Learning Outcomes Assessment:

A PRACTITIONER'S HANDBOOK

Higher Education Quality Council of Ontario

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Acknowledgements:

With thanks to the essential contributions of Peter Marval from the University of Windsor, and of the international advisors, Gordon Joughin, Arshad Ahmad and Lesley-Jane Eales-Reynolds.

The creation of this handbook was supported by the Higher Education Quality Council of Ontario (HEQCO).

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PREFACE

This handbook is intended to serve as a resource for faculty, staff, academic leaders and educational developers engaged in program and course design/review, and the assessment of program-level learning outcomes for program improvement. The assessment of learning outcomes at the program-level can assist in making improvements to curricula, teaching and assessment plans.

HOW TO USE THIS HANDBOOK

The handbook is designed so that you can either jump to particular sections or read sections sequentially.

The definitions, examples, cases and recommendations included are designed to help you develop effective assessments for program-level learning outcomes but will need to be evaluated and adapted to your specific institutional context.

Section 1 explores the theory, principles, reasons for and methods behind producing program-level learning outcomes.

In Section 2, we review a variety of practices and emerging developments in learning outcome assessment.

In Section 3, we provide tips and techniques for developing institutional capacity through building institutional culture, increasing faculty involvement in the process of program-level learning outcomes assessment, and examining methods for curriculum-embedded assessment.

Using this guide to develop a plan for program-level learning outcomes assessment can help steer the systematic collection of data and enable its use to continually improve the effectiveness of your programs and demonstrate to others how well your students are learning.

Definitions and Examples
Key terminology defined.

Case Studies
Sample applications and ideas.

Recommendations
Sample questions and suggestions.

THE INTERNATIONAL CONTEXT

The assessment of learning outcomes at the program level has been a topic of international interest as a method for quality assessment and ongoing program quality enhancement. According to a UNESCO report (Altbach, Reisberg & Rumbley, 2009), increasing global integration and exchange of both students and instructors has been an important international objective in higher education in recent years. This trend requires institutions to identify standards of quality, resulting in an increased emphasis on both learning outcomes and evidence from course assessments to demonstrate that students have mastered the expected learning. While there is widespread agreement that institutional autonomy is important, researchers also agree that students would benefit from greater clarity around learning outcomes (Harris, 2009; Tremblay, Lalancette & Roseveare, 2012). The Bologna Tuning Process[1], which involved over 40 countries, has significantly contributed to international discussions of quality, learning outcomes and other processes to promote transparency, mobility and employability (Altbach et al., 2009; Barrie, Hughes, Crisp & Bennison, 2011). Other movements have worked to identify and assess learning outcomes at broad levels and across disciplines; for example, the Dublin Descriptors define learning outcomes across the European higher education sector (Harris, 2009).

Recently, attention has also been focused on discipline-specific learning outcomes. For example, the United Kingdom Quality Assurance Agency engaged in a process to identify more focused disciplinary learning outcomes called Subject Benchmark Statements, which are evaluated by external examiners. The Bologna Tuning Process (1999), Tuning Latin America Projects (2004) and Tuning USA (2009) worked to identify disciplinary learning outcomes (Harris, 2009; Barrie et al., 2011). Similarly, the Valid Assessment of Learning in Undergraduate Education (VALUE) focused on assessment through generation of rubrics in the US (AACU, 2009).

The Australian government has taken an active role in quality assurance since the 1980s (Chalmers, 2007) and the Australian Learning and Teaching Council facilitated the articulation of learning outcomes within disciplines through the Learning and Teaching Academic Standards project in 2010. Despite much attention on the development of learning outcomes, the alignment of course outcomes with curriculum and program-level institutional assessment poses a challenge internationally (Barrie, Hughes & Smith, 2009; Barrie, Hughes, Crisp & Bennison, 2012). The Organisation for Economic Co-operation and Development (OECD) has initiated an international project to address this difficulty. The Assessment of Higher Education Learning Outcomes (AHELO) project aimed to examine student results of standardized tests used to measure learning outcome attainment at the cross-disciplinary and the disciplinary levels, with the intention of producing data that could inform institutional improvement (Harris, 2009; Tremblay, Lalancette & Roseveare, 2012; Lennon & Jonker, 2014).

Canada has also participated in inter-jurisdictional projects designed to pilot the use of standardized tests to assess student attainment of discipline-specific learning outcomes. For example, the Higher Education Quality Council of Ontario (HEQCO) has trialed the use of the Collegiate Learning Assessment with civil engineering students (Lennon, 2014). Concerns related to sample size and self-selection bias were raised, including fears that information might be used for ranking and to re-allocate public resources to the detriment of institutions, and that the limited information from standardized tests would be too simplistic for use in complex institutional contexts (Tremblay et al., 2012; Lennon, 2014). Even though international projects are beginning to explore methods to assess learning outcomes at program or institutional levels, assessment remains a difficult and complex task.

[1] For more information on the specifics of the Bologna Process, visit http://www.ehea.info/article-details.aspx?ArticleId=5

THE ONTARIO CONTEXT

Similar to trends in the international context, the Ontario postsecondary system has been involved in identifying program-level learning outcomes for many years, with strong leaders especially at the college level. In 1990, the provincial government published *Vision 2000: Quality and Opportunity*, in which it recommended establishing a council mandated to develop program standards for the college system (Ontario Council of Regents for Colleges of Applied Arts and Technology, 1990; Ministry of Training, Colleges and Universities (MTCU), 2006a, 2006b). Both college and university programs now use a set of program-level learning outcomes to determine what students are expected to achieve by the time they graduate. Many institutions in Ontario have also developed expectations at the institutional level, often called "graduate attributes" (Barrie et al., 2009).

College programs include: 1) a vocational standard specific to the program; 2) essential employability skills standards critical for success in the workplace, daily life and lifelong learning; and 3) general education requirements for breadth and development of citizens (MTCU, 2006b), which students must meet prior to graduation. A program team, in conjunction with advice from a curriculum specialist, will develop a set of program-level learning outcomes that follow the Ministry of Training, Colleges and Universities' (MTCU) program description and which become part of the historical record of the program. The Postsecondary Education Quality Assessment Board (PEQAB) expects all college degree programs to meet degree-level standards. Credential Validation Service (CVS) is a service to help the college system with the process of defining learning outcomes and assessments, developed to be consistent with the Minister's Binding Policy Directive, Framework for Programs of Instruction. This service is a subsidiary of Colleges Ontario and, along with the approval of programs of instruction by the local college's board of governors, makes up a component of the self-regulatory mechanism for the college system (Ontario College Quality Assurance Service, 2014).

With the implementation of the Quality Assurance Framework (Ontario University Council on Quality Assurance ((OUCQA), 2012) and the Degree Level Expectations (Ontario Council of Academic Vice-Presidents (OCAV), 2007; Council of Ontario Universities (COU), n.d.), Ontario universities are now also committed to the assessment of program-level learning outcomes and the continuous improvement of academic learning. Both colleges and universities follow self-regulatory processes. Universities submit program-level learning outcomes through the Ontario University Council on Quality Assurance, following an institutional process that is consistent with the Quality Assurance Framework (OUCQA, 2012).

The assessment of program- or degree-level outcomes is an integral part of learning-centred education. It provides an ongoing mechanism for challenging tacit assumptions about program effectiveness, identifying conflicting program elements and ensuring that student learning objectives are met. It also allows for the continuous improvement of program goals and objectives over time. HEQCO, together with COU and the OCQAS (Ontario College Quality Assurance Service), has promoted the assessment of learning outcomes at the course and program levels at both colleges and universities. While the development of learning outcomes has become embedded in most postsecondary institutions in Ontario, effective assessment of program-level outcomes is still a challenge for many institutions. The strategies contained in this handbook may help to address these challenges.

Section 1

OVERVIEW AND FRAMEWORK

Summary

In this section, we outline the reasons for and benefits of assessing program-level learning outcomes as a way to enhance and enrich programs. We also describe the theoretical underpinning of this handbook, which stresses the importance of the authenticity, validity and reliability of assessment practices and principles and describes the alignment of course objectives with larger, program-level learning outcomes. Lastly, we outline briefly how you can create a plan for assessing program-level learning outcomes. Section 2 explores practical ways to apply these theoretical concepts.

1.1 ASSESSMENT OF PROGRAM-LEVEL LEARNING OUTCOMES

Program-level learning outcomes identify what students should know, value or be able to accomplish after successfully completing their program. These outcomes are often achieved through specific learning activities, which are integrated at the course-level and build toward overall program-level learning.

WHY ASSESS PROGRAM-LEVEL LEARNING OUTCOMES?

Intentionally assessing your own **program-level learning outcomes** can be of great benefit, as can effective, well-planned assessment, to:

- ensure that students learn the most important skills, ideas, attitudes and values of the discipline or profession.
- document evidence of students' learning, based on the actual outcomes they have achieved, for accreditation and accountability purposes.
- ensure that expectations are communicated clearly to and understood by students (including those interested in applying to a program).
- allow you to improve the effectiveness of your program based on actual student achievement.
- showcase the quality of your program; make your graduates appealing to employers and your program attractive to prospective students and donors.
- emphasize current institutional priorities for teaching and learning.

Monitoring both quantitative and qualitative data may enable institutions to make decisions that lead to improved instruction, stronger curricula, and more effective and efficient policies about learning outcomes assessment, with the overall goal of improving teaching and learning. This can reinforce continued engagement for faculty, students, staff and administrators who work both individually and in teams to design and assess programs and enhance student learning.

Institutions can also use these analyses to help meet their mission and to strengthen arguments for increased funding and/or allocation of resources. The information from assessing program-level learning outcomes may help satisfy the requirements of accrediting and funding agencies, will inform various accountability-driven decisions, and recognize time and resources spent on learner engagement strategies that align to learning outcomes and assessment. When used thoughtfully, assessment of the right learning outcomes can help guide institutions to meet their goals and justify institutional claims that graduates are well prepared to succeed in future endeavours.

Program-Level Learning Outcomes
Statements that indicate what successful students should know, value or be able to do by the end of a program.

What is the format for writing learning outcomes?

A learning outcome should start with an observable action verb (representing knowledge, skills and values), followed by a statement specifying the learning to be demonstrated (content).

The ABCD of Learning Outcomes[1] recommends addressing:

Audience: Who are the learners?
Behaviour: What will they be able to know, value or do?
Condition: Under what circumstances/context will the learning occur?
Degree: How much will be accomplished and to what level?

Examples:
http://www.uoguelph.ca/tss/pdfs/What%20is%20a%20Learning%20Outcome%20Handout.pdf
http://www1.uwindsor.ca/ctl/system/files/PRIMER-on-Learning-Outcomes.pdf

[1] Adapted from https://www.iusb.edu/weave/Goals%20and%20Objectives%20Powerpoint

OUTCOMES-BASED, AUTHENTIC AND ALIGNED FRAMEWORK

The outcomes-based approach has been used to assess program-level learning outcomes for a number of years internationally, extensively in the Ontario college system, and more recently, in the university system. This approach focuses on what students must be able to demonstrate they know, value, and can do at the end of a course and program. These expectations are expressed as learning outcomes, which underlie programs and courses (Angelo & Cross, 1993). Courses build intentionally towards completing a coherent program. It is important for all assessments to be situated in the context of the intended discipline or profession. If programs are well-planned, many program-level assessment tasks are likely to be integrated and embedded within courses. Consequently, assessments of courses can be designed to demonstrate achievement of program-level learning outcomes in addition to course-level outcomes. Designing courses and programs is often most effective and successful when done by teams of instructors, educational developers and administrators.

A common approach to intentional program-level and course-level design is **constructive alignment** (Biggs & Tang, 2011). In a constructively aligned course, learning outcomes, learning experiences and assessment tasks work together to mutually reinforce the achievement of the course-level learning outcomes (Figure 1). By their nature as descriptions of success, learning outcomes are tied to assessment, which is most effective if it takes place in the context of a discipline, profession, program and/or course. Outcomes-based learning in the framework of constructive alignment (Biggs & Tang, 2007) helps curriculum designers observe, measure and assess learning outcomes. Once the learning outcomes and assessment tasks are determined, the learning activities, teaching methods and resources required to achieve those outcomes and assessments may be planned – in turn, every element of a course supports the intended learning.

Constructive Alignment
Creating courses whose learning outcomes, learning experiences and assessment tasks cohere internally and build towards program outcomes.

Constructive Alignment at the Course Level

FIGURE 1

Constructive Alignment at the Program Level

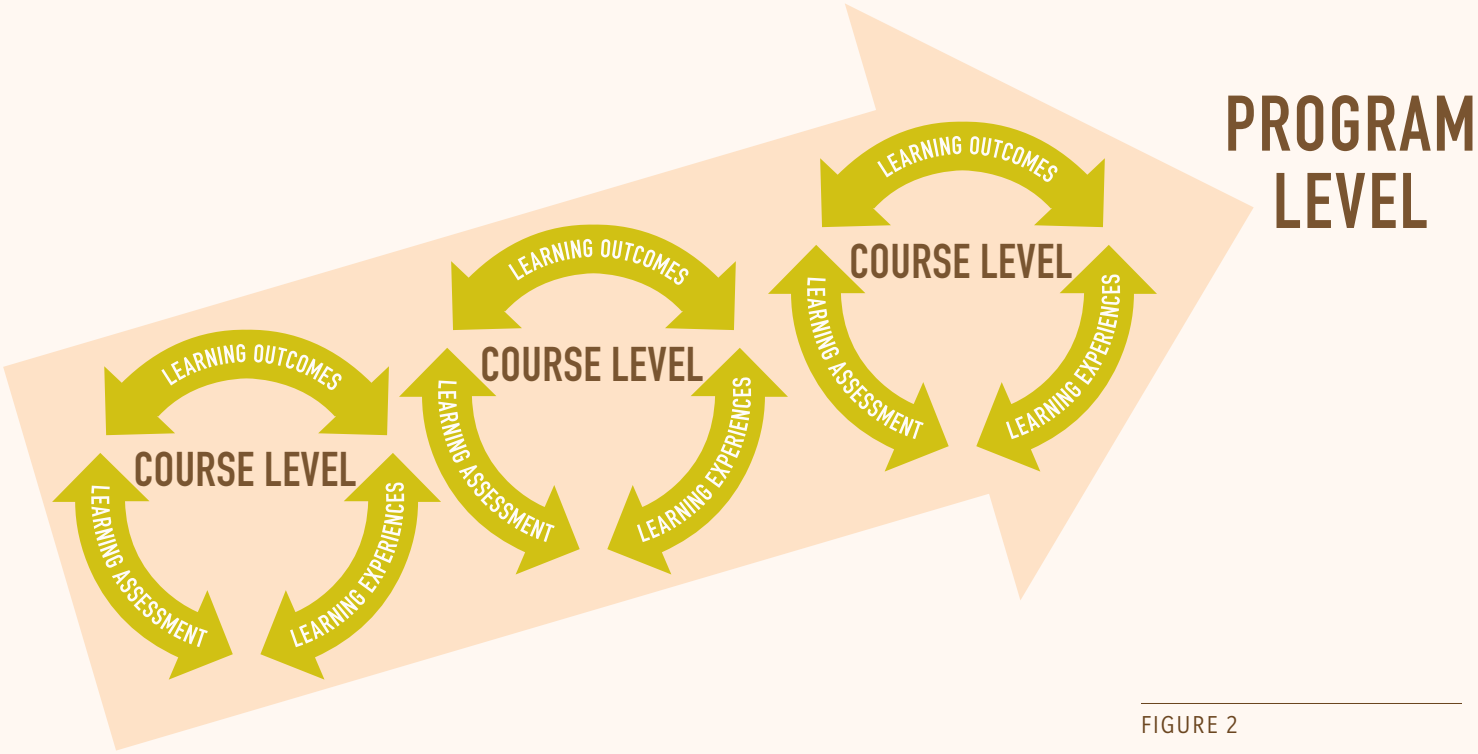

FIGURE 2

In a constructively aligned **program**, the **courses** are carefully coordinated to ensure steady development or scaffolding from introduction to mastery of the learning outcomes, leading to achievement of the intended program-level outcomes (Figure 2).

