholders it intends to serve. In this sense, there is a strong expectation of alignment within the school and its programs. The Rowe School of Business emphasizes values-based management and leadership; improving business productivity to enhance regional prosperity; and fostering a global perspective. These strategic goals are supported at the

program and course levels via students' interaction with professors active in research and rich in professional experience; collaboration with other units in the Faculty of Management; and by opportunities for hands on learning.

AACSB requires a minimum of one direct course-embedded measure per objective and further requires that data be collected on the performance of students in the program in relation to that objective, indicating the percentage of students who exceed, meet, and fail to meet the instructor's expectations. These data must be collected from at least 20% of the students at two different points in time (per 5-year cycle).

Accreditation and curriculum review in practice: Putting assurance of learning to work

Admittedly, this sounds like a labour-intensive process. How does it work in practice? Dr. Lorn Sheehan, Associate Director of the Rowe School of Business, is the School's AACSB lead. He worked closely with the curriculum committees of the four accredited programs to develop their individual assurance of learning plans with the further input of key instructors of required courses. Each of the AoL plans clearly states the program-specific goals, objectives, and course-embedded measures of individual student performance related to each objective. Instructors of relevant courses develop rubrics and collect the required data on student performance. Throughout the year, the academic program director and lead administrator of each program collect data on student achievement of learning objectives from teaching faculty as well as from other stakeholders (including Management Career Services and co-op work term/corporate residency employers). This compiled data is used by the Academic Program Directors to create an annual report, which is reviewed every fall by the program-specific curriculum committee.

Thus the AoL report becomes one factor in a broader curriculum review process in the School. In addition, the program curriculum committee also takes into consideration course evaluations by faculty, SRI responses, and feedback from employers and alumni. In this way, recommendations for changes to specific courses may also result. Such curriculum

revisions have strengthened student achievement of learning outcomes. For example, professors in the capstone undergraduate strategy class now provide more detailed instructions on how to better develop an insightful case analysis and have introduced an ethics case as part of a simulation assignment. The professor of an MBA Economics class has introduced a formal midterm exam to ensure students will be better prepared for the final exam.

Assurance of learning and continuous curriculum development

The AoL plans have become a regular part of the cycle of continuous curriculum development and improvement. Each program curriculum committee annually reviews its AoL goals, objectives, measure, and rubrics. The revised AoL plan is then used to collect data on student achievement of learning objectives throughout the year and this data is incorporated into the annual assurance of learning report, which is produced each September. The AoL report is reviewed by the relevant curriculum committee in October and is used as a source of recommendations for curriculum changes and revisions. As a strategy to support the monitoring of assurance of learning, the Rowe School of Business has embarked on a curriculum mapping initiative using Daedalus software, developed by Dr. Christian Blouin of the Faculty of Computer Science. Curriculum mapping will be a valuable tool for curriculum committees to identify which learning objectives are strong and well-integrated (i.e. addressed by several courses in a logical progression and sequence) and where gaps or weaknesses in the curriculum may lie. Other graduate programs in the Faculty of Management are considering curriculum mapping initiatives this academic year.

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Mapping a Curriculum: Seeing the Forest as well as the Trees

Christian Blouin, Faculty of Computer Science and Department of Biochemistry and Molecular Biology Faculty Associate, CLT

Instructors are working hard to deliver well-designed courses, but sometimes the big picture gets lost in the bustle of getting things done. There is a forest behind all these trees. Students, parents, employers, professional bodies and government increasingly expect transparency regarding program learning objectives. Instructors need to comprehend the context of a course within the broader curriculum. Understanding this context allows instructors to set realistic expectations, and academic units to make program decisions based on facts rather than anecdotes.

A growing number of academic units at Dalhousie are using curriculum maps to help them visualize, assess, and communicate their degree programs. Creating a curriculum map should be useful for many purposes, and sustainable as an ongoing practice. It is better to start small, driven by the need to identify the elements for student success. The general idea appears relatively simple: express course expectations as a series of Student Learning Outcomes (SLOs). SLOs are statements outlining what students will know, be able to do, or value at the end of a course or program. Ultimately, these SLOs should be demonstrated by students through an assessment process.

