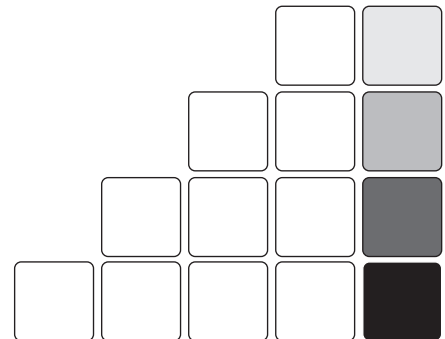




Office of the Associate Vice-President (Academic)

# A Guide to Developing and Assessing Learning Outcomes at the University of Guelph

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## Introduction

The University of Guelph prides itself on the quality of its learning environment. The University's 1987 Learning Objectives (Appendix A) established Guelph as a leader in outcomes-based pedagogy, and our academic community continues to engage in many innovative initiatives designed to enhance students' learning experiences. With the 2005 articulation of the province's University Undergraduate and Graduate Degree-Level Expectations (Appendix B), postsecondary institutions across Ontario have become increasingly engaged in articulating and assessing learning outcomes to account for and ensure quality in their educational programs.

The Ontario Council of Academic Vice-Presidents' Quality Assurance Framework (2010), requires that all institutions implement an Institutional Quality Assurance Process (IQAP) that is consistent with their institutional mission statements and degree level expectations. The Quality Assurance Framework also requires that each individual academic unit clearly articulate learning outcomes that are appropriate to the discipline and are consistent with the institution's mission, degree level expectations and academic plans. The University of Guelph's IQAP places strong emphasis on the importance of learning outcomes.

Learning outcomes have long been established and are deeply embedded as a feature of the delivery and assessment of University's professional program offerings. As a result, the institution is well positioned to build on this model by undertaking the development and articulation of learning outcomes within every undergraduate degree program (University of Guelph, 2011, p. 2).

The following Guide is intended to support programs, departments and instructors as they continue to develop and assess learning outcomes such that curricula become increasingly coherent, aligned and evidenced. It will ensure that instructors, departments, programs and the University are actively able to demonstrate and account for student achievement of learning outcomes.

## An Outcomes-based Approach

An outcomes-based approach to education clearly specifies what students are expected to learn and arranges the curriculum such that these intended outcomes are achieved (Harden, 2007a). Learning outcomes provide the base for an effectively aligned and integrated curriculum, where instructional activities and assessment strategies

are explicitly linked to course-specific and degree-level learning outcomes, which are tied to institutional and provincially-defined graduate degree level expectations (DLEs) (Figure 1).

Learning outcomes provide a powerful framework upon which to structure curricula. According to Harden et al. (1999; 2007b) learning outcomes:

- help to provide clarity, integration and alignment within and between a sequence of courses;
- promote a learner-centred approach to curriculum planning;
- encourage a self-directed and autonomous approach to learning, as students can take responsibility for their studies, and are able to actively gauge their progress;
- promote a collegial approach to curriculum planning, as instructors collaborate to identify gaps and redundancies;
- ensure that decisions related to the curriculum and learning environment are streamlined;
- foster a philosophy of continual monitoring, evaluation and improvement; and,
- help to ensure accountability and assure quality of our education programs.