According to Biggs and Tang (2007), all aspects of teaching and learning in a course should be aligned to the appropriate program-level learning outcomes for clarity of focus. In the assessment activities, students demonstrate their level of achievement of the course learning outcomes. Teaching strategies, learning activities, assessments and resources should all be designed and organized to help students achieve the learning outcomes at the course level. Wiggins and McTighe (2005) suggest a backward design approach that facilitates this alignment in course design.

Programs composed of constructively aligned courses contribute toward the achievement of program-level learning outcomes. This program alignment should be approached developmentally to allow students to meet the expectations expressed in the program-level outcomes from the first semester to the last. As Biggs and Tang (2007) suggest, when assessment is conducted in this way, program-level learning outcomes become more strategic and effective; they are an organic component of overall learning strategies. The program-level learning outcomes are also designed to reflect the context of institutional-level graduate attributes, and provincial or disciplinary accreditation expectations (Figure 3).

Constructive Alignment at the Institutional and Provincial Level

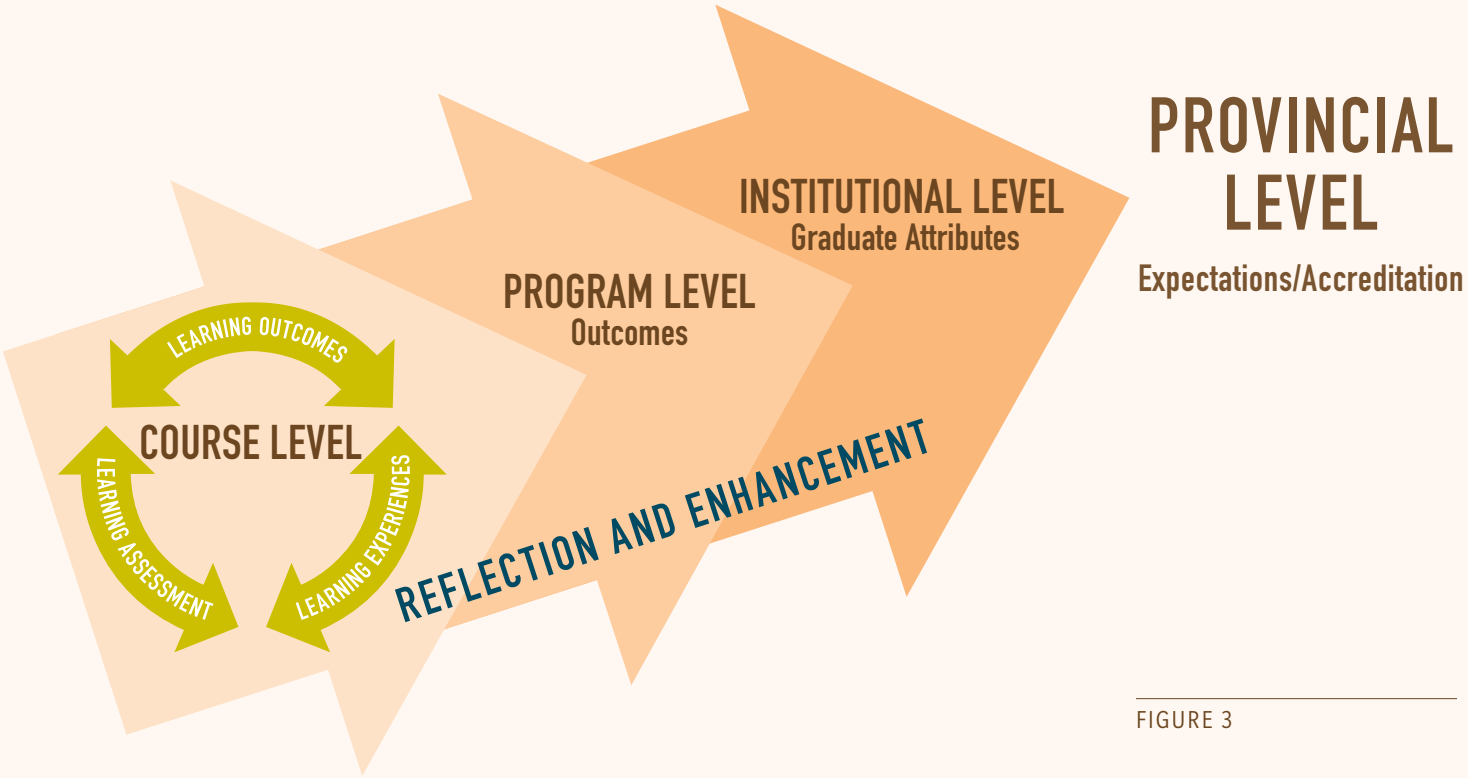

FIGURE 3

1.2 CONCEPTS AND PRINCIPLES

Institutional and departmental contexts vary a great deal, which makes single approaches to effectively assessing program-level learning outcomes very difficult to formulate. We believe that identifying important concepts and a set of principles that can be applied to diverse environments provides the opportunity for a coherent yet flexible approach.

Our approach to the assessment of program-level learning outcomes is guided by four underlying concepts: quality enhancement, constructive alignment, authentic assessment and the Structure of the Observed Learning Outcome (SOLO) taxonomy. These concepts can be considered as a foundation for moving from macro to micro levels. They underpin the handbook and provide the basis for the three principles to guide the assessment of program-level learning outcomes that are identified at the end of this section.

THEORETICAL FOUNDATION

The concept of **quality enhancement (institutional or macro level)** refers to institutional cultures that encourage honest reflection on the learning-centeredness and effectiveness of policies and practices for student success, with the reflection used to inform policies and practices to favour well-reasoned and evidence-informed enhancement of student learning (Biggs, 2001). This "prospective quality assurance" approach encourages continual improvement that goes beyond quality assurance and its associated "assessment for accountability." Quality assurance for accountability tends to focus on universities as corporate entities but often ignores or impedes meaningful pedagogical reform and can detract from the quality of education (Biggs, 2001). We recommend assessment for the purposes of ongoing quality enhancement. Intentionally using the information gained from program-level assessment to continually improve programs is one example. For a specific example of how assessment can be used for program improvement, see 'Case Study: Carnegie Mellon University Assessment for Improvement within Program Review Processes' at the end this section. Elements that impact the institutional culture and capacity for quality enhancement are explored further in Section 3.

Quality Enhancement
An institutional culture that encourages honest reflection on learning-centredness and, using this reflection, informs policies and practices for ongoing improvement.

Constructive alignment (program or meso level) ensures that learning outcomes, learning experiences and assessments cohere internally within a course and that courses cohere similarly to reinforce the achievement of program-level learning outcomes and institutional or disciplinary graduate attributes (Figures 1, 2 and 3; Biggs & Tang, 2011). We suggest that the assessment of program-level outcomes is most effective when an entire program is constructively aligned.

Authentic assessment (micro level) is assessment providing direct evidence of meaningful application of learning (Angelo, 1999; Maki, 2010). We believe that assessment should not be undertaken as an end in itself but as a vehicle to guide teaching strategies and enhance student learning. Authentic assessment tasks require students to use skills, knowledge, values and attitudes they have learned in situations that simulate the performance context of the intended discipline or profession as closely as possible. In aligning assessment with outcomes, the degree to which assessment tasks simulate 'real-world' problems and situations associated with their disciplines or professions measures its authenticity.

Authentic Assessment
Assessment that provides direct evidence of meaningful application of learning, often within the context of a discipline or professional practice.

It includes two key elements:
1) performance assessment: the learner demonstrates the ability to apply the required skills and knowledge
2) context: the tasks and conditions of the discipline or profession are faithfully represented.

The **Structure of Observed Learning Outcomes (SOLO) (micro level)** taxonomy offers one of several approaches to articulating the complexity of desired learning as students progress through a program (Biggs & Collis, 1982; Collis & Biggs, 1986). This provides a useful structure to craft learning outcomes appropriate to the desired quantity and quality of learning at particular program stages. It can also be used to align assessment tasks with learning outcomes, evaluate student achievement, and align learning outcomes and assessment tasks with teaching and learning strategies. We believe that the SOLO framework provides a practical, useful structure to guide construction and assessment of program-level learning outcomes, which can help curriculum designers intentionally develop programs and assessment plans to enable students to graduate at the highest level of the framework.

SOLO represents learning through five levels, from the merely quantitative (the acquisition of new amounts of information) to the qualitative (change in understanding and creating meaning from information) (Figure 4). Pre-structure is the stage before learning. The sequence of stages from uni-structural to relational occurs in a cycle, in which student understanding grows and deepens. Students may need to go through various levels within the learning cycle multiple times as new ideas are brought in, but the goal is for them to leave the learning cycle eventually by reaching the extended abstract stage. Students may be at a different point in the learning cycle for different topics. Even if students have reached the extended abstract level of understanding about a topic, they may regress if faced with new information that shakes their understanding (Potter & Kustra, 2012). Program-level assessment is most appropriately aimed at the relational or extended abstract level.

To explain SOLO we use the example of writing essays, as all of us are familiar with them and in some disciplines this type of assignment can be adapted in an authentic fashion to prepare students for tasks they will use in their professions (see Section 2).

Bigg's SOLO Taxonomy

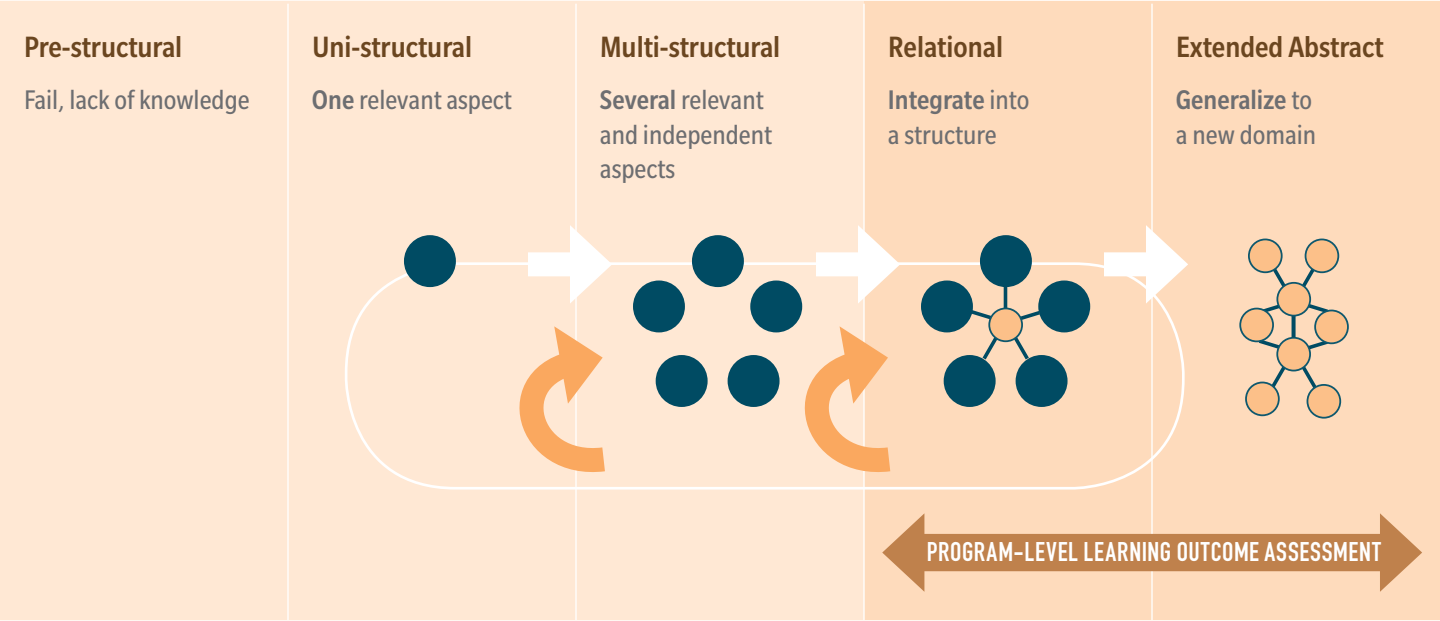

FIGURE 4

Pre-structural

The pre-structural level occurs before the learning cycle begins, when students do not understand what is expected of them (or why). For example, students do not know what an essay is. They are likely to confuse essays with other forms of writing, attribute irrelevant or trivial features to essays or recognize them only as words that have been used by those around them ("Essays are what teachers tell us to write").

Since this is the level at which students are expected to begin a course or program, the only assessment tasks at the pre-structural stage are diagnostic in nature, intended to elicit information about the nature and extent of student understanding and misunderstanding at the outset of a program. Assessment at this level would be used as a baseline to compare assessment of learning outcomes at the end of a program.

Uni-structural

The uni-structural level is the first level of what Biggs and Collis (1982) call the learning cycle – the stage where students begin to learn. At the uni-structural level, students have moved from **not** understanding or misunderstanding essays to understanding **very** simple approaches. Learning at this level is **quantitative** in nature in that students have added one fact or idea to their storehouse of knowledge. Whatever students understand about essays is likely to be reductive. They may make simple and obvious general connections ("Writing in this format equals essay") but they lack the ability to create useful meaning from those connections.

Learning outcomes achievable at this level, to use the familiar verbs of Bloom's Taxonomy, include identifying what essays are, repeating an explanation of what essays are and writing simple essays of particular types.

Many standard (often inauthentic) assessment tasks can be used to determine whether students have achieved uni-structural level learning outcomes, such as multiple-choice quizzes and exams, fill-in-the-blanks questions and simple essay assignments.

Multi-structural

The multi-structural level is the second level of the learning cycle, where students have learned many facts and ideas about essays and/or can write multiple forms of essays. However, this **quantitative** increase in learning does not result in greater depth or complexity in how they understand those facts or ideas in relation to each other. They learn each fact or idea independently from others, aside from a few obvious and simple connections. At this stage, there is little or no integration or organization of knowledge.

Learning outcomes achievable at this level include describing the components of multiple forms of essays, combining one's own thoughts into paragraphs to create essays and performing simple algorithms or procedures.

Many standard (but often inauthentic) assessment tasks can be used to determine whether students have achieved multi-structural-level learning outcomes, such as multiple-choice quizzes and exams, fill-in-the-blanks questions, application exercises and essay assignments.

Relational

At the relational level, students move from quantitative increases in learning to **qualitative** increases in learning (deepening understanding and creating meaning, rather than merely adding items to a disconnected set of what they know). This depends on their ability to generalize and abstract from particular bits of information. At this stage, students can draw increasingly complex connections and distinctions between facts, ideas, theories, actions and purposes. They can compose their own arguments about what they are learning and may create meaning and purpose from course material, integrate parts to create a sense of the whole, and elaborate connections between facts and theory, action and purpose. At the relational level, students' ability to apply competently what they learn to familiar problems or experiences becomes evident. When students encounter contextual difficulties at the relational level, they may slide back to the multi-structural level or uni-structural level before returning to the relational level. This is why we use the term "learning cycle" – to avoid the impression of strictly linear progress through the SOLO levels.

Learning outcomes achievable at this level include analyzing why essays are arranged in certain ways for certain purposes, relating essay structure to rhetorical intent and integrating multiple types of essays to create a document serving multiple purposes. To assess whether students have achieved relational-level (or extended-abstract level) learning outcomes requires more complex, involved and time-consuming methods than those used for multi-structural learning – such as course-length projects and multi-stage term papers. Most higher education courses should expect relational outcomes at least; as a result, more assessments should be aimed at this level and higher.