Many important tasks can be achieved with a clear curriculum map. Instructors often find the process of specifying expectations as SLOs to be effective for aligning them with the choice of assessments. SLOs are more than just a laundry list of topics but rather testable tasks. Identifying SLOs across courses provides a basis to identify overlaps and gaps in coverage of a curriculum. These challenges can be identified by browsing a map using the frequency of SLO categories. Defining the sequence in which SLOs must be taught allows faculty to assess the soundness of course pre-requisites. Performing these tasks is required to maintain a coherent and consistent curriculum. Finally, having a curriculum map helps in reporting to accreditation bodies.

There is a clear benefit to using a simple tool to facilitate mapping and visualization. The software tool Daedalus is available for all academic units within Dalhousie. Daedalus has been developed on campus to fit specific Faculty and department needs. Each map is a website hosted within Dalhousie, and accessible with any web browser. There is currently a community of

Wordle of the frequency of words found in the SLO for the Bachelor of Computer Science and the Bachelor of Informatics. Major themes from these curricula are captured in one glance.

more than 20 map builders from which those who are just beginning to think about mapping their curriculum can draw experience. The CLT is actively supporting mapping efforts. As a Faculty Associate of CLT, I have been assisting Faculties and departments in getting started with curriculum mapping by communicating the process to faculty and discussing how to prepare effective SLOs. Once built, faculty are free to interpret the map and make curriculum decisions. Many units contract out the bulk of the data entry work of importing SLOs into Daedalus for a few hundred dollars. There are a growing number of people with experience with the tool who can help. About an hour of work should be budgeted per half-credit course once the SLO data is obtained. Daedalus allows users to browse a curriculum by course and program objective, among other categories. It also includes reporting features, and some visual tools to get a one-glance overview such as tag clouds and diagrams. The key to this exercise is to make the information easy to view, maintain and manipulate.

In the Faculty of Computer Science our curriculum mapping process led us to realize some difficulties that were being encountered in our undergraduate curriculum were related to a sudden jump in the level of abstraction expected from our students. A discussion between instructors of two courses offered in a sequence allowed for the identification of possible causes for the lower performance of some of our students. Because the discussion was based on a common language (the SLOs), it was possible to reconcile the discontinuity in levels of expectation and make the flow of learning seamless between key courses.

In Computer Science we have also found that providing maps to students is the best motivation to make sure that the map is current and correct. There is a clear benefit for a student to understand the connection between foundational and capstones outcomes. In a Daedalus map, this type of information can be explored by anyone with a web browser. This level of transparency between a program and its students may appear unusual at first. However, students, employers and government alike are demanding a better understanding of the value of the university experience. The onus is on us to provide a substantial rationale for our Program design. Communicating program goals and expectations requires a clear, elegant common language. Curriculum mapping of SLOs may just be the language that we need to express the value of our programs.

Change One Thing Challenge

Attention Faculty, Instructors, and Teaching Assistants

The Centre for Learning and Teaching challenges you to share your student engagement activities

Two Conference Travel Grants for up to $1000 each will be awarded!

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Deadline for proposals: January 31, 2014

Curriculum Renewal: Part of Our Oxygen

Peter Stoicheff, Dean, College of Arts and Science, and Professor, Department of English, University of Saskatchewan

Curriculum renewal is one of the most important faculty-driven projects that the college will undertake in the Third Integrated Plan. Earlier this year, we established five college-level learning outcomes for students graduating from any of our programs (see article by Leslie Biggs also included in this issue of *Focus*, see facing page). In the shift to a learning outcomes model for curricula we are ensuring that our students develop skills and abilities common to every program in the college and that, among other things, help prepare graduates for careers regardless of their disciplines.

From now to 2016, curriculum renewal will involve four phases. We are currently working on the first—creating learning goals for each program and undertaking curriculum mapping. Next, we will shift to curriculum alignment, in which programs, departments, divisions and the college will redesign their curricula to be as innovative and distinctive as they can be, to include the program goals and align with the college's learning outcomes. We will then undertake the administrative and collegial processes necessary to institute revised and new curricula in the fall of 2015.