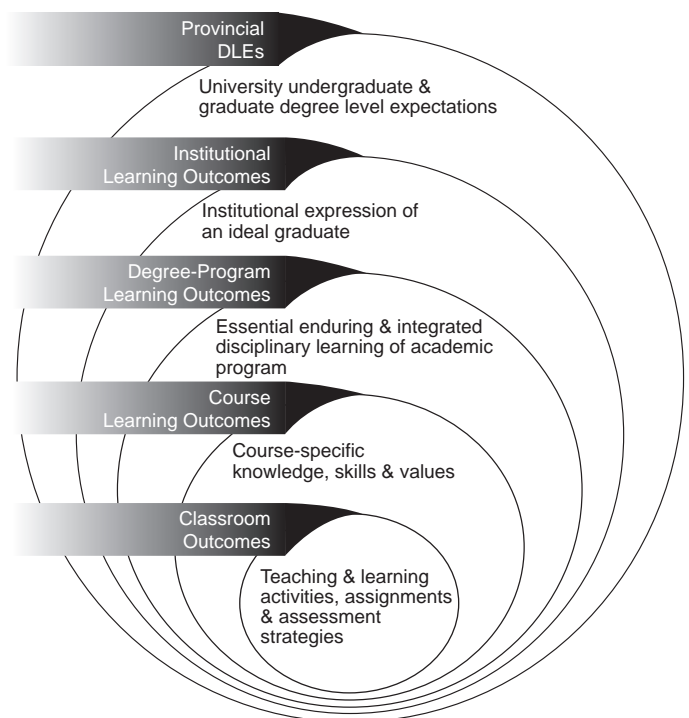


Figure 1: Graphic representation of outcomes-based curriculum alignment, from degree level expectations to course-specific activities.

An aligned curriculum organizes structures and sequences courses around the intended learning outcomes. It is therefore essential that all courses within the curriculum have clearly defined learning outcomes. In order for this approach to succeed, learning outcomes must be: 1) clearly articulated in a way that is contextualized within the discipline; 2) communicated broadly; 3) used to inform and influence decisions about the curriculum; and, 3) monitored regularly to ensure that they remain current and accurately reflect the intent of the degree program (Manogue and Brown, 2007; Harden, 2007a).

## Preparing Effective Learning Outcomes

Learning outcomes are direct statements that describe the essential and enduring disciplinary knowledge and abilities that students should possess, and the depth of learning that is expected upon completion of a program or course (Anderson et al., 2001; Harden, 2002). They focus on transferable knowledge, skills and behaviors that can be observed and assessed, and are reflective of disciplinary contexts. Learning outcomes answer the questions:

1. How would you describe the attributes of an ideal graduate of the program? What unique strengths should students who complete this program possess?
2. What is essential that students know and be able to do at the end of their learning experiences? What key knowledge, skills and values/attitudes should students who complete the program possess?

The following guidelines should be considered when preparing effective LO statements. Learning outcomes should:

- complete a phrase describing what students should know and/or be able to do by the end of the program or course (e.g. “By the end of this program, successful students will be able to...”).
- start with an action verb that specifying the depth of learning expected (Table 1), followed by a statement describing the knowledge and abilities to be demonstrated, and finally a statement (or statements) to provide context within the discipline.
- be concise, direct and clearly stated. Terms such as *know*, *understand*, *learn*, *appreciate* and *to be aware of* should be avoided, and the specific level of achievement should be clearly identified.

- be observable and measurable. LO must be capable of being assessed, based on clearly defined criteria associated with the teaching/learning activities and assessment strategies contained within the curriculum.
- be balanced. If the LO is too broad, it will be difficult to assess. If the list of learning outcomes is long and detailed, they are likely to limit flexibility and adaptability in the curriculum.
- be grounded within the discipline, and consistent with disciplinary language, norms and standards.

## Example Program-Level Learning Outcome Statements

The following excerpts provide examples of the format, breadth and level of detail typically contained in program-level learning outcome statements.

The Academy of Art University, San Francisco, Master of Fine Arts <sup>1</sup>

- Solve creative problems within their field of art and design, including research and synthesis of technical, aesthetic and conceptual knowledge.
- Communicate their ideas professionally and connect with their intended audience using visual, oral, and written presentation skills relevant to their field.

*Table 1: Depth of learning conceptualized from remembering and understanding to evaluating and creating (adapted from Anderson et al., 2001).*

Level	Description	Common Verb Associations
Remembering and Understanding	Recalling and remembering information, explaining ideas and concepts	recognize, recall, identify, label, interpret, explain, illustrate, summarize, classify, review
Applying and Analyzing	Applying, distinguishing and relating information	execute, implement, use, differentiate, distinguish, organize, integrate, apply, analyze, solve
Evaluating and Creating	Justifying a decision, creating a product	monitor, judge, test, generate, design, plan, produce, construct, hypothesize, recommend, revise, compose

<sup>1</sup> [http://www.academyart.edu/interior-design-school/mfa\\_program.html](http://www.academyart.edu/interior-design-school/mfa_program.html) (accessed Feb. 11, 2011)

- Design processes for extraction, synthesis and processing of materials to meet technical, economic, environmental and ethical needs and constraints.
- Communicate effectively in a professional environment through technical reports and presentations. Articulate and justify technical solutions to diverse audiences.
- Analyze materials engineering problems using a balance of mathematics, physics and chemistry, including thermodynamics, mass, momentum and energy transport, kinetics and mechanics of materials.