Extended Abstract

At the extended abstract stage, the **qualitative** increase in student understanding is difficult to predict – students who reach this level have exited the learning cycle envisioned in this taxonomy. Whereas at the relational level students could abstract and generalize from course material, at the extended abstract level they abstract and generalize **beyond** the course material, transferring and applying ideas to new situations and new experiences, integrating them with ideas from other courses and other aspects of their lives, testing and hypothesizing beyond the confines of a course, and developing arguments and theories of their own.

It should come as no surprise that in considering the assessment of learning outcomes at the program-level, we should be thinking in terms of the relational and extended abstract levels of SOLO. It would be inappropriate to deliberately plan assessment tasks for program assessment at lower levels, since students graduating from our programs should be expected to understand what they have learned and transfer it to novel situations. The assessment tasks described in Section 2, therefore, only include those assessments appropriate for relational or extended abstract-levels of learning.

AUTHENTICITY, VALIDITY AND RELIABILITY

In aligning assessment with outcomes, the degree to which assessment tasks simulate real-world problems and situations associated with their discipline or profession represents their degree of authenticity. There is clear evidence that, whether intentional or not, assessments influence both how educators teach and how and what students learn (Boud & Associates, 2010). Assessment and learning are closely linked. Teachers may "teach to the test" even if the content or form of the test fails to reflect what they consider to be important (Fredericksen, 1984; Prodromou, 1995). In that case, what students learn from the test depends largely on what they perceive as the requirement of the assessment task rather than what may be the desired learning outcome (Gibbs, 1992). Principles and practices for effective assessment are consistent with assessment aimed at program-level learning outcomes (Barrie et al., 2012).

As defined earlier, authentic assessment tasks require students to apply what they have learned (skills, knowledge, values and attitudes) in situations that simulate the performance context of the intended discipline or profession. Authentic assessment includes two key elements: 1) performance assessment: the learner demonstrates the ability to apply the required skills and knowledge; and 2) context: the tasks and conditions of the discipline or profession are

represented faithfully. Together these elements require that students use the same knowledge, skills, judgment and attitudes that would be expected of practitioners in those disciplines or professions. The authenticity of an assessment task depends on the degree to which it resembles the reality of practice. Standardized assessment instruments like standardized tests are often isolated from practical environments, rendering them largely ineffective in assessing evidence of learning in these contexts (Barrie et al., 2012; Rhodes, 2012). Instead, we recommend discipline- or context-specific, curriculum-embedded assessment methods that are authentic.

The **validity** of authentic assessments relates to whether they assess what they are supposed to assess and thus achieve the intended learning outcomes. Learning outcomes require assessment tasks that appropriately reflect the level of skills and competencies expected of the students and that require them to demonstrate processes, approaches and attitudes of practitioners in the field. Authentic assessment strategies that reflect not only the tasks but also the context of real-life situations have a high level of construct validity.

Validity
Whether an assessment task assesses what it is supposed to, appropriately reflecting the level of skills and competences expected of a learner for program-level learning outcomes.

Reliability of assessments refers to their consistency and objectivity: would two students who achieve similar knowledge and skills perform similarly on the assessment? Traditional assessment methods frequently attempt to establish reliability by giving students the same assessment at the same time in the same (often inauthentic) setting. Because that approach ignores most variables affecting what, whether and how well students learn, traditional reliability may come at the expense of the assessment task's validity.

Reliability
The consistency and objectivity of assessments. At the program-level, this could be achieved through multiple assessments and/or controlled standardized authentic tasks.

Emphasizing authentic assessment tasks may increase the tension between reliability and validity: the more assessments mirror real-life situations, the more individual, situated, uncertain, unpredictable and variable they will be. How then can reliability be reconciled with authenticity?

One way is to increase the sophistication of simulations (Petti, 2013) and assessments, such as through the use of Objective Structured Clinical Examinations (OSCE), so that stylized, realistic problems can be presented to students in a controlled standardized way (Burn, Nestel & Gachoud, 2013). Another way is to emphasize the **trustworthiness**, **credibility** and **authenticity** of the information provided by the assessments in a qualitative context. Cresswell (2009) identified eight qualitative procedures to establish trustworthiness and credibility that can be applied usefully to assessment. One example is to use a variety of assessment methods together with peer- and self-assessment to provide **triangulation**. Using several convergent data sources and perspectives increases the credibility of the judgments. Portfolios and reflective journals at the program and course levels provide detailed, meaningful information (also supported by the VALUE project, AACU, 2009). Furthermore, because these types of assessments are a product of **prolonged engagement** by students, they provide greater context and add to the validity of the assessment tasks.

Establishing the authenticity, trustworthiness and credibility of assessment tools can help to confirm that students have achieved desired learning outcomes and can reliably apply knowledge and skills to the real world.

PRINCIPLES FOR ASSESSMENT OF PROGRAM-LEVEL LEARNING OUTCOMES[2]

Using the above concepts – the quality enhancement, constructive alignment, authentic assessment, SOLO, validity, trustworthiness and credibility – and drawing upon the work of Biggs and Tang (2011); Biggs and Collis (1982); Gulikers, Bastiaens and Kirschner (2004); and Boud and Associates (2010), we propose the following set of principles to guide the assessment of program-level learning outcomes:

1. **Ensure that programs are constructively aligned to enable the use of course-embedded assessments.**

   When a program's courses are adequately aligned with overall program-level learning outcomes, it becomes possible to use course-embedded assessments to evaluate learning across the curriculum. Key course-embedded assessments can be selected that best demonstrate student learning progress in relation to the program's intended learning outcomes. For an example of how this can be done through a learning management system (LMS), refer to the Learning Analytics Case Study in Section 1.3.

2. **Design the assessment of program-level learning outcomes with the content and complexity of the learning outcomes in mind.**

   The validity of an assessment task will depend on the degree to which it assesses the implications of what students are intended to learn, so careful attention to the content and complexity of learning expressed in the outcomes is important. As described in the SOLO taxonomy, program-level assessment should be aimed at learning outcomes in the relational and extended abstract levels.

3. **Be sure that assessment of program-level learning outcomes is authentic to the program of study and/or profession.**

   The assessment should require students to perform tasks or create products that are true to the practice or relevant to the program of study or profession, in a context that simulates the reality of that program of study or future profession (insofar as is feasible).

Case Study:
Carnegie Mellon University
Assessment for Improvement
Within Program Review Processes

Context: "In 2009, Carnegie Mellon University [CMU] began a university-wide initiative to have each degree-granting program systematically document their outcomes and assessment processes. This initiative was directly tied to the Curriculum Review and Revision process... supported centrally through the Eberly Center [for Teaching Excellence and Educational Innovation]. The documentation showcases how programs use data and information to continually improve their quality and effectiveness."[3]

Tools:[4] In addition to a standard Program Outcomes Chart,[5] CMU makes available a Mastery Outcomes Grid[6] and an Outcomes Matrix to map outcomes from course to program levels. However, the assessment for improvement process at CMU emphasizes disciplinary differences and avoids a 'one size fits all'[7] approach.

"We approach assessment from a data-centric rather than a tool-centric position, our choice of methods guided by faculty questions such as:

- What will this process tell me about my students' knowledge, skills and growth?
- What will I learn about the strengths and weaknesses of our program?

What information will this give me on how to improve my teaching or our program?"[8]

[2] For more on assessment of program-level learning outcomes, refer to http://gototheexchange.ca/index.php/curriculum-overview/curriculum-models-and-design-principles.
[3] http://www.cmu.edu/teaching/assessment/assessprogram/index.html
[4] http://www.cmu.edu/teaching/assessment/assessprogram/toolsfacilitateprocess.html
[5] http://www.cmu.edu/teaching/assessment/assessprogram/components.html
[6] http://www.cmu.edu/teaching/assessment/assessprogram/masterygrid.html
[7] http://www.cmu.edu/teaching/assessment/history/ATFdocs/ATFpositionOnAssessment.pdf
[8] http://www.cmu.edu/teaching/assessment/history/ATF.html

1.3 CREATING A PLAN FOR THE ASSESSMENT OF PROGRAM-LEVEL LEARNING OUTCOMES

In this section, we provide recommendations on how to create a plan to ensure constructive alignment and to assess program-level learning outcomes. As outlined in the first two sections of the handbook, assessment of learning outcomes is a process of "making our expectations explicit and public; setting appropriate criteria and high standards for learning quality; systematically gathering, analysing, and interpreting evidence to determine how well performance matches those expectations and standards; and using the resulting information to document, explain, and improve performance" (Angelo, 1995, p. 7).

Well-articulated program-level assessment plans must identify program-level learning outcomes, the assessments used to measure that achievement and a plan for using this information for program enhancement. The process is most effective when undertaken by a team made up of instructors, program coordinators, students and educational developers. Program-level assessment plans aim to highlight the characteristics of successful programs and note areas for improvement. Substantial programs, effective leadership and administrative support are essential throughout the planning and implementation process (see Section 3).

We have conceptualized the assessment of program-level learning outcomes as a four-stage cycle:

Four-Stage Cycle for the Assessment of Program-Level Learning Outcomes

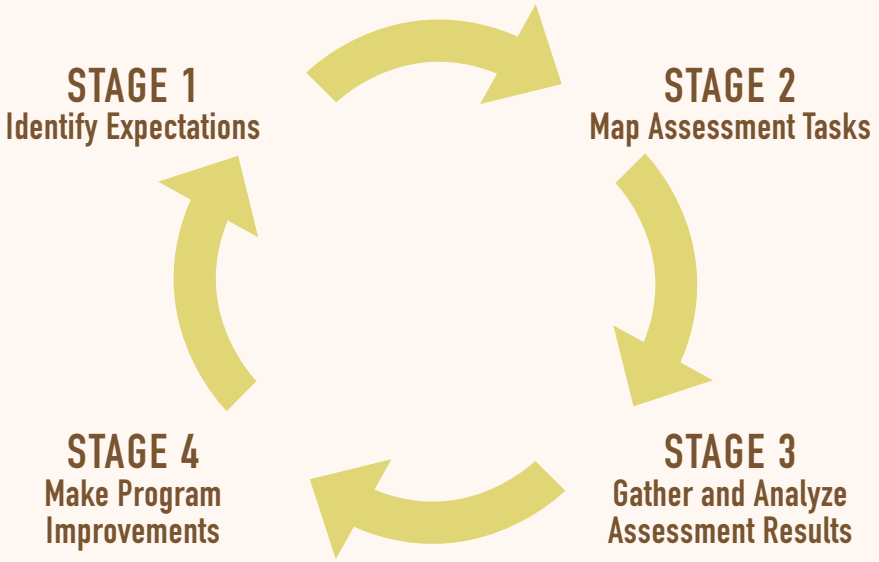

FIGURE 5

STAGE 1: IDENTIFY EXPECTATIONS OF PROGRAM-LEVEL LEARNING OUTCOMES

The first step in program assessment is to articulate clearly what you expect students to learn and how you expect them to demonstrate this learning by the time they reach the end of the program. Clearly defined expectations are important because they form the basis for future decisions about the appropriate assessment types to measure the achievement of those outcomes. Clarifying your program-level learning outcomes will also help you to ensure that learning experiences and assessments are focused on the most important skills, ideas, attitudes and values of the discipline or profession. Recent literature suggests that many students are not able to identify or articulate the learning outcomes that they have achieved; greater clarity may help graduates better articulate their skills and attributes to future employers (Barrie et al., 2009; Martini & Clare, 2014). It is therefore important to communicate learning outcomes to students throughout their program of study. There are a number of factors worth considering when identifying learning outcomes (Figure 6), such as students' knowledge prior to entering a program; the curriculum; types of teaching and learning techniques they will experience within the program; possible methods of assessment; and expectations from external bodies, including government agencies and professional associations.

It is often helpful for all instructors in the program to contribute to the development and review of program-level learning outcomes to ensure that essential learning outcomes are captured and that they understand thoroughly the outcomes and their purpose. Additionally, it is helpful at this stage to involve students and employers, often done through focus groups, interviews or questionnaires. Once desired program-level learning outcomes are clear and appropriate, the next step is to ensure that there is constructive alignment at the course, program, institutional and provincial levels.

Influences on Program-Level Learning Outcomes

FIGURE 6

STAGE 2: MAP ASSESSMENT TASKS THROUGHOUT THE PROGRAM

Curriculum mapping provides an effective strategy for articulating, aligning and integrating learning outcomes across a sequence of courses and explicitly locating how student learning outcomes are delivered within a program (Kopera-Frye, Mahaffy & Svare, 2008; Uchiyama & Radin, 2009). It is important to identify how and where learning occurs in the curriculum and how it is assessed. Curriculum maps often categorize learning by courses and clarify how each course contributes to the program-level learning outcomes and, furthermore, how these outcomes contribute to institutional or provincial expectations (Figure 3). Mapping is a visual approach to analyzing programs and it can be accomplished using charts, tables, diagrams or any other process that enables an overview and analysis of the program as a whole. Mapping reveals patterns otherwise difficult to detect and makes transparent subtleties in the alignment of assessments and program-level learning outcomes.

This process can be managed by a small team that gathers initial information from instructors and incorporates the data into a curriculum map. The team can hold a retreat or meeting to review the information for accuracy and to analyze the map, inviting the program instructors, the program coordinator, the department head and an educational developer to act as facilitators. Several institutions, such as the University of Guelph[9] and Ryerson University[10] (Mazurat & Schönwetter, 2009), have developed or purchased software to aid with curriculum map development. Two examples of simple curriculum maps are included below (Examples 1 and 2).

[9] http://www.uoguelph.ca/vpacademic/avpa/outcomes/curriculummap.php
[10] http://www.ryerson.ca/lt/programs/curriculum/curriculumdevelopment

Mapping Program-Level Learning Outcomes to Teaching, Learning and Assessment

Program-Level Learning Outcomes	Degree Level Expectations	Teaching Activities and Learning Opportunities	Assessments and Evidence
By the end of the program, successful students graduating will...	For each program-level learning outcome, with which degree level expectation or accreditation outcomes does it align?	What specific teaching activities and learning opportunities will help students achieve each program-level learning outcome?	For each program-level learning outcome, what is specifically collected from the students as evidence that they can/have achieved the learning outcome prior to graduation?
1...			
2...			

EXAMPLE 1

Once assessment tasks are mapped into the program-level learning outcomes, gaps in the assessment of certain learning outcomes may become apparent (Kopera-Frye et al., 2008; Uchiyama & Radin, 2009). For example, an analysis of Australian curricula found that outcomes related to ethical development, intercultural competence and social responsibility were rarely assessed (Barrie et al., 2012); this trend would likely be similar in Canada. While triangulation and multiple forms of assessment are recommended, some outcomes may be overly assessed, burdening both the students and instructors. Others may be assessed at inappropriate levels of proficiency – for example, at lower levels of the SOLO taxonomy (Section 1.2).

Mapping provides an excellent opportunity to revisit assessment tasks included throughout the program and ensure alignment with the intended learning outcomes. Specific assessment tasks can be designed to measure course outcomes. Assessment tasks should be set at the appropriate level of proficiency, ideally at the extended abstract level of the SOLO taxonomy, where students are able to transfer ideas and apply them beyond the course. Additionally, assessment tasks should be embedded within the courses and based on the principles of authentic assessment relevant to the discipline (Section 1.2). Each course can be examined individually to be certain that the assessments are congruent and build towards the identified program-level learning outcomes. This whole-program approach, in which an overarching framework guides assessment in individual courses to ensure systematic generation of evidence at the program level, is strongly recommended by experts through projects such as the National Institute for Learning Outcome Assessment (NILOA), VALUE and Assessing and Assuring Graduate Learning Outcomes (AAGLO) (Barrie et al., 2012). Section 2 describes assessments that can be used for various types of program-level learning outcomes.