The college's Curriculum Innovation Steering Committee (CISC), chaired by Professor Scott Bell (Geography and Planning) and Sheryl Mills of the Gwenna Moss Centre for Teaching Effectiveness, has done an outstanding job of undertaking and promoting the crucial planning and legwork for the beginning of our first phase of curriculum renewal. Mills and the previous First-Year Curriculum Bridging Committee (chaired by Professor Lesley Biggs) and the First-Year Curriculum Review Steering Committee (led then by former Dean Jo-Anne Dillon) did the research and formed the necessary recommendations to lead our college to our current stage, where we are now poised for transformative and cultural change regarding how and what we teach.

I am pleased to announce the formation of a new committee within our college (beginning at the start of Term 2) that will oversee the implementation of curriculum renewal. The Curriculum Renewal Implementation Committee (CRIC) will oversee the alignment, coordination and communication of the many aspects of curriculum renewal. CRIC will include members from the Dean's Executive, the Programs Office, the Undergraduate Student Office, Arts & Science IT and the Gwenna Moss Centre.

With administrative efficiency and sustainability at the forefront, CRIC will form three subcommittees, each of which will examine and interrelate discrete elements of our college's culture and structure that will factor into conversations and decisions during the alignment phase. These elements include Aboriginal engagement, accreditation, mapping of program's goals to those of the college, block transfer agreements and transfer credit, types of credentials offered (degrees, diplomas, certificates), distributed learning, distribution requirements, interdisciplinarity, internationalization, learning communities and peer mentorship, pedagogical innovation, program prioritization and TABBS. The college's and divisions' Third Integrated Plans provide us with a chance to think about what we do and why we do it. The period of the Third Integrated Plan (2012–16) gives us a chance to promote the value of all that we do.

Our curriculum renewal process is now part of our oxygen—a key dimension of our college's commitment to innovative teaching and research, scholarly and artistic work—and it promises to create a college that is truly unique in Canada.

I Thought that We Were Just Creating a Few New Courses: Reflections on Curriculum Transformation in the College of Arts and Science

The Context

In 2008, Jo-Anne Dillon, then Dean of the College of Arts & Science, established the First-Year Review Steering Committee (FYRSC). Our mandate was, *inter alia*, to "Discuss possible approaches for implementation of a new first-year experience," which we understood to develop new interdisciplinary courses for first year students. At the time, this task seemed relatively simple, and since January 2009, the FYRSC began meeting weekly to discuss what these first-year courses might look like and how they might be delivered within the existing course distribution framework. It became clear, however, that we had no principles upon which the development of the courses might be based. It also became evident very quickly that the current model of delivering courses was out-of-date; the last time that the distribution requirements had been changed was in 1968!

Lesley Biggs, Chair, First Year Review Steering Committee and Associate Professor, History and Women's Studies, University of Saskatchewan

Since then, of course, much has changed in the funding and delivery of postsecondary education as Saskatchewan and Canada have moved into the global economy and the digital age. Not only has post-secondary education been undergoing a radical reconstruction, but also the scholarship of teaching and learning has emerged as a distinct body of research, the result of which has led to the identification of high impact practices that improve faculty teaching and enhance student learning and engagement with ideas. Here in the College of Arts and Science, we utilize some of those practices, but not all, and not consistently across programs.

At a time, then, when the College is faced with significant economic challenges, it seems counter intuitive to argue for a transformation in the Arts and Science curriculum. "If it isn't broke, why make changes?" is an often repeated phrase. But all of the institutional data about student engagement and retention rates, as well as the very real competition from other post-secondary institutions that are also tuition dependent, indicates that College of Arts and Science could do better if the College applied these high impact practices more consistently across the curriculum.

The College of Arts and Science at the University of Saskatchewan is (one of) the only universities in the medical-doctoral category which offers programs/courses in the fine arts, humanities, social sciences, and the sciences under one administrative structure. The College has not taken full advantage of this unique configuration, although in recent years an interest in multi- and interdisciplinarity has emerged.