#### University of Guelph, Bachelor of Commerce

- Ethical, social and environmental responsibilities of businesses, organizations and individuals: Able to demonstrate appropriate ethical, economical, social and environmental considerations in decision-making processes; to develop and implement sustainable and ethical business solutions.
  - Identify and evaluate ethical, economical, social and environmental issues related to business problems and proposed solutions.
  - Develop and implement sustainable business solutions that demonstrate appropriate attention to the economy, environment, and society.
- Problem solving/ Analysis: individually or within a group identify relevant business problems; evaluate the credibility, accuracy and reliability of information derived from a variety of sources; construct and communicate evidence based decisions and conclusions.
  - Gather, analyze and evaluate information within the context of consumer behavior, marketing analysis, financial/economic analysis and business strategy
  - Perform cost/benefit analysis

## Assessing and Evidencing Learning Outcomes

Assessing and evidencing learning outcomes are inherently complex tasks that are best approached through a comprehensive process, involving multiple methods and stakeholders (Green et al., 2009). When implemented effectively, learning outcomes assessment can provide evidence of student learning and progression, and prioritize recommendations for continuous curriculum improvement (Cummings et al., 2008).

<sup>2</sup> [http://www.academyart.edu/interior-design-school/mfa\\_program.html](http://www.academyart.edu/interior-design-school/mfa_program.html) (accessed Feb. 11, 2011)

## Curriculum Mapping

Curriculum mapping is an assessment method which is used to determine where, when, and how learning outcomes are taught and assessed within a degree program. It provides an effective strategy for articulating, aligning and integrating learning outcomes across a sequence of courses, and explicitly identifying to students, instructors, administrators and external stakeholders how student learning outcomes are delivered within a degree program (Uchiyama and Radin, 2009; Kopera-Frye et al., 2008; Bath et al., 2004).

The University of Guelph has developed a curriculum mapping software tool (CurricKit™) which is designed to assess the intended and delivered curriculum across a sequence of courses. It distributes a questionnaire, asking each instructor the following questions:

1. What methods of instruction do you use in your course?
2. What methods of assessment are used in your course?
3. Which program-level learning outcomes are developed in your course?
4. What level of complexity/depth is expected for each of the learning outcomes?
5. Please specify how each of the learning outcomes are taught and assessed in your course.

The value of curriculum mapping is demonstrated when instructors collaborate to review data collected from the questionnaire to identify strengths, gaps, redundancies and inconsistencies in the curriculum (Uchiyama and Radin, 2009; Kopera-Frye et al., 2008; Willet, 2008). Based upon the aggregate data related to the intended and delivered learning outcomes, instructors discuss strengths and establish specific recommendations for improvement. They can evaluate the range and frequency of instructional and assessment methods, and examine how the depth and complexity of student learning experiences varies across the degree program. Curriculum mapping provides an opportunity for instructors to reflect upon and have meaningful discussions about the curriculum and to engage in broader discussions related to teaching and learning within their discipline (Kopera-Frye et al., 2008).

## The Experienced Curriculum

A curriculum can be viewed from three vantage points: What is intended or planned; what is delivered; and, what is experienced (Pideaux, 2003). Although curriculum

mapping provides an important opportunity to evaluate what has been intended and delivered in the program, it is equally important to evaluate what learning is actually experienced by students.

Bath et al. (2004) used student questionnaires to confirm alignment of students' experiences of their learning with that which faculty had espoused, planned and delivered. They noted that the process of evaluating students' perceptions can capture the development of learning outcomes that were not intended by the curriculum, and/or espoused by instructors. For each course within the curriculum they asked students to answer the following questions along a likert-type scale (1=not at all, 3=some-what, 5=great deal):

- How much has this course contributed to the following skills and outcomes?
- Which of these outcomes do you feel has had the greatest/least amount of time spent on it in this course?
- Which of these outcomes do you feel you developed to the highest/lowest level of sophistication in this course?
- Is there any outcome mentioned that was not covered, that you felt should have been covered?