Mapping Program-Level Learning Outcomes by Course

Program-Level Learning Outcomes	Lower-Level Courses			Upper-Level Courses			Assessment Summary
	Course 1	Course 2	Course 3	Course 4	Course 5	Course 6	
Outcome 1	I		R	R		M A1	A1
Outcome 2		I		R A2	M A3		A2, A3

I INTRODUCTORY LEVEL: *outcome is achieved at the introductory level, assuming limited or no prior knowledge*

R REINFORCED: *outcome is reinforced, assuming introduction in a previous course*

M MASTERED: *outcome is mastered or met, usually assuming introduction/reinforcement in prior courses*

A ASSESSED: *indicates where in the program the program-level learning outcomes are assessed*

EXAMPLE 2

STAGE 3: GATHER AND ANALYZE ASSESSMENT RESULTS

Once assessment tasks are designed to measure achievement of learning outcomes throughout the program, you should gather these data on an ongoing basis (by semester and annually) and evaluate them for use in program enhancement. More specifically, you can use the information gathered during your assessment of program-level learning outcomes to:

- determine the extent to which students are meeting the previously determined program-level learning outcomes;
- prioritize areas in which program improvement is necessary;
- showcase the quality of the program to employers, donors and prospective students; and
- document evidence of students' achievement and learning for accreditation and accountability purposes.

There are a number of considerations to address before and during this stage of the process, including the best time to gather assessment data, the scope of the assessment tasks, the multiple ways you can collect data and the best method to analyze the results. These considerations are explored in greater detail below.

Timing of Assessment

Ideally information gathering occurs at the beginning, throughout and at the end of any course or program. Because this will require you to collect data during busy times of the semester, it is important to ensure that adequate support is available. Course-embedded assessments are ideal for assessing program-level student learning. Among other benefits, they prevent testing fatigue among students, encourage student motivation to complete the assessments and increase the instructors' expectations that the assessment will be authentic and relevant (Ewell, 2009). If time or resources are limited, you can focus on the end-of-program courses, as these are the courses that will most likely reflect the achievement of program-level learning outcomes.

If gathering and analyzing data takes more than a year, the information will be less useful for nimble program refinement. Again, adequate resources and departmental and institutional support affect time to completion. If you do not have access to adequate resources, choosing to focus on one aspect of assessment (such as one learning outcome or one stakeholder group) can be useful.

Timing of Assessment

1. *What time of year is best to collect information?*
2. *What point in the program will you collect from (e.g., all years, end-of-program courses)?*
3. *How long will you allocate to gather the information?*
4. *How long will you allocate to analysis?*

Scope of Assessment

Using a variety of assessment tasks helps to provide a holistic picture of student achievement. Both the amount and type of data gathered should be sufficient. It is also advisable to use a combination of both direct and indirect methods of assessment. Direct methods demonstrate evidence of student learning, whereas indirect methods (e.g., surveys, focus groups) provide information from which inferences can be drawn about student learning. It is important to collect the types of data that are most meaningful to disciplinary values and most likely to engage faculty and instructors in conversations about program improvement.

Scope of Assessment

1. *What variety of assessment tasks will be you used?*
2. *Will you focus the scope (e.g., on one program-level learning outcome)?*
3. *Will you have the resources (people, time, expertise)?*

Collecting Assessment Data

It would be overwhelming to gather and analyze information on all of the program-level learning outcomes at once. Establishing a manageable plan, embedding assessment at the course level and using assessments that reasonably represent student learning will make the process much more efficient, as they decrease collection and analysis time. Consider early on in the process how results will be reported and used as this may help determine what data are most valuable to collect.

We recommend that you start small and focus on a few important goals or program-level learning outcomes each year for review and assessment. Some institutions are using electronic tools to aid data collection and analysis. For example, some learning management systems have components that allow assessments to be linked with learning outcomes at the course and program levels. Rubrics or grades that are entered through this system can be collected and presented in a report that demonstrates the general level of learning outcome attainment (e.g., Kaupp, Frank & Watts, 2013). Technologies that use e-portfolios to represent work gathered over the length of the program are also becoming more effective in supporting the process (e.g., Mentkowski, 2006).

Other institutions engage the help of institutional research analysis offices. These offices have expertise and access to online survey systems and data analytics. Various types of data may draw attention to disparities between direct and indirect forms of assessment. This can be particularly helpful when triangulating assessment results, instructor perceptions of assessing learning outcomes and student reports of achieving learning outcomes. Relying solely on student

self-reporting is limiting; it may be illuminating to ask students to reflect upon their learning experiences. Students might be asked:

- How much has this course/program contributed to the following outcomes?
- What outcomes did you spend the greatest amount of time developing?
- Which outcomes did you feel had the least time spent developing them? (adapted from Kenny & Desmarais, 2012)
- What have instructors and staff done that has made the biggest difference to your learning?
- What makes a class difficult for you? (adapted from Blaich & Wise, 2011)

As mentioned in Section 1.2, you could use baseline assessments to analyze chosen program-level learning outcomes at the beginning and end of a program to examine change over time. Alverno College has been engaging in program-level learning outcome assessment the course for many years, using portfolios and other embedded assessments to determine whether students have met the learning outcomes (Mentkowski, 2006).

Collecting Assessment Data

1. *How many and what kinds of assessment information data will you examine? What will best reflect student learning?*
2. *Is there a question or problem that you are interested in answering that will focus your collection?*
3. *What tools will you use for collection?*
4. *Who will be responsible for managing data collection? For doing data collection?*
5. *How will you store the information?*

Analyzing the Results

At this stage, dialogue and reflection between instructors and students are very useful. Guiding questions can lead to fruitful discussion and insight.

For example, if analysis indicates that student achievement did not meet expectations on any task, you should consider factors that may have contributed to this finding. Presenting a few critical elements from the initial analysis of the data to instructors and staff groups can lead to further dialogue, iterative cycles (asking for more data) and a more focused discussion (Ewell, 2009).

Recent trends in the development of learning analytics tools have produced new methods that institutions may consider to connect the assessment of student performance at the course level to the program level. An example of an application of a learning analytics tool is demonstrated in the case study below.

Analyzing the Results

1. *Did students achieve the program-level learning outcomes?*
2. *What patterns or trends do you see?*
3. *Did anything surprise you?*
4. *What factors might have contributed to your findings?*
5. *What does this mean for action?*
6. *Are there changes to the process of data collection /analysis you should make for future cycles?*

Case Study: *Learning Analytics*

Context: In 2013, the University of Guelph and Desire2Learn began a pilot project to use Desire2Learn's Insights analytical tool to align program- and course-level learning outcomes and their assessment. The pilot project focused on measuring learning outcomes achievement for several courses within two programs – Engineering and Arts & Science – by integrating a system of learning outcomes tracking and assessment directly into the Desire2Learn Learning Management System. While the application of learning analytics to outcomes assessment is a relatively new concept, the project will provide the University of Guelph with a comprehensive way to track and assess learning outcomes at the course and program level.

In the second year of the project, McMaster University, Wilfrid Laurier University, the University of Waterloo and Mohawk College were invited to join. These project partners contribute to the process of integrating the Insights tool across the province and adapting its functionality to various disciplinary and institutional contexts. The tool is being piloted and used in a variety of different circumstances at each institution.

An analytics tool such as Insights has wide applicability for assessment and will ultimately provide flexibility in the way data on learning outcomes achievement are collected in Ontario.

STAGE 4: MAKE PROGRAM IMPROVEMENTS

Using assessment data to enhance programs contributes to an institutional culture that values and engages in quality enhancement. Yet most institutions have difficulty translating assessment information into improvement plans and implementing them effectively. While there is evidence that institutions often use program-level assessment data for accreditation and program review purposes, only a small number use the information for strategic planning, academic policy development, curriculum revision and institutional improvement (Kuh, Jankowski, Ikenberry & Kinzie, 2014). In order to bring about change, the process and results of learning outcomes assessment must be shared with multiple stakeholders throughout each stage, thereby shaping a campus culture that engages with and values systemic, strategic program enhancement (Blaich & Wise, 2011).

You can begin by reviewing the conclusions reached about student learning. While opportunities for improvement arise from concerns about student achievement in an area, it is not always obvious to predict how specific changes might affect performance. If student achievement is below expectations, you should consider what opportunities exist for improvement within and among the courses and program. Having identified areas within the program for improvement, the next step is to ask reflective guiding questions.

It can be helpful to rank the suggestions for action based on answers to the above questions. You should also include other stakeholders in these discussions (e.g., instructors, students, staff, employers). A follow-up plan should be developed, including timelines and responsible persons. At this point, you can decide if additional information is needed before initiating action. In most cases, this might include a review of the literature on teaching and learning or conducting a small research project on the program-level learning outcome in question. It might be useful to conduct a data audit to discover any assessment data the institution collects that are not already used for program-level learning outcome assessment. Many institutions have small grant programs or strategic funding opportunities that could provide resources to engage in a small research project to trial and evaluate a program enhancement (Deepwell & Buckley, 2013).

It is important to share the results of the program assessment since a substantial time commitment is often involved in program enhancement and willingness to commit more time in the future may be affected by the perception that past cycles have had an impact. Information can be shared in a variety of ways, including faculty-wide or department meetings, retreats, small focused meetings, email updates, websites, formal reports, conference presentations and articles (Kuh et al., 2014). Just as multiple assessment tasks provide more comprehensive information about student learning, multiple reporting formats broaden understanding and appeal to a wider range of audiences. Information may be summarized as tallies, percentages, scores or qualitative summaries. Patterns of performance may be compared among cohorts or groups, instructors, or peers over time. Targeting the questions that influence instructor practice may motivate change (Blaich & Wise, 2011). Again, the best approach depends on the program-level learning outcomes, how outcomes are assessed, etc.; open, creative discussion is imperative. It is helpful to decide during the information-gathering process how the results will be summarized and reported.

Making Program Improvements

1. *What are the most important findings?*
2. *Which areas show the greatest challenges with learning (and therefore the greatest opportunity for improvement)?*
3. *What actions could address each of the challenges?*
4. *Which of these are most likely to be effective?*
5. *Which are possible in terms of cost, operation, etc.?*
6. *What changes are feasible immediately and which challenges might be addressed in the future?*
7. *Who might be able to take action?*
8. *How would you know if your enhancement was effective (planning for the next cycle of assessment)?*

Transparent Communication

1. *Who will you be communicating with?*
2. *How and when is best?*
3. *What format for presenting results will prompt conversations that are most likely to enhance student learning in the program?*
4. *How will reporting formats help answer questions about student learning and achievement of program-level learning outcomes?*

Creating a comprehensive plan for assessment helps to ensure that program-level learning outcomes are explicit to students and stakeholders; teaching and learning activities are aligned with learning outcomes; assessment tasks are effective, coordinated and structured throughout the program; students are meeting key learning outcomes; and investment in assessment pays off in improvement and enhancement of programs. For an example, see Case Study: Washington State University Monitoring Progress in Assessment for Improvement below.

Case Study: *Washington State University, Monitoring Progress in Assessment for Improvement*

Context: "The Senate of Washington State University [WSU] instituted its initial program assessment policy in 1990. The 2009 update to the policy specified that "the faculty associated with each undergraduate and graduate degree program will develop a plan for assessing...students about to receive the degree... Departments must be able to demonstrate improvements over time."[11]

Examples of Assessment for Improvement: The Office of Assessment of Teaching and Learning provides numerous examples of how WSU programs use assessment results.

- *"The School of Economic Sciences changed their curriculum to include a research requirement...after assessments revealed student weaknesses in applied economic and quantitative tools."*[12]
- *"The Human Development program collected supervisors' rating of student interns in order to...strengthen weaker skill areas.* [The curriculum] *changes have boosted supervisor ratings."*[13]
- *"The School of Food Science focused on improving students' skills in communication and time management after surveying alumni and industry employers about WSU graduates on the job."*[14]

Monitoring Progress in Assessment for Improvement: WSU also uses departmental self-assessment to track the evolution of assessment for improvement processes within programs. The table below highlights how institutions can use a rubric for process maturity to plan support for programs in assessment for improvement.[15] In response to the report, the accreditor cited a "noticeable transformation of the culture of assessment"[16] at WSU.

Holistic Self-Assessment of Program Assessment System

Number of Programs	4 (7%)	20 (37%)	20 (37%)	10 (19%)
DEVELOPMENT OF ASSESSMENT SYSTEM AND PRACTICE	BEGINNING: One iteration of assessment process begun; may be in the pilot stage; may not yet have data or data may not yet be shared or discussed	DEVELOPING: Actively adjusting basic process or tools after on iteration/ pilot; some sharing and discussion of data; developing system of participation	REFINING: Data regularly shared and discussed through more than one assessment cycle; results used to improved and validate student learning; use of results is being regularly documented	ESTABLISHED: Several iterations of assessment cycle; process is structurally driven with wide participation; process and tools are established but also responsive to changing needs in the program; system is cyclic and used to improve and validate student

[11] http://facsen.wsu.edu/eppm/AssessmentStudentLearning.pdf
[12] http://oai.wsu.edu/assessment_resources/assessment_highlights_long.html#assessment_data_for_change
[13] http://oai.wsu.edu/assessment_resources/assessment_highlights_long.html#internship_and_field_experience
[14] http://oai.wsu.edu/assessment_resources/assessment_highlights_long.html#professional_skills
[15] http://accreditation.wsu.edu/reports/WSU-2013-Year-Three-Self-Evaluation-Report-Final.pdf p. 223
[16] http://president.wsu.edu/blog/perspectives/2013/10/17/accreditation-report-praises-assessment-progress-outlines-need-for-more/

Section 2

ASSESSEMENT PRACTICES

Summary

In this section, we present a variety of assessment tasks that could be selected and organized within a framework to assess learning at the program level. They have been categorized by the types of learning outcomes they are best suited to assess, with the expectation that most can be adapted to assess more than one learning outcome. Each of these possible tasks was chosen because of its consistency with the principles outlined in Section 1. While these assessments are embedded in individual courses it is important to consider how they can be arranged to scaffold across the program. Introductory-level assessments placed early in the program can be reinforced later in the program. As long as courses are constructively aligned, course embedded assessment data can be used to report progress and achievement of program learning outcomes. Section 3 will focus on the development of institutional cultures that support authentic and aligned assessment, thus increasing the likelihood of both uptake and sustainability.

This section summarizes assessment tasks for particular sets of program-level learning outcomes likely to be authentic in multiple disciplinary and professional contexts. While they are categorized within one form of learning outcome to help you find and select tasks, each can be used to assess several types of learning outcomes. Many can be adapted for individual, pair or group assessment and most can be implemented in face-to-face, online, blended or hybrid courses. All of the tasks were selected because they can be used to assess program-level learning outcomes that demonstrate learning at relational or extended abstract levels. The later an assessment occurs within a program, the closer to extended abstract levels students are expected to reach.

When you are choosing assessment tasks, bear in mind the principles introduced in Section 1. The need for **validity** helps narrow the range of choices – ask yourself, would this particular assessment task assess this particular outcome? For example, validity in assessing the ability to critique arguments requires students to critique arguments. Assessing authentically requires students to critique arguments in a way that simulates the intended performance environment.

Ultimately, judgments about assessment measures should be made by instructors and supported but not directed by educational developers, students, administrators, representatives of relevant professions or government agencies. This is because assessments that are embedded within a **constructively aligned** set of courses and curriculum have been found to be most efficient and relevant for assessing program-level outcomes (Barrie et al., 2009; Barrie et al., 2012; Rhodes, 2012; Kuh et al., 2014). Sadler (2013) cautions against large-scale model assessment of separate competencies: "Instead, the focus is on the concept of competence as the capability to orchestrate knowledge and skill independently, in a range of contexts, on demand and to a high level of proficiency. The complementary focus is on competence as it is acquired and developed by students within their regular academic programs, and how that competence might be enhanced and assessed" (p. 26). The choice of assessments occurs within an intentional plan for assessment of program-level learning outcomes so that a strategic framework is used to examine the whole program and systematically generate evidence of learning (e.g., see Section 1.3; Barrie et al., 2012).