The College needs to ask itself, "What does the College have to offer that would make it a destination point for undergraduate students?" One way to answer this question is by developing program goals that help to forge a vision of undergraduate education based on high impact practices.

To this end, the FYRSC spent almost six months discussing program goals that would answer the question "What should a student know by the end of his/her first year?" the FYRSC developed program goals that are organized around five themes of DEEPC Learning:

1. Develop a wide range of effective communication skills.
2. Encourage personal development, growth and responsibility.
3. Engage students in inquiry-based learning, critical thinking and creative processes.
4. Prepare thoughtful, world-minded, educated, engaged citizens.
5. Cultivate an understanding of and deep respect for the unique sociocultural positioning of Aboriginal peoples in Canada, and support Aboriginal students so that they can realize their educational aspirations.

Each goal includes the student attributes and the evidence and outcomes that would demonstrate the student's progress in achieving that goal. For the full report, go to http://artsandscience.usask.ca/.

Curriculum Mapping

These College program goals provide a framework for the delivery of undergraduate programs. The next step in the process is for departments/units to develop their own program goals, based on their unique signature pedagogies, in order to answer the question "What should a student in our discipline know by the time he/she completes a three or four year degree?" The development of these goals is based on signature pedagogies relevant to a discipline; i.e., "the types of teaching that organize the fundamental ways in which future practitioners are educated for their new professions."[1]

Peter Wolf (University of Guelph), a leading curriculum designer in Canada, offers a model for curriculum development that is "faculty-driven, data-informed, and educational developer-supported."[2] In this model, curriculum development is based on three phases:

- Curriculum Visioning: involves the assessment of various kinds of data collected in order to match the attributes of the ideal graduate with the program goals. This data could include student and faculty surveys, a summary of program offerings offered at other institutions, and so on.

- Curriculum Development: uses curriculum mapping to match foundational content and program objectives to assess current and future course offerings, sequencing, and so on.

- Alignment, Coordination, and Development: involves "reviewing the literature and research on one or more program objectives, developing relevant rubrics and exemplars of differing levels of skill development, and developing suggested teaching approaches to foster skill development." [3]

By developing a systematic and explicit approach to curriculum development, departments/units will be able to identify their strengths and potential synergies with other programs both in - and outside their disciplines, as well as their weaknesses.

Looking Forward

Developing program goals and curriculum vision, development and alignment take time, and involve more than adding a few new courses. These processes ultimately will lead to a transformation in the curriculum of the College of Arts and Science—a revolution by evolution as Marcel D'Eon (from the College of Medicine, and then Chair of the Teaching and Learning Committee of Council) has observed. Curriculum transformation ultimately requires a shift in the culture, identity, and teaching practices within the College of Arts and Science. The FYRSC believes that the College is more than able to meet these challenges.

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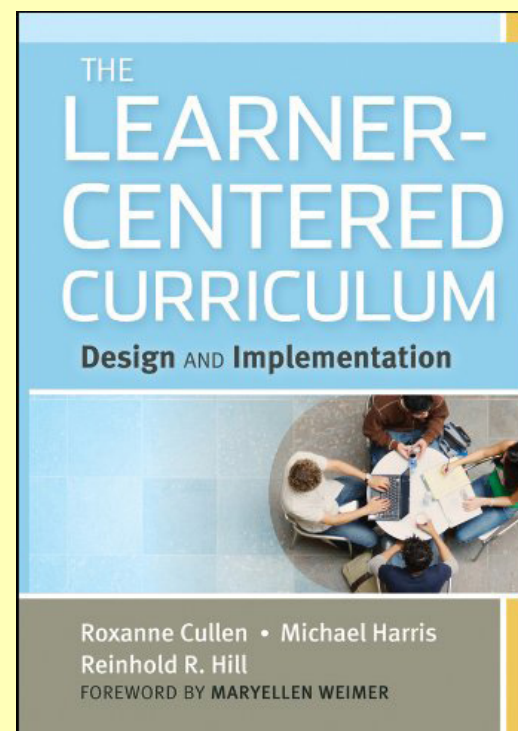
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The Effective Integration of Blended Learning in Courses and Programs

Over the past decade, there has been an increased focus on the topic of student engagement in light of rising tuition costs and concerns about student success and retention rates. In response to these issues many educational institutions have adopted a blended approach to courses and programs by combining face-to-face and online opportunities for learning.