They correlated the responses by asking instructors the same questions but revised the question stem to read, "...think about the course you are evaluating, how much has the teaching in this course contributed to the development of the following skills and outcomes in students?" (Bath et al, 2004, p.321). Comparing the views of student and faculty perceptions allowed for better alignment and validation of the curriculum. The instructors collaboratively developed an improved view of the program by identifying the program strengths, mapping the unintended positive learning outcomes into the existing courses, and developing strategies to deal with gaps between intentions and students' experience of the curriculum. A similar approach to evaluating student perceptions of the LO development is presented in Treleaven and Voola (2008), who also emphasize the importance of triangulating these results with multiple sources of data, including qualitative student comments, instructor feedback, and examples of in-course assessments.

Amin and Amin (2003) used a pre-test/post-test methodology in combination with student self-assessments, to evaluate learning outcomes in a business education program. The data collected was used to inform curriculum discussions and decisions, and led to a change in course sequencing and prerequisite requirements in the program. The authors highlight the importance of adopting a curricu-

lum decision-making process that involves collaborative and transparent discussions with multiple stakeholders. They also note that one of the methodological challenges associated with the pre/post-tests was attrition rates, as the tests were dependent upon the voluntary participation of students.

## Curriculum Embedded Assessment

Curriculum-embedded assessment (CEA) is an efficient and effective method for demonstrating the achievement of learning outcomes, as it is based on existing course requirements (Cummings et al., 2008). CEA is based on the identification and collection of specific examples of student work (e.g. examinations, presentations, essays, group projects) which demonstrate mastery of disciplinary learning outcomes. Students are often directly involved in selecting examples of work, which are then correlated directly with the specific instructional strategies that were intended to promote the development of these learning outcomes (Knight, 2002).

As it is based on existing course requirements, CEA helps to reflect accurately the disciplinary nuances that exist within the broad range of academic disciplines within higher education. One of most common CEA practices is student portfolios, which help to provide a progressive view of student learning overtime. Portfolios require that students reflect upon what they have learned, and individually select evidence which demonstrates their learning (Cummings et al., 2008). One of the distinct advantages of portfolios is that it allows both students and instructors to work together to assess learning. CEA requires that learning outcomes become explicitly integrated and communicated throughout the curriculum. Faculty and students develop a collective awareness of the progressive development of the disciplinary knowledge and abilities over the course of the program.

## Multi-Stakeholder Focus Groups

Focus groups can provide an important opportunity to gain a deeper understanding of perceptions of the experienced curriculum from multiple points of view. Hill (2007) used focus groups to evaluate employer perceptions of the Food Science curriculum at the University of Guelph. During the focus groups, qualitative data was collected from the employers, using the following questions:

- With reference to the current Food Science curriculum, describe in what ways the learning outcomes and content match or do not match your expectations of Food Science graduates.



- Based on your experience with Food Science graduates employed in your company, how well do our graduates meet your expectations?
- Describe one or more ways in which the Food Science curriculum at Guelph has helped graduates help your organization fulfill its mission or meet its objectives.
- Please suggest one or more changes to help us improve the Food Science curriculum at Guelph. What can we do better to prepare our graduates for employment?
- What advice would you give to a recent or soon to be graduate of Food Science?

Likewise, Coe et al. (in press) used focus groups to qualitatively evaluate student perceptions of learning within a second-year course (Art of Veterinary Medicine (AVM) II) situated within the Doctor of Veterinary Medicine (DVM) curriculum based on the following questions:

- What is the purpose of the AVM courses? Why are they part of the DVM curriculum?
- What are these courses trying to achieve? What are the intended outcomes of the AVM courses?
- Why are these outcomes important? How will they contribute to your preparation in becoming a veterinarian?
- What have you liked most about this course? Why? How has it impacted you and contributed towards your learning?
- What specific improvements do you feel could be made to the AVMI course? Why should these areas be improved?
- Drawing on your own background and experiences, what changes would you suggest to AVM II if you were to redesign the course?