Some assessments are specific to single assignments within one course and others reflect learning across courses (i.e., portfolios and capstone projects). Keeping the principles in mind makes decisions about appropriate assessment tasks much easier. Various design criteria are important. For example, calling an assessment tool a "portfolio" is hardly enough; it must be designed with the appropriate content and complexity. The portfolio task must be well designed and clearly communicated to students in an environment that encourages and supports learning. Those same considerations apply to the evaluation and grading of student work; if students are compared to their colleagues or held to unknown or unreasonable standards, results of the assessment experience will be unreliable. They should be held to well-articulated explicit standards drawn from your learning outcomes and clearly communicated to students in advance. Rubrics are increasingly being developed by collaborations of universities and colleges for use at the institutional level.[17] Additionally, adapting assessments to be authentic and relevant to the discipline will be an important step following the selection of the appropriate tasks for a framework of assessment.[18]

The broad categories of assessments for the particular types of outcomes in the following sections draw heavily from the work of McMichael (2009), who relied on the work of Nightingale et al. (1996) and Brown, Rust and Gibbs (1994).

[17] For example, visit http://www.aacu.org/value/rubrics/.

[18] For example, visit http://www.itl.usyd.edu.au/projects/aaglo/pdf/AAGLO%20Summary%207%20Assessment%20tasks_Final.pdf.

2.1 CRITICAL THINKING, PROBLEM-SOLVING, JUDGMENT AND INSIGHT

"Critical thinking" is a broad term with diverse meaning in higher education, varying not only among disciplines but also between sub-disciplines and individuals working within them. This is true of the discipline of informal logic (the domain of critical thinking) as with any other system of organizing thought. In order to be effectively assessed, learning outcomes must define critical thinking in relation to the context of the specific program.

In most cases, critical thinking involves one or more of the following cognitive activities: analysis, synthesis, assessment, judgment, evaluation, argumentation and critique. Some of these may vary in relevance among disciplines. Each activity can be divided further into its components, which can be taught and assessed separately. Judgment and insight typically go beyond critical thinking; judgment requires the clear articulation of reasons for preferring one alternative to others, while insight may require interpreting complex information and deriving unexpected yet defensible meaning from it.

Problem-solving outcomes are specific to particular problem-solving processes, which typically involve identifying, posing, defining, interpreting, analyzing and solving particular problems. Some disciplines include planning and strategizing components to "solving." This in turn involves making and revising plans, using information to draft strategies and implementing strategies.

In addition to being useful tools to assess critical thinking and problem-solving skills, **case studies** and **open problems** present opportunities for students to synthesize and apply a broad array of content and process knowledge (Christensen & Hansen, 1987; Dunne & Brooks, 2004). Cases are often assigned to groups, though they may be used to assess students individually within a group or independent of groups. Case studies are potentially among the most authentic and effective assessment types in a variety of disciplines and professions – they are highly relevant, motivational and cognitively demanding (although poorly designed and administered case studies can be superficial and inauthentic). Their design can be simple or

Problem-Based Learning
An authentic scenario in which the problem drives student learning. Students define the questions, find appropriate resources, analyze and synthesize the information to better understand the problem, communicate their findings and self-assess their own progress.

Adaptation to assess large classes:
http://insight.glos.ac.uk/tli/resources/toolkit/resources/alcs/pages/pbltriplejump.aspx

complex and they are easy to use simultaneously as learning strategies and assessment tasks. Self-directed learning strategies, in which students take greater responsibility in the learning (such as problem-based learning,[19] for instance), can be driven by case studies, but they also align well with more teacher-driven forms of instruction such as traditional lecturing.

In testing the authenticity and alignment of case studies, it is helpful to seek feedback from departmental colleagues or external practitioners. Once case studies are written, students can practice synthesizing and applying the relevant knowledge through micro-cases in and out of class. The result of that practice provides assessment in itself.

Case Study
A description of a realistic or authentic situation. This may be presented in a variety of forms, including a descriptive paragraph, newspaper article or long descriptive case.

Sample process:
http://ar.cetl.hku.hk/am_case_study.htm

Modified essay questions (MEQs) are a useful way to combine the strengths of case studies and essays in an exam setting by presenting students with a structured series of open-ended essay questions to answer in relation to a case study. After students answer one question about a case, they are given more information, asked a second question, and so forth. Ideally, the cycle grows increasingly complex and requires more and deeper integration, analysis and evaluation than its predecessors. MEQs may help some students appreciate the importance of following a sequence or process to assess information. Although exams have historically been used in inauthentic ways, if you find yourself forced to give exams due to high enrolment, MEQs may provide an approximation of authentic assessment for critical thinking, written comprehension, problem-solving, reflection and adaptability. Care must be taken, however, to ensure that students who perform poorly on the initial questions are not unduly penalized for it later in the sequence, for example by allowing them to review and revise their answers as they go along.

Modified Essay Questions
An exam with a structured series of open-ended essay questions to answer in relation to a case study. After students answer one question about a case, they are given more information

University of Sydney Online adaptation:
http://sydney.edu.au/medicine/showcase/assessment/meq/index.php

Problem sets – predetermined, often concise problems to be solved quickly – can be used in nearly any discipline or profession and provide a useful, though usually inauthentic or disconnected, way to assess problem-solving skills involving a range of content. They are relatively easy to design and grade, can be scaffolded by using gradually more complex problems to build on each other, and are fairly rigorous and reliable if well designed.

Debates, mock court sessions, oral arguments and other simulated problem-solving and argumentative experiences can help students transfer critical thinking to real-world situations. The artificial structure of some debates works against authenticity, however, so you must take care not to over-structure them. Similarly, problem-solving can be assessed by giving students a set of principles and information and asking them to follow a process to reach a defensible solution – or, to make the assessment more complex, asking students to devise a strategy by integrating, evaluating and applying multiple sources of information to develop a feasible strategy. Assessments that involve critiquing and improving an existing problem-solving process can assess problem-solving skills, evaluate them, and could easily be designed to engage students in research.

The assessment of critical thinking is often combined with assessment of writing in argumentative, persuasive or evaluative writing assignments such as essays, speeches, poems, book reviews, letters to the editor, or journals. We expand on some of these below. To assess insight and judgment, mock advice columns directed at the problems of real or simulated persons can be useful.

[19] See http://cll.mcmaster.ca/resources/pbl.html.

Analysis – distinguishing parts of a whole and distilling information so that it is clearly understood – can be assessed by asking students to create flow charts that identify key steps in a process or deconstruct an argument. Assessments that require students to deconstruct the assumptions embedded in sets of information, analyze arguments into their component claims and logic, or problematize a seemingly unproblematic statement can allow students to demonstrate critical thinking skills thought to be essential to the education of democratic citizens.

Evaluation and judgment appear at the relational and extended abstract levels of SOLO and can be assessed only in that context. It often takes more care and time to create assessments for them, particularly when first beginning to use this type of assessment. Two-step assessments asking students to design and defend criteria for judging phenomena before applying them involve deep assessment of content knowledge, application of the principles and logic specified by the program, and multiple forms of thinking and judgment. Similarly, debates, oral arguments and writing tasks that ask students to judge the value, acceptability, merit or accuracy of an idea or argument engage subjective elements of critical thinking that push students beyond following rote procedures and parroting what they believe is required to discover what solving particular problems actually requires.

Ultimately, when courses are aligned appropriately to program learning outcomes, it becomes possible to use results from the above-mentioned course-embedded assessments to inform the progression of learning throughout the program.

Debate

A structured argument, considering multiple viewpoints and arriving at a judgement

Variations of formats:
http://www.usma.edu/cfe/literature/vargo_12.pdf

2.2 RESEARCH AND SCHOLARSHIP

"Research," like "critical thinking," carries many different meanings. Research-focused learning outcomes can focus on components of the process, such as finding and accessing information, managing and organizing information as it is gathered, evaluating the credibility of sources, performing disciplinary investigative techniques, interpreting information, using it appropriately and so forth. Some disciplines or professions are more comfortable with the term "scholarship." Whatever we call it, we recognize the basic forms of the associated activities.

For undergraduate programs, **research reviews** and **annotated bibliographies** are popular choices, not least because, as learning experiences, they can introduce students to a variety of current disciplinary research in a relatively brief period of time and can allow them to share that knowledge with each other. This works best when students must synthesize the results of their review rather than leaving the individual contributions disconnected. Annotated bibliographies, which are typically shorter and easier to produce and evaluate than research reviews, are most effective if students specify the sequence in which others should read the entries, including a brief rationale of that judgement. This helps students reach the relational level of SOLO, as good explanations must include relationships between entries.

Generally speaking, and especially for the purposes of program-level learning outcome assessment, **long-term research projects** completed over one or two semesters are best for assessing research skills (in addition to other types of outcomes). Depending on the discipline and profession, such projects can require students to use information to develop and test hypotheses and predictions; measure and compare multiple outputs and variables; classify phenomena using schemas of principles or taxonomy; conduct experiments (virtual or hands-on); synthesize large bodies of scholarship; and many other activities important to the development of researchers, scholars and citizens. The communication of the research results can take any form, even multiple forms – reports, theses, research papers, presentations, posters, videos, choreographies, etc. Some courses are designed using **inquiry-based learning** and assessed based on a final project (Healey, 2005). To maximize the learning potential of projects, they should be designed to ensure that successful completion requires synthesis, interpretation, evaluation and application of what students learn in the program and not just the particular course. This, plus the considerable time and effort required to provide regular feedback, combine to virtually guarantee useful learning and meaningful assessment.

Annotated Bibliographies
An alphabetical list of relevant references, with annotations

Sample process:
http://www.writing.utoronto.ca/advice/specific-types-of-writing/annotated-bibliography

If students are given a choice of topic, they are more likely to be motivated to complete the project. The assessment of projects of this type often includes assessment of learning outcomes related to communication skills, time-management skills and project-management skills, as well as interpersonal and problem-solving skills in the case of group projects.

To better facilitate successful completion, we recommend that the project be submitted for feedback and revision at multiple stages; at the very least, students will need constructive feedback on their first proposals. Exchange of drafts for peer feedback can provide additional constructive feedback to students, as well as provide alternative models of peer work. In order for the full benefit of peer review to be achieved, instructors need to be clear about the learning outcomes and provide training on how to give constructive feedback appropriate for the specific assessment task.

These course-based assessments can then inform program learning outcomes.

Inquiry-Based Learning
A form of self-directed learning in which students choose a question, refine it and learn through inquiry

McMaster Inquiry Process:
http://fhs.mcmaster.ca/bhsc/inquiry_what.html

Sample process and impact:
http://insight.glos.ac.uk/TLI/RESOURCES/TOOLKIT/Pages/default.aspx

2.3 COMMUNICATION

Most programs expect some outcomes related to communication to be achieved. Written communication dominates this category of outcomes – and writing takes many forms. In some disciplines and professions, argumentative and persuasive writing is the norm, and in others, research reports, professional memos and strategy documents, executive summaries or marketing plans. In fact, written communication is typically the means by which critical thinking is assessed indirectly.

Essays are still the most common form of written assessment. When poorly designed, essays can be an inauthentic form of assessment. However, there are many different types of essays – some are critical and argumentative, some report the results of research, some are reflective, some persuasive – that can be used in authentic ways to assess student learning. Many educators have experimented with **visual essays** in the form of comic strips, films, photographic sequences, or multimedia essays that can be uploaded to YouTube or a learning management system. These alternative essay formats may seem odd to those accustomed to thinking of essays as documents. Nevertheless, the alternatives are consistent with the original meaning of "essay," which is a sustained presentation of an individual's point of view. It is because of this persistent historical meaning that, whatever the mode of composition and communication, good essays all feature **in-depth and sustained engagement with ideas**.

One advantage to using essays is that most students are familiar with at least one type of essay. However, that same familiarity may lead some students to dismiss the utility of essays. Students may also have learned to write essays poorly (using the "three paragraph format," for example), and have trouble adjusting their writing choices strategically, especially if they are used to thinking of essays as a recipe that must strictly be followed. Nevertheless, it is easy for educators to structure essay assignments so that students progress through them developmentally, step-by-step, receiving feedback along the way. When the essay process is well-structured and allows for self-direction, students appreciate the opportunity to engage with a topic of personal interest and express their ideas coherently.

Visual Essays
A sustained visual presentation of an individual's point of view, featuring sustained engagement with ideas

How to make a visual essay:
http://virginialynne.hubpages.com/hub/How-to-Write-a-Visual-Essay

Essays can be aligned with multiple learning outcomes for the assessment of writing skills, argumentation, critical thinking skills, application of ideas and theories, and demonstration of research ability. They are authentic in disciplines that prepare students for academic life in the humanities, journalism, literary careers and public discourse. They are not authentic in every context and can be time-consuming to write and grade. Inter-rater reliability and rigour require some moderation and the collaborative development of a rubric for use by everyone involved in the grading.

In addition to essays, there are many other forms of written communication, all of which can be learned and assessed if appropriate for your context: **reports, short stories, poems, memos, proposals, briefs and online journals**. As long as the form of writing is authentic to the discipline and validly assesses learning outcomes, the choices are unlimited. Note too that we need not think of any of these forms of written communication as necessarily exclusive of all others. Research reports, for example, can be combined with reflective and persuasive writing – a factual report of what was found, for instance, followed by critical reflection on the process of research, followed by advocacy for a course of action the student believes is justified by the research results.

Despite the dominance of the written word, many programs also expect visual, oral or multimedia communication, each of which can be assessed in many ways as well. Although **oral assessment** has fallen out of fashion in recent decades, its use in education is older than any form of written work. It can take many forms but what they all share is that students are assessed on their ability to answer questions, debate or converse in the moment, aloud, or in response to either an educator or other students. Most forms of oral assessment take place in front of one's peers as well and oral performance is often assessed by a committee or group rather than a lone educator. The assessment often evaluates the quality of oral performance as well as the content that is being communicated.

It is possible to assess a diverse range of learning orally, in addition to providing an opportunity to assess adaptability, quick thinking and grace under pressure – important skills outside of the academy yet difficult to assess through other means. Students receive immediate feedback from their audience, much as they would in the performing arts, and that visceral feedback can be followed by feedback from you and their peers that need not be written, thus saving time. The reliability, rigour and authenticity of oral assessment can be as high as that of any other form of assessment, provided care is taken to communicate and use pre-determined criteria. Using a group or committee to grade oral assessment may help to prevent both the perception and the reality of biased judgment, as long as each member undergoes training and moderation to increase inter-rater reliability.

Perhaps the most obvious benefit is that oral assessment provides opportunities to those who struggle with written communication – opportunities they need in order to be equitably assessed, ensuring that their actual understanding is evaluated rather than their writing ability. However, it also disadvantages students who struggle with public speaking or freeze under pressure. Intimidation and anxiety are greater issues for some students than for others. For this reason, we recommend practicing smaller oral assessments in-class (easier to do in discussion-based courses and seminars) and in some cases allowing students to choose oral assessment from among other options.

Presentations are quite popular, especially in upper-year courses where much program-level learning outcome assessment occurs. Nowadays, these are typically multimedia presentations involving an oral, visual, multimedia or written component, for example, in slideshows and videos. Presentations have the potential – typically unrealized – of being truly multimedia and thus of providing an opportunity to assess students' ability to communicate orally, textually and visually at once. Oral presentations can be recorded and compared through each year of a degree to document and assess change through a program. For example, Alverno College has a long history of intentionally assessing the development of oral skills through the program (Loacker, 1981).