How does a blended approach to teaching and learning impact student engagement and success? This session will attempt to answer this question by presenting a series of case studies that will help you identify strategies and tools that are appropriate for engaging students in your own teaching and learning context.

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Considering the Nature, Growth and Development of Learning Outcomes

Suzanne Le-May Sheffield, Director, Centre for Learning and Teaching

Uninvited, unplanned, a sunflower grew in the flowerbed outside the Killam Library at the end of the summer. Looking off to the side of the bed, you could see that the seed had clearly been tossed under the shrubs and was never meant to see the light of day. But it fought its way towards the sun and, seeming to defy gravity, managed to support its brilliant display of flowers despite its crooked stem. The planned, well-pruned shrubbery had become nothing more than a backdrop to this unexpected delight.

Learning outcomes, for our courses, programs or institutions, can and should set a backdrop, a foundation, for learning. Outcomes provide guidance and a vision for a course, program or institution. They let students know what goals they can aspire to achieve. Outcomes encourage instructors to think explicitly about the knowledge, skills and values they hope to support students in achieving. They also encourage us to communicate these goals to our students and to align our assessment tools with those outcomes. Successful attainment of a range of interconnected program outcomes can ensure that, as teachers, we have supported the development of thinking and caring professionals and citizens, and educated the whole human being who will live and work in our society.

However, outcomes should never become so all encompassing that there is not room for growth, for the creation or evolution of outcomes that push teachers and students past the expected, the planned. If we want to encourage innovation and creativity through the stimulation of students' imagination, if these are truly our over-arching aims for a university education, we can't begin that process by constraining the possible. Students should be able to explore the unexpected, and teachers should feel free to take the opportunity to follow a new but equally relevant and valuable path when one arises, when it presents new possibilities for authentic learning. Outcomes should guide us, but they should not inhibit us, they should not make us afraid to move beyond what we expected and planned, or what we can readily assess. What kinds of learning outcomes can we introduce if we consider a broad spectrum of possibilities? David Naylor, former President of the University of Toronto, recently referred to the importance of developing students' resilience, emotional self-awareness and "competencies fostered by interpersonal exchanges" as key competencies for development during a university education.[1] Dalhousie's President, Richard Florizone, noted in an interview with *Maclean's*, "universities are both a training ground [for careers] and also about a more transformative personal experience."[2] How would we measure such resilience, self-awareness and transformation at the conclusion to a program and within the context of many of our frequently utilized modes of assessment?

When we stretch our minds to produce outcomes that meet our desire to engage students in aspects of life-

long learning, or that explore values and meaning, we may then struggle with how we can be creative and innovative in our articulation of assessment approaches. This is especially the case if some of our outcomes are difficult to assess in a short time frame, or appear to elude clear assessment options at all. How can we re-think our modes of assessment to allow us to include outcomes that grow beyond common ways of determining what students know and can do by the end of our courses? Can students and faculty have some outcomes that we don't explicitly assess?

The same opportunities and challenges exist when we turn to institution-wide outcomes. Earlier this year, I introduced a group of graduate students to a list of institutional outcomes: critical and creative thinking, literacy, global understanding, communication, and professional and ethical behaviour. I asked these graduate students what they thought about the idea of establishing institution-wide outcomes and what they thought of this particular list from the University of Guelph. One student quietly asked, 'But shouldn't those outcomes automatically apply to all universities? Aren't they obvious?'

Certainly learning outcomes are one way that universities might potentially differentiate themselves. The 2012 DalVision initiative underscored Dalhousie faculty and students' interest in interdisciplinarity and undergraduate research as key outcomes. What would a university education look like that consciously and consistently intertwined these two approaches? A student writer on the Dalhousie academic innovation blog suggested that one of our institutional outcomes should be sustainability, "University is also about self-discovery and our ability and duty to contribute positively to our world and our environment."[3] Can we differentiate our institution without specializing ourselves into the potentially narrow niches of problem-solving universities as described by Alex Usher[4] or generalizing to the obvious, even if perhaps the obvious should be stated? How can we stand out as an institution, while still remaining rooted in the need to ensure quality student achievement of expected outcomes that often have to meet accreditation requirements?