## Planning for Continuous Curriculum Improvement

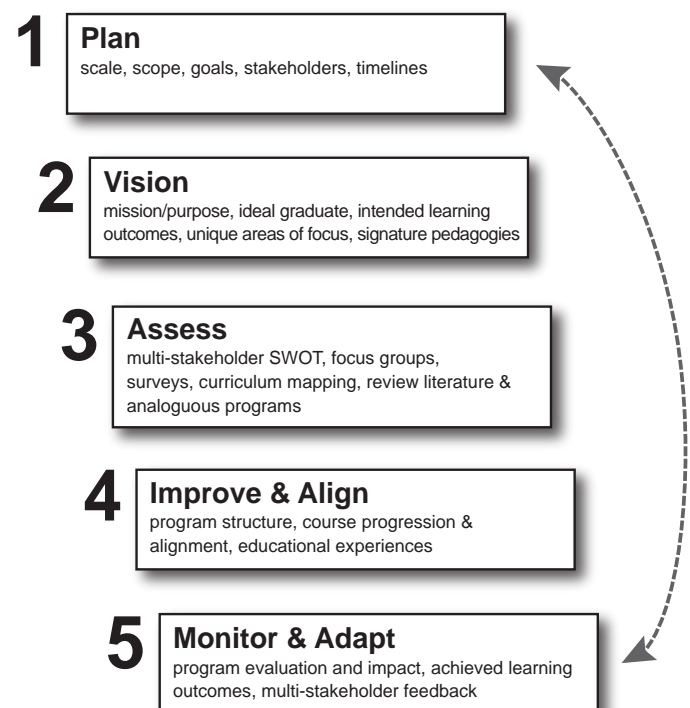
One of the core focuses of learning outcomes assessment is to develop a process for continuous quality improvement in our academic programs (Knight, 2002). Assessing student perceptions of their learning throughout and at the end of their program of study can be an integral component in the development of a plan for continuous curriculum improvement. It can also be advantageous to evaluate the input and perceptions of multiple-stakeholders.

The University of Guelph's Department of Food Science has developed a comprehensive outcomes-based model for curriculum assessment and improvement (Hill, 2007). The Department

has effectively developed an incremental, multi-stakeholder and cross-curricular plan for assessment as follows:

- data on students' reactions and perceptions of their learning are collected through group exit interviews and postgraduate questionnaires (annually);
- the intended and delivered curriculum are evaluated through curriculum mapping, which is then correlated with student achievement of learning outcomes through course-specific assessments and student portfolios (every 5 years);
- alumni questionnaires and employer focus groups are used to assess how student learning has impacted their behaviours and results in the work place (triennially); and,
- a half-day faculty retreat is used to review all assessment data and to conduct a program strengths, weaknesses, opportunities and threats (SWOT) analysis such specific strategies for improvement are developed (triennially).

Learning outcomes are central to the development of an efficient and effective framework for continuous improvement of the curriculum. The following 5-step framework (Figure 2) can help programs manage an outcomes-based approach to curriculum development.



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Figure 2: A 5-step framework for continuous curriculum improvement.

## Plan

Curriculum committees are often overwhelmed by the inherent complexities associated with assessing and improving the curriculum. Curriculum development must be viewed as a continuous process (Wolf, 2007). To manage this process, it is invaluable for committees to establish a manageable framework for continuous program assessment and development by establishing a strategic planning process based on the following questions:

1. Why? (What are your specific goals and objectives for curriculum assessment and improvement?)
2. Who? (Who will you involve? Who are the target stakeholders?)
3. When? (What are your timelines?)
4. How? (What assessment method is most appropriate?)
5. What? (What data will you collect to help inform?)

## Vision

An outcomes-based approach to education is inherently dependent upon the identification and communication of clearly defined learning outcomes, which describe the essential and disciplinary knowledge and abilities that students should possess upon completion of the program. The articulation of meaningful and measurable learning outcomes that are contextualized within the discipline may require substantial consultations with a range of stakeholders (e.g. alumni, students, faculty, employers) (Green et al. 2009). As a valuable first step it is often helpful to discuss, communicate, and review the broader context of the program:

- What is the purpose of program? Why should it be offered? What is the need?
- What will make this program innovative and distinctive? What unique areas of focus or strengths does this program offer?
- How will this program contribute to students' academic and professional development? How will it be of benefit to them?
- How will the program fulfill its vision and goals? What signature pedagogies (i.e. teaching/learning/assessment activities) should the instructors and students be involved in?