Poster creation and **poster shows** can be an authentic means of assessing students' ability to communicate academic ideas, especially in programs that are primarily intended to prepare students for academic careers. Creating a well-crafted poster for a poster show requires students to summarize a mass of information succinctly, interpret and communicate it visually, and answer questions about it while competing with other posters for time and attention. Consequently, standards and assessment criteria for a poster assignment can be set quite high, especially if students are required to develop their posters in stages, with feedback, even from peers, on each stage. Poster shows are representative of skills needed in many science, engineering, health science and business areas. With enough opportunity for feedback and revision, students can achieve demanding learning outcomes to high standards. The requirements for synthesis and alternative representation of (typically) written and numerical information alone can be demanding.

Poster assignments can be used to assess individuals or groups; they lend themselves to formative feedback from educators and peers; and they can be graded reliably and rigorously using fairly intuitive criteria. Students who struggle to interpret and communicate information visually may feel disadvantaged, so considerations similar to those for oral assessment should be used, including a multiplicity of assessments. It may also be challenging to ensure that students focus on what they are to learn and how effectively they are communicating it rather than focusing on the more superficial aspects of presentation style.

By identifying a variety of existing course-embedded assignments that assess communication skills, student development of these skills can be assessed or reported at the program level. This is possible when courses and their assessments are constructively aligned with the program learning outcomes. Data from the course assignments can be compiled for program assessment purposes.

Poster Show
Combines visual representation and oral communication, often to peers and expert communities

A short guide and examples:
http://www.ucd.ie/t4cms/UCDTLA0039.pdf

2.4 CREATIVITY AND DESIGN

The assessment of creativity is often associated with the arts but it is relevant to most, if not all, disciplines and professions. Certainly, in the arts, designing, creating, producing and performing are primary foci of many programs. Most scientists would think first of scientific creativity, which is at the root of what they do. In research-focused programs, students are expected to develop novel interpretations of information, advance innovative arguments and/or creative ways of approaching problems. When developing assessment tasks, many characteristics can be taken as indications of creativity, including flexibility and unorthodoxy in interpretations, drawing obscure but defensible connections, and identifying subtle similarities and differences between phenomena (Sedlacek, 2004).

Creativity is often burdened with assumptions of mystery and ineffability – and brings with it a belief that effective assessment is difficult or impossible to achieve (Sedlacek, 2004). Yet it is common to distinguish, for example, between work that displays creativity and work that is merely mimicry. Recognizing novel solutions to problems requires deep knowledge of the field and from the instructor's point-of-view it also requires an understanding of the students' perspective in order to be able to assess whether the work is novel or creative given what the student could be expected to know about the problem and other attempts to solve it. Insightful human judgment is needed.

Assessment of creativity *per se* is rarely done alone. It is usually assessed as a component of another task – be it problem-solving, poster design, alternative representations of information (e.g., a diagram, digital story, comic or video) or portfolio design. For instance, assessments that ask students to **create diagrams of concepts or events**, to **design simulations** and to **role play** are potentially powerful means of assessing creativity – as well as research skills, comprehension of course content and communication skills. However, this is unnecessary if you would prefer solely to assess creativity directly. One way to do this is by asking students to **create a new visual model** to explain a complex theory or phenomenon. This sort of assessment encourages students to convert information learned (typically) through text and voice into a completely different medium, which enables students to reconceptualize and reframe ideas and concepts in creative ways.

Role Play
Students take on a role in order to be able to learn, often simulating an authentic situation, either online or in person

EnROLE: Encouraging Role-based Online Learning Environments:
http://www.uow.edu.au/cedir/enrole/

AACU Creativity Rubric:
http://www.aacu.org/value/rubrics/pdf/CreativeThinking.pdf

2.5 SELF-REGULATION AND PROFESSIONAL COMPETENCE

For programs to produce competent graduates ready for 'real-world' practice, two sub-categories of outcomes should be considered: application and self-regulation. The range of possible application outcomes is limited only by the boundaries of the profession or discipline. Applying them often requires performing certain kinds of calculations, using types of equipment and following certain procedures and protocols that are sometimes presented as codes of professional ethics. For example, Nursing and Health Sciences use Objective Structured Clinical Examinations (OSCE) to observe students performing in a professional capacity (Pugh & Smee, 2013). On the other hand, self-regulation focuses on the demonstration of habits thought to be critical for professional success, such as time-management, goal-setting, organization and self-representation.

Reflective writing – whether as learning journals/logs or reflective essays – can focus students' attention on details of their own experiences with life or course content. This form of meta-cognition is thought by some to be essential for the development of self-regulation and by extension critical thinking. Initially, students will tend to focus on what appears immediately salient but over time reflective writing tasks can help both broaden and deepen the scope of what they notice, as they learn to derive meaning from their experiences. The repetition in reflective journals can help to reinforce some aspects of student experience, providing opportunities until meaning has been made.

For these reasons, reflective writing has the potential to help students integrate course material into their own thinking, make connections between ideas initially perceived as isolated and gradually see the course and the discipline as relevant to their own lives and the world. Actually achieving this potential, of course, is a matter of details.

Reflective writing should not be confused with critically reflective writing. In critically reflective writing, students must go beyond making connections and creating meaning – they must judge their own conclusions and assumptions, subjecting them to rigorous scrutiny. This moves students past mere pattern-recognition to develop critical thinking skills, judgment and habits of humility, honesty and integrity that are important in many disciplines.

A benefit of reflective and critically reflective writing tasks is that they are easy to create and adapt. Most students require a simple prompt – often a question or a request, which can be found online – to get them started. Prompts from one discipline can often be adapted for others with minor tweaking.

Reflective Writing

Reflective writing involves reflecting on your own experience, making connections and creating meaning. Critically reflective writing goes beyond this to judge your own conclusions and assumptions.

Examples of reflective journal writing in different disciplines:
https://www.aub.edu.lb/ctl/activities/seminars/Documents/2012-13/SelfJournals.pdf

One danger in evaluating student performance on reflective tasks is that educators mistake evaluation of reflective writing for evaluation of reflective thinking. As with any assessment task intended to judge an internal state or process – such as understanding, awareness, value, attitude, creativity and the like – the evaluation must involve careful judgment. In these cases we are inferring conclusions about what is happening internally from publicly observable products. Students who struggle to express themselves articulately in writing may be able to reflect critically, so the assessment criteria must be articulated carefully. By teaching students to reflect and critique using diverse exemplars, discussion, ample constructive feedback and opportunities for revision – in a respectful and honest atmosphere – many who struggle at the outset can improve substantially. Additionally, those same tools provide multiple opportunities to assess how students think, which improve the trustworthiness of your inferences.

Like essays, reflective writing tasks are time-consuming for both students and educators, easy to treat superficially and authentic in a narrow range of contexts. At present, they are probably used inauthentically more often than not, as in many cases the connections to discipline or future contexts for application are not made clear by the instructors. The assignments will then appear to students to be 'hoop jumps.' And the inter-rater reliability and rigour of their grading requires thoughtful moderation and collaborative rubric development.

In professional programs, the gold standard for the authentic assessment of **application** at the program-level is the **practicum**. Strictly speaking, a practicum is any assessment that requires students to demonstrate competence or mastery in a simulated or 'real-world' setting. Students completing practica are usually observed and assessed by some combination of educator, coordinator, supervisor and peers. By definition, practica are more likely to be authentic than is any other form of assessment and they can be used to assess nearly every type of learning outcome. They are especially useful for the assessment of outcomes at the relational and extended abstract levels of SOLO. Aside from their obvious tendency toward authenticity, practica lend themselves well to immediate feedback that can be acted upon in the moment, they tend to be easy to grade, are inherently formative, can be adjusted for multiple levels of learning, and rigour and reliability tend to be high. Nevertheless, practica require a significant commitment of time and resources, so they are often reserved for elite students (those who tend to perform well on traditional assessments) in small classes.

Micro-practica and **simulations**, which focus on smaller and simpler tasks performed in approximations of real-world conditions, may be substituted for practica in larger classes or used to rehearse for later practica. In large classes, students may submit recordings of their performances in simulations.

Simulations and micro-practica are usually performed under more controlled, timed conditions (such as within one class period). While less authentic than full practica, they still offer many of the same advantages for learning and assessment. A sequence or set of simulations can be created to represent what might be required in a full practicum. One form of micro-practicum, common in nursing, is known as an Objective Structured Clinical Examination (OSCE) and requires students to perform a series of tasks under pressure in a simulated environment.

If peer and/or self-evaluation are used with practica, students must be trained beforehand or their feedback may be inconsistent or inflated. As is typical, the reliability of practicum assessment may be proportionate to the level of structure provided – the less structure you

Practicum
Students demonstrate competency in a simulated or a real setting, usually observed by others

Work-based learning practicum and internship:
http://casn.berkeley.edu/resource_files/WBL_Definitions_Outcomes_Criteria_pg_120512_v2.pdf

provide, the more inconsistency you will find in the assessment results. In some cases, this may be an expected and acceptable situation; in other cases, consistent results may be the goal.

Practica and simulations may require a lot of time to create and coordinate – practica require more coordination but less time for creation, while simulations require more time for creation but less coordination.

Learning portfolios, either course-level or program-level, continue to increase in popularity. They require students to combine multiple pieces of evidence to demonstrate achievement of one or many intended learning outcomes. The items are often completed over the course of a semester or academic year, though for purposes of fidelity (the ability to ensure a grade can be trusted as an accurate, authentic communication about what a student has achieved), items completed earlier in the semester should be revised and refined in light of formative feedback. Portfolios often include essays reflecting what students have learned. The explanations turn each included item into evidence of achievement, connecting it explicitly to the intended learning outcomes. At a program level, the items should be gathered from each of the student's courses and connections should be drawn between them to tell the story of the student's progress and achievement.

Portfolios may be paper-based folders or binders, electronic media or a combination of the two. Recent developments in technology permit the use of electronic or ePortfolios, which are essentially websites that represent learning in different ways for different audiences and are now much more accessible to the average student than they were only a few years ago. The digital world allows students to draw from a much larger range of sources, or artefacts, as evidence of their learning than would be possible with the traditional paper-based systems. Evidence may now take the form of videos, audio recordings, artwork, photographs, computer programs, performance in simulations, recorded performance in virtual worlds, web quests, electronic versions of written assignments (including feedback received), blogs, digital stories and many other 'non-traditional' items if they are relevant and authentic demonstrations of achievement.

In addition to providing evidence of achievement, portfolios can effectively develop critically reflective habits of mind and self-awareness, especially if introduced at the outset of a program and reinforced regularly in each course. Incorporating multiple pieces of evidence over time makes portfolios more likely than other forms of assessment to provide a complete and credible representation of student achievement. For the same reason, portfolios are easy to align with other learning experiences and assessments, such as journals. Though heavy in time investment for students and instructors, portfolios are one of the strongest ways to assess program-level learning outcomes as they allow the collection of and reflection on multiple pieces of evidence within a course and over the length of a program. Products from many of the assessment tasks mentioned in this section can be included within a portfolio, allowing triangulation of evidence, demonstration of change and meta-cognitive reflection on strengths and weaknesses related to program-level learning outcomes.

Learning Portfolio
A systematic collection of evidence for a student's achievement of learning outcomes, with reflection on the work

Comparing course and program level portfolios:
http://manoa.hawaii.edu/assessment/howto/portfolios.htm

National Institute for Learning Outcome Assessment Portfolio has over 50 Resources about portfolios:
http://www.learningoutcomeassessment.org/publications.html

Section 3

DEVELOPING INSTITUTIONAL CAPACITY

Summary

In this section, we discuss the importance of shifting institutional culture to one that values assessment for both meeting external demands for accreditation and accountability, and internal demands for enhancing teaching and learning. We identify strong leadership, sufficient resources and faculty involvement as necessary components. Furthermore, this cultural shift should occur alongside widespread use of authentic assessment practices that are curriculum-embedded and discipline-specific; and here too faculty involvement is vital. Finally, we bridge the gap between formative and summative assessments by discussing the emerging field of learning analytics and how data gathered through formative measures may be collected to conduct summative assessment. Student involvement in all of these processes is one of the future trends to enhance further the institutional culture in its approach to program-level learning outcome assessment and ongoing enhancement.

3.1 SHIFTING THE INSTITUTIONAL CULTURE AND INCREASING AUTHENTIC ASSESSMENT PRACTICES

In this section, we will address components of institutional culture and authentic assessment. We will also provide examples of traditional summative approaches to program-level learning outcome assessment but primarily focus our discussion on the emerging field of learning analytics and how data gathered from formative approaches may be accumulated to provide summative information at the institutional and program levels.

Engaging in the assessment of program-level learning outcomes and using this information for ongoing enhancement is incredibly difficult without faculty engagement and buy-in, administrative and institutional support and leadership. It requires a systemic, inclusive process of data collection, analysis and sharing and, importantly, occurs within an institutional culture that values assessment and quality enhancement. An institutional culture that views assessment as a means to improve teaching and learning encourages faculty members to do so as well, leading them to develop and use authentic assessment instruments and results – and this directly impacts and enhances student learning (Figure 7).

Though course-level and discipline-specific assessment practices are imperative for enhancing teaching and learning, they may not provide the necessary data to conduct large-scale, institutional reviews. Program-level assessments provide vital information on student learning at the conclusion of an instructional unit and, by proxy, assess the effectiveness of the program and the larger institution. Therefore, program-level assessment must occur alongside formative approaches to satisfy both external and internal demands of the institution.

Factors Influencing Institutional Culture and Impacting Program-level Learning Outcome Assessment

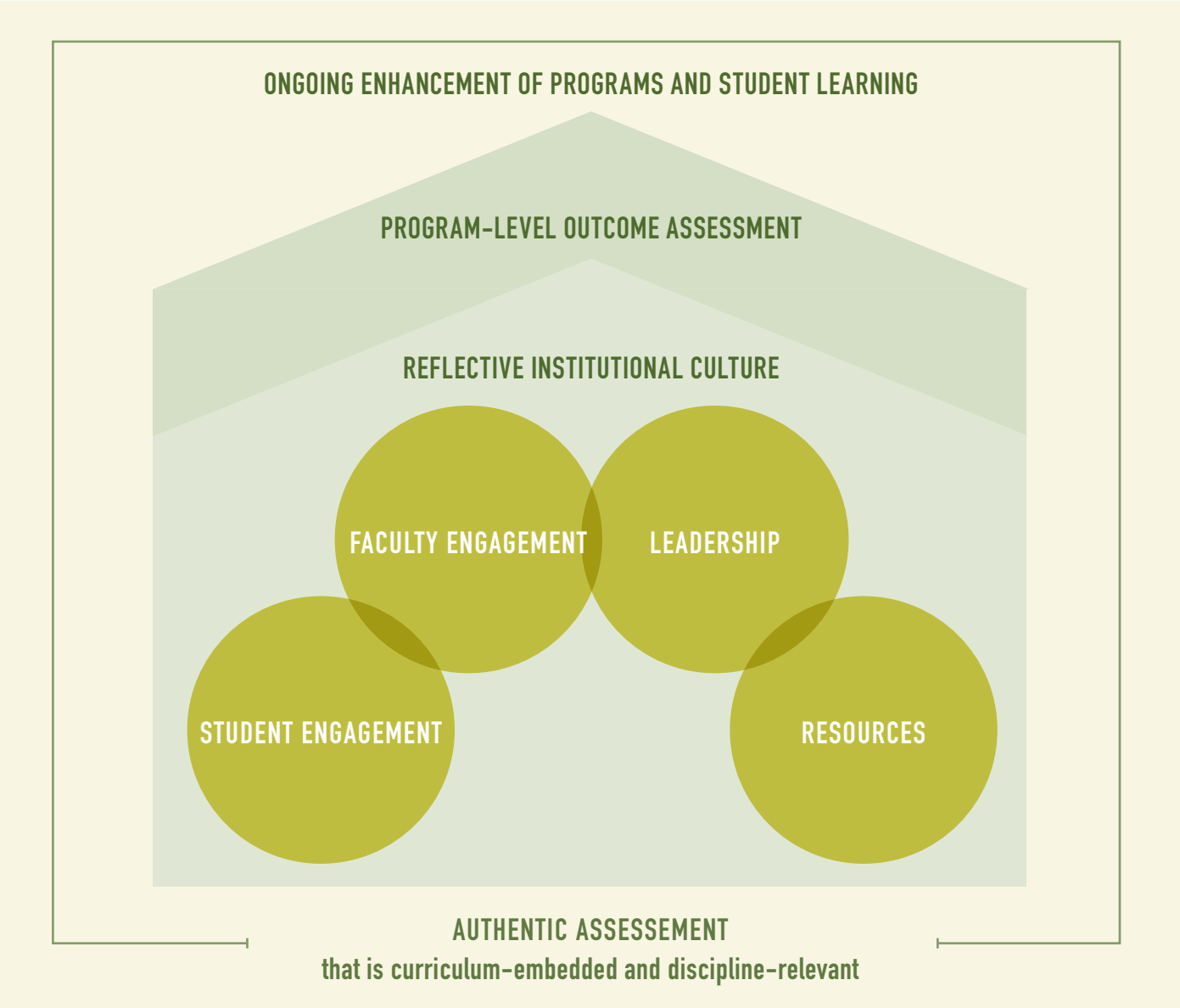

FIGURE 7

REFLECTIVE INSTITUTIONAL CULTURE

Program-level learning outcome assessment will more likely result in enhanced programs, teaching and learning when it is supported by a reflective institutional culture. Quality assurance processes such as assessment should not simply be conducted to meet external demands but also to reflect on, understand and improve current teaching practices (Biggs, 2001). To effectively build an institutional culture that approaches assessment as a means to enhance teaching and learning, learning outcomes should constructively align with classroom teaching methods, program curriculum and institutional graduate attributes (Section 1.1 and 1.2), and institutional procedures and policies (Biggs, 2001).