Ruth Walker, one of the authors of *Zombies in the Academy, Living Death in Higher Education* (2013), was recently quoted in an interview for *Inside Higher Education* as saying "…we insist on critical analysis,

but woe betide those who are critical of the institution itself."[5] While many different forces are at play influencing the future of the university, how do we ensure that we maintain the ability of students and teachers to think carefully and critically about the outcomes for learning? We need to revisit outcomes regularly, discuss them with our students and colleagues, but both students and teachers also need to feel empowered and challenged to reach beyond them, to take risks, to fail, and to try again – to follow their own path, to be unique.

Each morning and afternoon, as I walked past the Killam flowerbed this past August, I wondered if a groundskeeper would feel obligated to pull up this flower by its roots, encroaching as it was on the purposefully designed and otherwise well trimmed, organized shrubbery. Each day, I found myself hoping it would still be there. Growing a little stronger, finding its way. Exploring the unexpected is where the true excitement and meaning of a university education lies. The shrubbery did not catch my eye, but that surprising flower did.

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Mapping the Engineering Curriculum to Graduate Attributes

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Engineering Degree Programs in Canada are reviewed and evaluated by Engineers Canada (through the Canadian Engineering Accreditation Board), to ensure the education necessary for licensure as a professional engineer in Canada. Canada is a signatory to the Washington Accord, an international agreement among bodies responsible for accrediting engineering degree programs recognizing the substantial equivalency of programs accredited by those bodies. Washington Accord members have moved toward an outcomes approach to evaluating and accrediting Engineering programs and in 2009 the CEAB announced its intention of requiring all undergraduate engineering programs in Canada to utilize twelve graduate attributes for assessing the capacities of its student. These graduate attributes are listed in Table 1.

Table 1: CEAB Graduate Attributes

A knowledge base for engineering:	Demonstrated competence in university level mathematics, natural sciences, engineering fundamentals, and specialized engineering knowledge appropriate to the program.
Problem analysis:	An ability to use appropriate knowledge and skills to identify, formulate, analyze, and solve complex engineering problems in order to reach substantiated conclusions.
Investigation:	An ability to conduct investigations of complex problems by methods that include appropriate experiments, analysis and interpretation of data, and synthesis of information in order to reach valid conclusions.
Design:	An ability to design solutions for complex, open-ended engineering problems and to design systems, components or processes that meet specified needs with appropriate attention to health and safety risks, applicable standards, and economic, environmental, cultural and societal considerations.
Use of engineering tools:	An ability to create, select, apply, adapt, and extend appropriate techniques, resources, and modern engineering tools to a range of engineering activities, from simple to complex, with an understanding of the associated limitations.
Individual and team work:	An ability to work effectively as a member and leader in teams, preferably in a multi-disciplinary setting.
Communication skills:	An ability to communicate complex engineering concepts within the profession and with society at large. Such ability includes reading, writing, speaking and listening, and the ability to comprehend and write effective reports and design documentation, and to give and effectively respond to clear instructions.
Professionalism:	An understanding of the roles and responsibilities of the professional engineer in society, especially the primary role of protection of the public and the public interest.
Impact of engineering on society and the environment:	An ability to analyze social and environmental aspects of engineering activities. Such ability includes an understanding of the interactions that engineering has with the economic, social, health, safety, legal, and cultural aspects of society, the uncertainties in the prediction of such interactions; and the concepts of sustainable design and development and environmental stewardship.
Ethics and equity:	An ability to apply professional ethics, accountability, and equity.

Economics and project management:	An ability to appropriately incorporate economics and business practices including project, risk, and change management into the practice of engineering and to understand their limitations.
Life-long learning:	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.