Institutions in the UK and Australia have moved toward formalizing this reflective approach to assessment by developing institutional academic frameworks and/or teaching and learning strategic plans, supported by external and governmental resources and mandates. The Quality Assurance Agency (QAA) and the Higher Education Academy (HEA)[20] promote innovative assessment practices and quality assurance procedures that examine how assessment has been designed. Scotland ensures that quality assurance is intentionally linked to quality enhancement by identifying a new theme every three years to focus intensive resources on a common priority to enhance higher education.[21]

Baker, Jankowski, Provezis and Kinzie (2012) examined case studies of institutions in the US that effectively use assessment data for ongoing enhancement of programs, suggesting that institutions:

1. use calls for accountability to leverage their own internal improvement efforts
2. align assessment work with organizational structures
3. focus assessment efforts on specific problems or questions to allow focus of data in a manageable fashion

LEADERSHIP IN ASSESSMENT

Whether and how assessment enhances teaching and learning is dependent on how an institution approaches assessment – in other words, its culture of assessment. If the institutional culture advocates for and supports assessment for the purposes of improving teaching and learning, then assessment practices will likely result in enhanced teaching and learning. Strong, passionate leaders and centres for teaching and learning both play essential roles in promoting an institutional culture that values assessment as a tool to enhance teaching and learning.

Centres for Teaching and Learning

Most Ontario institutions have centres for teaching and learning (or similar, integrated areas responsible for academic quality). Over the last 30 years, these centres have evolved to provide a wide array of services, programs, resources and expertise to faculty, graduate and undergraduate teaching assistants, sessional instructors and academic administrators (Grabove et al., 2012) – many of whom then become leaders in the area themselves. Faculty members who were once motivated to review program-level learning outcomes can become discouraged without the necessary support and resources (Hersh & Keeling, 2013). Centres offer support through one-

Leadership: Centres for Teaching and Learning

Centres could offer:

- *facilitation for the process of developing a program-level learning outcome assessment plan in a structured and systematic way*
- *professional development (program-level learning outcome assessment on embedding effective assessment in the curriculum)*
- *resources, e.g., small grants, staff time, access to and knowledge of literature*
- *networking between people with expertise and interest*
- *sharing examples of effective practices*

[20] http://www.qaa.ac.uk/ABOUTUS/Pages/default.aspx

[21] http://www.enhancementthemes.ac.uk/

time, introductory workshops; extended, week-long and semester-long programs; one-on-one consultations; funding for teaching and learning grants and conferences. Staff in centres provide leadership and facilitation for the process of developing course- and program-level learning outcomes, and learning outcome assessment; representation on institution-wide committees impacting teaching and learning; and other methods of sharing examples of effective practices (Grabove et al., 2012).

Centres for teaching and learning can provide resources and conceptual support to currently engaged faculty, while encouraging others to become involved. Through these varied, systemic efforts, centres can contribute to an institutional culture of quality teaching and authentic assessment for the purpose of enhancing programs and student learning. We caution against viewing centre staff as the only experts; rather, we recommend that centres partner with faculty and departments to develop further expertise and engage faculty in the assessment process, by supporting distributed leadership.

Case Study: *Leadership and Centres for Teaching and Learning**

A New Hampshire college funded the creation of a systematic professional development program for part-time faculty known as the Adjunct Teaching Forum. The Forum encouraged faculty to engage in conversations explicitly linking assessment to enhancement of teaching and learning practices. The Forum had four different levels: developing higher-level cognitive skills, facilitating experiential and active learning, reimagining courses and enhancing assessment strategies.

The college continued to build on this work through research on assessment strategies and teaching practices. An institution-wide assessment program was then implemented to monitor program development, determine learner success, improve teaching and learning and establish institutional effectiveness. With renewed, institution-wide funding, the assessment program continued, later fostering leadership among faculty, establishing course-embedded assessment and analyzing the assessment programs in place.

Many factors contributed to creating an institutional culture of assessment at this college. First, implementing a committee on assessment allowed for a formal space where members could review, discuss and improve assessment within the institution. Second, establishing faculty leadership positions increased engagement, knowledge and participation. Lastly, ensuring that institutional leaders were part of the discussion helped to integrate matters of assessment into budget reviews, course evaluations and program creation.

*Retrieved from Zubrow (2012)

Formal Institutional Leaders

Formal institutional leaders can directly impact the success of assessment efforts within an institution (Shipman, Aloi & Jones, 2003). Effective leaders are instrumental in promoting and fostering an institutional culture of assessment geared toward enhancing teaching and learning. It is important to note that effective leaders may trigger a cultural shift but successive leaders with similar values must maintain this shift. Researchers have identified leadership qualities and attitudes integral to implementing and maintaining a successful culture of assessment (Shipman et al., 2003; Stayhorn, 2006; Baker et al., 2012). Effective leaders:

- provide a vision for assessment, especially at the program and institutional level;
- participate in program-level learning outcome assessment processes;
- encourage collaborative assessment efforts between faculty, staff, administrators, students and employers;
- advocate for institutional incentives that encourage and recognize faculty and staff participation in assessment efforts;
- make incremental, sustainable changes in assessment practices and policies;
- know the strengths and weaknesses of the various assessments instruments and use this information to provide a framework for improvement of teaching and learning;
- make resources available (e.g., for professional development of faculty and staff, program-level assessment and program enhancement, infrastructure/IT systems that allow more effective data analysis and visualization, etc.);
- provide and encourage space for discussion and collaboration;
- guide the institution to organize information around specific questions of interest that will help improve student learning;
- provide time and processes to reflect and make meaning of the information gathered through program-level learning outcomes;
- encourage dissemination of information in a transparent process – with a focus on ongoing enhancement;
- use the information for institutional priorities, strategic planning, and decisions; and
- celebrate successes.

Institution-wide initiatives, especially concerning culture, perceptions and values, require representatives and leaders from various levels of the institution: faculty members, administrative staff, and students with different levels of expertise (Stayhorn, 2006). This multi-faceted approach to assessment helps to encourage a comprehensive, institution-wide culture and ensures access to important resources (Baker et al., 2012).

Formal Institutional Leaders

Effective leaders engage in a number of essential activities:

- *Setting vision*
- *Encouraging collaboration and engagement between faculty, staff, administrators, students and other stakeholders*
- *Providing an encouraging space and time for discussion and reflection*
- *Providing resources for enhancement*
- *Encouraging dissemination*
- *Recognizing time and effort and celebrating successes*

RESOURCES

Shifting an institution's culture toward valuing assessment usually requires an allocation of funding, time, space, equipment, policies and staff, as well as the expertise necessary to facilitate change. Studies looking at institutional spending in terms of effective teaching practices suggest that it is not necessarily a matter of the total spending but rather of how the funding is allocated (Wellman, 2010). It is also worth considering that while funding for program learning outcome assessment is an expense with respect to short-term accountability, it is an investment when it offers long-term benefit through program enhancement (Swing & Coogan, 2010). As Swing and Coogan (2010) put it, "Nothing negatively impacts the cost-benefit ratio more than collecting data that are never analyzed, failing to close the loop in implementing the improvements" (p. 12).

To use resources most effectively, you should have a clear purpose, design and plan for data analysis and use before engaging in program-level learning outcome assessment (Section 1.3). New or reallocated resources could include release time for those responsible for the program-level assessment, external consultations, software to capture, store, analyze and help visually display collected data, and participation incentives for students and faculty (Cooper & Terrell, 2013). Furthermore, the sensible way to ensure that there are sufficient resources in place is to engage in conversations about program-level learning outcome assessment during planning, budget and curriculum reviews (Shipman et al., 2003).

Resources

Shifting an institution's culture toward valuing assessment usually requires a commitment of resources.
These include:

- *Centres for teaching and learning*
- *Professional development on the use of assessment data*
- *Integration of assessment information into revised curriculum, policies and practices;*
- *Faculty incentives, e.g., funding, release time*
- *Software for data analytics*
- *Funding support for projects and networks to use the information gathered*

FACULTY INVOLVEMENT

Support from teaching and learning centres, campus leaders and resources contributes to a culture that values assessment; and these efforts must be complemented in turn by faculty buy-in and engagement (Hutchings, 2010). Formal assessment might be the impetus for initially engaging in program assessment; however, fostering a culture that values teaching, learning and assessment is essential for continuous improvement and enhancement of learning. Scholars have found that an institutional culture that values assessment encourages faculty engagement in assessment: simply put, faculty members are more likely to engage in authentic assessment if the institution publicly and strategically commits to it as well (Wang & Hurley, 2012).
At the grassroots, faculty members provide the expertise and discipline-specific knowledge necessary to develop authentic assessment instruments and are instrumental in the successful implementation of authentic assessment practices (Baker et al., 2012; Van Dyke, 2013). On the other hand, there are several factors that dissuade faculty engagement in these types of initiatives (Hutchings, 2010):

- Assessment is seen as part of management culture.
- Faculty are not trained in assessment.
- Teaching in general, including assessment work, is often undervalued in hiring and promotion and tenure processes.
- There is no good evidence that engaging in program-level learning outcomes assessment results in improved student learning.

In attempting to address many of these challenges, we find it most effective to approach assessment as a scholarly activity undertaken for the purpose of enhancing teaching and learning.

Assessment as a Scholarly Activity

Faculty willingness to engage in program-level learning outcome assessment can be encouraged if they perceive assessment as a scholarly activity, as "a form of community property that can be discussed, critiqued, exchanged, built upon" (Schulman, 1993). Schulman (1999) notes that something becomes "scholarship when it becomes public; an object of critical review and evaluation by members of one's community; and members of one's community begin to use, build upon, and develop those acts of mind and creation." If faculty perceive assessment as an intellectual endeavour, part of their role as members of the institution, and one capable of producing data and effecting change, they are more likely to participate and value the process.

Assessment for the Purpose of Enhancing Teaching and Learning

Faculty members are more likely to participate in program-level learning outcome assessment efforts if it is clear that the results may directly impact their own teaching practices, the program and student learning (Wang & Hurley, 2012). Faculty engagement is deterred if assessment measures are undertaken primarily for accountability or accreditation purposes. Reverting the focus of assessment from a top-down initiative to one that involves multiple stakeholders working together to focus on improving student learning welcomes a culture of inclusivity, distributed leadership and quality teaching.

Engaging Faculty: Practical Approaches

We have included three practical approaches that institutions can use to help faculty view assessment as a scholarly activity that can enhance teaching and learning.

1. Professional Development

Centres for teaching and learning can offer workshops and programs on authentic assessment, explicitly detailing how effective assessment measures improve teaching and learning; how to design and assess learning outcomes; and how to design and implement assessment instruments, rubrics, and methods of data-collection and analyses. While assessment that is embedded and connected to the department or discipline can be helpful in creating context, institutions in the UK have found that establishing networks and opportunities (Hutchings, 2010) to share ideas with faculty from other disciplines and departments can provide a useful space to learn from one another and exchange ideas (Eales-Reynolds, personal communication, 2004). As a central, campus-wide service, teaching and learning centres can organize and support these initiatives.

Some institutions also offer graduate students professional development opportunities: departments are increasingly offering programs of study with options for participating in credit courses or programs on teaching and learning, curriculum design, assessment and alignment (i.e., University Teaching Certificate Program, http://www1.uwindsor.ca/ctl/utc).

Case Study: *Virginia Polytechnic Institute and State University Faculty Development Workshops**

Van Dyke (2013) describes the success of sequential, faculty development workshops at Virginia Polytechnic Institute and State University. Specifically, he notes how introductory workshops covered external demands for accountability while advocating internal demands for improvement. Furthermore, he discusses how task-specific workshops approached assessment as a scholarly activity, recognizing that faculty members were more likely to engage in assessment from their own perspectives and volition.

* Retrieved from Van Dyke (2013

2. Recognition of Assessment as a Form of Scholarship: Grants and Tenure

If we view assessment as a form of scholarship and hold this to be true through our institutional renewal and reward structures, faculty members would likely engage in assessment processes. Institutions could implement policies and procedures that recognize and reward instructors who participate in program-level assessment. Institutions can also encourage faculty involvement by providing funding or support for external grant applications that examine effective methods for program-level learning outcomes assessment; allocating time and resources to develop assessment techniques; and providing rewards and outlets for faculty members to share their findings. These changes demonstrate institutional commitment to assessment for improving teaching and learning and to implementing and maintaining a culture of assessment.

3. Faculty Leadership

Faculty members can also serve multiple leadership positions in the assessment process. Researchers have found that direct enlistment of faculty members in assessment efforts, especially in leadership positions, is key to engaging other faculty members (Zubrow, 2012).

Case Study: *Implementing a "Lead" Faculty**

A public, multi-campus college in New Hampshire created a committee of "lead" faculty members tasked with leading assessment efforts with the support of a central assessment office. The faculty members were selected from different disciplines and geographical locations, and each taught in different formats (online and in-class). They were responsible for developing assessment instruments and rubrics, serving on faculty teams that scored student artifacts, interpreting data, and facilitating inter- and intra-faculty discussions about assessments.