Individual Engineering Faculties across Canada have been experimenting with ways to assess and track these attributes with some collaboration and exchange of ideas and processes. At Dalhousie University, the Faculty of Engineering faced several major decisions, primarily in how to assess the attributes and how to track this assessment data. Each of the 12 attributes was broken down in to 5-7 different specific performance indicators, labeled with a letter. To keep track of the graduate attributes and performance indicators, an alphanumeric system was used, for example, 1a, 1b, etc. There are 68 performance indicators. indicators for the first sets of attributes are usually straightforward to measure for Engineering classes, for example 1a is "Explain and apply mathematics for analysis and synthesis in engineering". The higher numbered attribute/indicators are more challenging. Attribute 10-Ethics and Equity gets broken down into 6 attributes:

10. Ethics and equity

   1. Identify applicable ethical, OH&S, quality standards and dilemmas

   2. Treat all persons fairly, without bias, and with respect

   3. Demonstrate professional behaviour in all circumstances; adheres to student code of conduct

   4. Recognize the advantages of diversity and the limits of homogeneity

   5. Develop and maintain the trust and confidence of colleagues

   6. Demonstrate honesty, integrity and intellectual rigour in engineering practice

After the performance indicators were established, each course required for an Engineering degree was examined. The desired outcomes and methods of assessment for each outcome were identified by the individual course instructor with guidance from an educational consultant, and other closely related faculty members. These outcomes were then linked to the appropriate graduate attribute/ performance Indicator. Ultimately a matrix was generated showing where in the 8-term program for a particular engineering degree particular graduate attributes/performance indicators are covered. By entering individual student assessments into a software program each semester, data is collected over time. We are able to see how many measurements are made of each performance Indicator, and the average scores on the assessments. We can drill down into individual courses, and even to the student level, to investigate any abnormalities we see on the map of assessments.

The process of mapping the curriculum to graduate attributes, performance indicators, and scores on assessments is a useful tool in curriculum review. In piloting this process, individual professors were asked to identify assessments in their courses that measured a particular performance Indicator or set of indicators. For example, Question 3 on a test could be measuring Indicator 2c. The scores on this question are translated into a rubric score (0,1,2,3), for each student, and these scores are uploaded into a tracking program (eLumen). It is particularly important to build an element of continuous improvement into the process itself, as well as to utilize the results to improve the programs. My initial observations on how this process enhances teaching and learning stem from formulating desired outcomes and identifying how these outcomes/ attributes will be measured in the courses I teach. Now that we have over a year of data collected on different measurements, it has become apparent that some areas are heavily measured and some are barely measured at all. For the attributes such as (1) Knowledge Base, (2) Problem Analysis, (3) Investigation, (4) Design there are many places in the curriculum where these indicators are measured. Certainly some of the graduate attributes will, by their nature, be more predominant in the Engineering Programs than others.

Other attributes such as (12) Lifelong Learning, have fewer assessments. Possible reasons for this are that

they are more difficult to teach and measure, the subset of performance indicators is not accurate to what we teach, and that these attributes are acquired in non-course related activity. This draws attention to a need to carefully consider the assessments in each course, and in some cases to reformulate assessment methods to more accurately capture student performance data in key areas.

Some of the challenges and lessons learned from Faculty of Engineering curriculum mapping are:

- Run a pilot curriculum map with a small number of outcomes/courses as a tool for illustration, as faculty members are more likely to buy in to the concept if they can see how this information will be used.

- Select appropriate software for tracking performance indicators. There should be enough capability for expansion of inputs but remain user friendly.

- Restrict jargon and provide sufficient support and access to information for all involved.

- Survey students to determine where they think they are acquiring graduate attributes.

Overall the process of mapping the curriculum is time consuming but a vital enhancement to program revision. Dalhousie Faculty of Engineering has undertaken a very in-depth process to map our curriculum and track student performance in 12 graduate attributes that could eventually become part of a "student attributes transcript" unique to the Dalhousie Engineer.

Teaching and Learning

Conference Travel Grants

The Centre for Learning and Teaching offers grants up to $750.00 each to assist with the cost of travelling or conference registration for a limited number of instructors and graduate students each year to present at a teaching and learning conference.

Deadline to submit: Wednesday, April 30, 2014

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