*Retrieved from Zubrow (2012)

Case Study: *Valencia Community College, Learning Outcomes Assessment as an Essential Teaching Competency*

Context: Valencia Community College serves over 50,000 students annually in academic programs at its five campuses in the Orlando, Florida area. Valencia won the inaugural Aspen Prize for Community College Excellence in 2011 based on its record of success in learning outcomes, student completion, equity and diversity, and labour market impact. *"The graduation and workforce results are clear and especially impressive given Valencia's diverse student body, the large percentage who arrive needing remedial work, and the significant number from lower-income households...National experts and site visitors ranked Valencia's processes for assessing and improving learning outcomes as excellent, and were especially impressed with the college's professional development program for...professors."*[1]

Essential Competencies for Valencia Educators: One of the distinctive aspects of Valencia's excellence is the articulation of the *Essential Competencies* for its faculty and other educators. All new faculty members must demonstrate proficiency in the competencies in the transition process from limited-term to permanent positions. There is an extensive program[2] to support faculty in developing and demonstrating the *Essential Competencies.* The competencies include learning-centred methods for teaching and assessing, fostering institution-wide outcomes and student career development skills, and a commitment to professional and scholarly work in teaching and learning. Notably, there is a specific competency for *Outcomes-based Practice*, including the capability to *"use evidence of student learning to review and improve courses and programs".*[3] There are five workshop courses specific to program assessment.[4]

Examples of Program Assessment and Improvement Plans: Valencia's Institutional Assessment Office has an online library[5] with numerous examples of how programs have assessed specific student learning outcomes and the resulting improvements. The example programs include dance, dental hygiene, emergency medical services, film production, graphics technology and nursing. The college also maintains extensive repositories of assessment rubrics adapted by various programs,[6] data collection instruments and samples,[7] and resources for institutional program outcomes such as interpersonal communication[8] and ethical responsibility.[9]

[1] http://www.aspeninstitute.org/sites/default/files/content/docs/pubs/AspenPrize021312.pdf p. 7-8
[2] http://valenciacollege.edu/faculty/development/
[3] http://valenciacollege.edu/faculty/development/programs/tla/Candidate/documents/EssentialCompetenciesCurrentrevised9-11.pdf p. 3
[4] http://valenciacollege.edu/academic-affairs/institutional-effectiveness-planning/institutional-assessment/saicc/FacultyWorkshops.cfm
[5] http://valenciacollege.edu/academic-affairs/institutional-effectiveness-planning/institutional-assessment/LOA/PlanLibrary.cfm
[6] http://valenciacollege.edu/academic-affairs/institutional-effectiveness-planning/institutional-assessment/LOA/RubricLibrary.cfm
[7] http://valenciacollege.edu/academic-affairs/institutional-effectiveness-planning/institutional-assessment/LOA/DataLibrary.cfm
[8] http://valenciacollege.edu/academic-affairs/institutional-effectiveness-planning/institutional-assessment/loa/ResourcesInterpersonalPLO.cfm
[9] http://valenciacollege.edu/academic-affairs/institutional-effectiveness-planning/institutional-assessment/loa/ResourcesEthicalResponsibilityPLO.cfm

3.2 AUTHENTIC ASSESSMENT

CURRICULUM-EMBEDDED ASSESSMENT

Initial movements in the program-level assessment of learning outcomes tried to separate the assessment from regular course assessment through standardized tests. Standardized assessment measures are often isolated from both instructors and the programmatic curriculum and do not encourage faculty involvement or facilitate significant improvement of teaching and learning (Rhodes, 2012). They require additional work from students and their value (to the student) is often difficult to justify. Additionally, there is increasing concern that general standardized assessment does not accurately assess learning that is contextualized within a discipline (Barrie et al., 2012).

Curriculum-embedded and faculty-administered approaches to assessment align program-level learning outcomes with already existing course-level learning outcomes and integrate assessment activities into course requirements (Cummings, Maddux & Richmond, 2008). This embedded approach has the added benefit that assessment occurs within the disciplinary context. Assessment therefore takes place alongside and is aligned with teaching and learning activities. This integrated approach holds the following advantages:

1. Directly engaged faculty

Curriculum-embedded assessment instruments place assessment and subsequent improvement of teaching and learning directly in the hands of instructors (Garretson & Golson, 2005). Faculty take central roles in developing and implementing assessment within courses; subsequently, data acquired from such assessment instruments are tailored to instructors and address teaching and learning specific to instructors and courses.

2. Motivated students

Traditional, standardized assessments take place outside of the teaching and learning environment and are therefore not only isolated from the curriculum but hold little consequences for students. Curriculum-embedded assessment instruments, on the other hand, evaluate artefacts that students produce as a direct result of faculty teaching within the classroom or online. Students are therefore more motivated to perform well in these assessment tasks as they are already integrated into existing course activities (Cummings et al., 2008; Rhodes, 2012).

3. Minimized resource expenditure

Additional faculty time required for instrument administration and data collection is minimized as assessment activities are integrated into existing course requirements (Cummings et al., 2008). Faculty members can address grading and assessment needs without significantly increasing time and cost investment, while also providing the department and the institution substantial, detailed assessment results (Hardt, 2010).

4. Implications for teaching and learning

A curriculum-embedded approach to assessment is faculty-driven and explicitly linked to curricula; therefore, acquired assessment results are directly relevant to improving teaching and learning, clearly identify, and address curricular needs and deficiencies (Cummings et al., 2008). Significantly, assessment of multiple student-produced artefacts over time provides a value-added measure to ascertain effectiveness of current teaching and learning practices (McCarthy, Niederjohn & Bosack, 2011). Furthermore, programmatic assessment through course-embedded assessment instruments allows instructors to track student learning across time (Garretson & Golson, 2005) and to adjust teaching to better improve learning.

5. Implications for programmatic assessment

At the level of programmatic assessment, faculty members are expected to carry out assessment activities alongside their regular workloads. Limited time and department resources thereby limit their involvement in assessment efforts (Hardt, 2010). Curriculum-embedded assessment within individual courses can provide an alternate means of conducting overall programmatic assessment while engaging faculty (Cummings et al., 2008). Faculty members often consider their courses in isolation rather than as part of the larger program and are less receptive to program-level assessment instruments; incorporating curriculum- and course-embedded assessment instruments should align course objectives with programmatic learning outcomes and therefore establish how individual courses support larger programmatic goals. This approach not only encourages collaboration and communication between faculty members but the results acquired from course-embedded assessment instruments are also made relevant to programmatic assessment efforts.

6. Flexibility

Since curriculum-embedded assessment efforts are mediated by instructors, this approach allows for flexibility in pedagogical style, course content and assessment style and can be implemented in diverse disciplines (Garretson & Golson, 2005).

The effectiveness of curriculum-embedded assessment instruments in improving teaching and learning at both course and programmatic levels is determined by the following two factors:

Appropriate alignment of individual course-level learning outcomes and program-level learning outcomes

Assessment results from instruments embedded within individual courses hold direct implications for programmatic assessment when individual course-level learning outcomes align with larger program-level learning outcomes. The achievement of course outcomes can thus correspond with achievement of program-level outcomes. Data gathered from formative assessment measures may therefore be used in summative assessment efforts; this is addressed in greater detail in Section 3.4.

Appropriate integration of assessment activities into existing course requirements

Curriculum-embedded assessment activities should be integrated into already existing curricular frameworks so as to minimize faculty workload and time investment, and acquire assessment results relevant to improving teaching and learning.

Examples of curriculum-embedded assessment instruments that permit programmatic assessment of learning outcomes include student portfolios, senior projects, simulations and capstones (as described in Section 2), assessed through rubrics.

Case Study: *Curriculum-Embedded Assessment Portfolios**

Rhoda Cummings et al. (2008) describe the incorporation of student-compiled portfolios in a programmatic assessment framework at a Land Grant institution in the Western United States. Students entering that program are asked to maintain a portfolio of self-selected artefacts that demonstrate six domains of advanced professional competence in the field of study. Midpoint and completed portfolios are evaluated by at least two faculty members to determine whether included artefacts are representative of desired learning outcomes. Weaknesses in portfolios are identified and remedied by meeting with students and recommending changes or accepting other artefact submissions.

The authors credit such curriculum-embedded assessments with increasing awareness of best practices in improving both individual student performance and program effectiveness. Furthermore, the alignment of individual course-level learning outcomes and program-level learning outcomes resulted in increased faculty-student involvement and meaningful program modifications. The integration of assessment in existing frameworks minimized faculty resource investment and maintained faculty engagement in assessment efforts.

*Retrieved from Cummings et al. (2008)

DISCIPLINE-SPECIFIC ASSESSMENT

Studies have shown that content knowledge is crucial in demonstrating critical thinking and problem solving skills (Banta & Pike, 2012). Authentic assessment instruments require students to make connections between general abilities and skills and the disciplinary knowledge and contexts they have acquired through their majors and discipline-specific education. Successful discipline-based assessment instruments take into consideration such contexts. The integration of discipline-based, programmatic assessment leads to greater, more coherent understanding of how individual courses are connected with program-level learning outcomes and subsequently to the alignment of course assessment techniques with program-level outcomes. Significantly, results from discipline-specific assessment measures are more beneficial to faculty and therefore more applicable in efforts to improve teaching and learning (Banta & Pike, 2012).

Case Study: *Performance Assessment for California Teachers (PACT) & Embedded Signature Assessments (ESAs)*

Performance Assessment for California Teachers (PACT) refers to a group of teacher preparation programs at 30 universities, one district internship program and one charter school network. These institutions have collectively developed a teacher performance assessment, and completion of the teaching performance assessment is required to earn a California Preliminary Multiple Subject or Single Subject Teaching Credential.

Embedded signature assessments are assessment tasks that are embedded into one or more courses. Individual programs identify key assignments within their curriculum and develop them into ESAs; University of California – San Diego, for example, developed an ESA which focused on the social context of the classroom. The ESA collected evidence over time across multiple courses. Other institutions have developed ESAs embedded within a single course; examples include a community study, an observation of classroom management, a child case study or a curriculum unit.

3.3 FUTURE TRENDS

BRIDGING SUMMATIVE AND FORMATIVE ASSESSMENT: LEARNING ANALYTICS

Part of developing an institutional culture that supports program-level learning outcomes and their use for ongoing enhancement is to use the links between summative and formative assessments more effectively.

Traditionally, summative assessments are seen as tasks that measure student learning upon completion of an instructional unit. They are most often administered at the end of a course or program, and evaluation of student learning is usually based on measuring student performance against predetermined standards or benchmarks (Harlen & James, 1997). It is important to note, however, that in practice, summative and formative tasks form a continuum of sorts and that the same assessment task may provide information for both summative and formative assessment (Harlen & James, 1997). Therefore, perhaps the distinction exists not necessarily between summative and formative tasks but rather between summative and formative information: assessment tasks that consider *how* learning occurs provide formative information, while assessment tasks that determine *if* learning has occurred provide summative information. Common assessment tasks that provide summative information include but are not limited to: standardized tests, final exams, final projects, term papers and cumulative student portfolios. Not only does summative information allow institutions to benchmark progress regarding student learning and is it important for accreditation and accountability purposes, but it is also necessary for making large-scale decisions about program curricula and enhancing overall institutional, programmatic and departmental effectiveness (Benjamin et al., 2012).

Formative Assessment Used for Summative Purposes

Formative approaches to assessment can provide summative information. In their discussion of assessment, Harlen and James (1997) identify the following conditions for using formative assessment procedures and information reliably to conduct summative assessment:

a) "[Formative information] is reviewed strictly against the criteria of what students are expected to achieve at certain ages/stages."
   - External criteria should be used to determine how data gathered for formative purposes can be used summatively.

b) "The criteria are applied holistically, using judgments as to the 'best fit.'"
   - Formative data should be reviewed and aligned with uniformly applied criteria. It must also be understood that not all of the gathered formative information will meet the aforementioned criteria; therefore, not all formative information can be used for summative purposes.

c) "There is some way of ensuring that the judgments of one teacher are comparable with those of other teachers."
   - One approach to standardize judgments across instructors is to collectively discuss their judgments of collections of students' work.

As is evident in Harlen and James' conditions, summative use of formative data requires proper alignment. Summative assessment is not possible by simply gathering formative assessment information; rather, such assessment requires careful selection, judgment and consideration of formative information. Similarly, larger-scale program assessment of program-level learning outcomes can be conducted by aligning course learning outcomes with programmatic learning outcomes.

Summative Assessment Used for Formative Purposes

Conversely, summative approaches to assessment can also provide formative information and be used to fulfill formative purposes. For example, in her discussion of formative assessment, Taras (2009) considers the formative use of summative information: instructors may use summative results gathered from exams, projects and unit tests to identify areas of weak student performance and thereby focus subsequent teaching efforts.

Learning Analytics and Summative Assessment

In an interview regarding current innovations in assessment, Ahmad identified the emerging field of learning analytics as having great potential in conducting summative assessment (personal communication, November 29, 2013). Learning analytics is "the measurement, collection, analysis, and reporting of data about learners, and their contexts, for the purpose of understanding and optimising learning and the environments in which it occurs" (Mattingly, Rice & Berge, 2012). The data gathered can be used to make predictions about course and program effectiveness. Through statistical and predictive modeling, learning analytics can evaluate large data sets not only to report summative results but also to establish data patterns to make recommendations for improved learning. Learning management systems (LMSs), content management systems (CMSs) and learning content management systems (LCMSs) make this process more streamlined and consistent.

Case Study: *Learning Analytics at the University of Wollongong (Australia)**

The Graduate School of Medicine (GSM) at the University of Wollongong employs learning analytics to collect and analyze data regarding student clinical placements over the course of their medical school training. The developed tool allows students to record their experiences and further enabled instructors to help students integrate their experiences into the curriculum.

The GSM uses a learning content management system named *Equella* to collect and store relevant teaching and learning data, including patient demographics, curricular case studies, and students' placement locations. Notably, acquired data are used for both summative and formative purposes. *Equella* allows instructors to track students' level of involvement and self-reported confidence during the placements, while students identify lacking self-performances and subsequent actions. Conversely, administrators use summative data to ensure quality of the curriculum.

*Retrieved from Mattingly et al. (2012)

STUDENT ENGAGEMENT

Another important trend for improving program-level learning outcome assessment is the engagement of students in the process (Barrie et al., 2009; Hutchings, 2010). A review of Australian practices suggested that teaching graduate attributes is not likely to work unless students perceive the process as worthwhile. Barrie et al. (2009) suggest that involving students is one of eight critical elements that affect an institution's efforts in curriculum renewal and in achieving institutional-level learning outcomes or graduate attributes. Furthermore, Hutchings (2010) reminds us that while instructors might be ambivalent about engaging in program learning-outcome assessment they do care deeply about student learning. Involving students may actually be the most effective way to engage instructors. We have found through focus group interactions that student explanations of assessment results can be illuminating. There is also a movement towards integrating research and teaching in undergraduate research experiences. Involving students in projects assessing learning is a phenomenal way to integrate learning, teaching and research for students, building a more complete institutional culture that cares about learning and engages in ongoing enhancement.

Student Engagement

Future trends will include students through opportunities to be collaborators and co-inquirers:

- *Focus groups to recommend forms of assessment*
- *Focus groups to explain assessment results*
- *Research team members to examine program-level learning outcomes*
- *Project team members to implement new ideas*
- *Involvement in networks, committees and open conversations.*

SUMMARY

In this handbook, we have discussed how your program can be enhanced and enriched by assessing program-level learning outcomes. In Section 1, we outlined authenticity, validity and reliability of assessment practices and principles and described how you can design assessments with these components in mind. Drawing on established theoretical concepts and frameworks, we described how course-level learning outcomes should align to larger program-level learning outcomes. Section 1 continued with an outline of how you can create a plan for assessing program-level learning outcomes.

In Section 2, we applied the theoretical framework outlined at the beginning of this handbook. Specifically, we described a variety of assessment tasks, categorized by possible learning outcome. These would be selected and integrated within a program-level plan, choosing the best assessment tasks for particular program learning outcomes. We stressed the importance of creating assessment tasks that are well-designed and clearly communicated to students in an environment that encourages and supports learning. This section described a range of assessment tasks and how they can be applied to learning outcomes. Organized by broad categories – critical thinking, problem-solving, judgment and insight; research and scholarship; communication; creativity and design; and self-regulation and professional competence – we described how various assessment tasks can align to course learning objectives and ultimately be used to determine the success of program-level learning objectives.

In the final section, we discussed the importance of shifting institutional culture to one that values assessment for both meeting external demands for accreditation and accountability and internal demands for enhancing teaching and learning. Specifically, we identified strong leadership, sufficient resources and faculty involvement as necessary components for institutions to make this shift. Finally, we bridged the gap between formative and summative assessments by discussing the emerging field of learning analytics and how data gathered through formative measures may be collected to conduct summative assessment of program learning objectives.

It is our hope that this handbook will assist you in making this cultural shift at your own institution through the development of authentic assessment of program-level learning outcomes.

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