Table 1: Example excerpt of a strategic planning framework for curriculum development (adapted from Hill, 2007).

Why? Objectives	Who? Stakeholders	When? Timeline & Frequency	How? Evaluation Method	What? Data to collect
To identify industry needs, expectations and emerging trends that may impact the Food Science Curriculum	Employers, industry reps	Winter 2012 (tri-annually)	Focus group	Program strengths and weaknesses; emerging trends and industry needs; expectations of graduates; recommended Improvements
To identify where learning outcomes are taught and assessed in the curriculum	Faculty, results to be summarized to Institute of Food Technology	Every 5 years	Curriculum mapping	For each course: methods of instruction & assessment used; learning outcomes developed; level of complexity/depth is expected for each learning outcomes; how each learning outcomes is taught and assessed
To identify graduating students input and perspectives related to the curriculum	Graduating students	Annually	Exit focus groups and interviews	Key program learning outcomes; most enjoyable & important learning experiences; recommended program changes

## Assess

Learning outcomes provide an opportunity for programs to effectively review and enhance the alignment between the planned, delivered and experienced curriculum (Bath et al., 2004). A comprehensive approach to learning outcomes assessment ensures that decisions related to change are informed by data collected from multiple sources. Recommended methods include multi-stakeholder questionnaires, focus groups and Strength, Weaknesses, Opportunities and Threats (SWOT) analysis, curriculum mapping, curriculum embedded assessment, and reviews of both scholarly literature and of analogous programs.

## Improve and Align

Data collected through learning outcomes assessment can be used not only to account for student learning, but also ought to be used to engage faculty in critical discussions related to curriculum improvement. Data can be used to help ensure that decisions related to the alignment between the intended learning outcomes and the educational experiences embedded within the curriculum are evidenced-based. It is at this stage that instructors and curriculum committees improve, validate and align the curriculum by identifying and leveraging the program strengths, and developing recommendations and strategies to deal with the gaps, redundancies and challenges apparent in the curriculum. Committees may wish to explore specifically:

1. the essential educational experiences that allow students to successfully develop and achieve the intended learning outcomes, including assessment and feedback strategies and signature teaching and learning activities;
2. the progression of student learning throughout the program, including foundational and capstone experiences, and course sequences and scaffolding; and,
3. course weighting and the balance of between core and elective requirements.

## Monitor and Adapt

An outcomes-based approach to curriculum development requires developing a focus on continuous improvement (Wolf, 2007). In order to monitor and advance our academic programs, it is important to assess continually that the intended student learning outcomes are actually being achieved within the curriculum. An ongoing multi-stakeholder curriculum plan provides an opportunity for instructors to collaboratively discuss and propose changes to the curriculum based on data from multiple sources. In

order for this process to succeed, learning outcomes must be part of a living curriculum – that is they must be clearly articulated in a way that is contextualized within the discipline, communicated broadly, continually reviewed and monitored, and effectively integrated into decision-making processes. Learning outcomes provide an opportunity for programs, departments and instructors to create a curriculum that is reviewed and enhanced regularly to support alignment between the planned, enacted and experienced curriculum (Bath et al., 2004).

## Appendix A: University of Guelph Learning Objectives

### Literacy

Literacy is the base on which all else is predicated. The ability to read and write and, in general, to communicate properly is a fundamental intellectual tool. With it, students can learn to think clearly and to some purpose. Without it, they cannot analyze properly nor develop an independence of thought. Literacy affords a means of access to the raw material upon which the critical or creative intelligence is to be exercised. It affords a means of communication, of shaping ideas and concepts, of selecting between different or competing formulations. It is a means of instructing others.

The most basic experience in literacy given to the student should be the writing of a short expository paper, or the oral presentation of an informational report, on a prescribed topic or on a topic chosen from a restricted list.

At the next level, the student should be required to write a paper (or give a seminar), critical and analytical in its intent, on a topic of the student's devising. The ability to devise a topic, to frame its bounds, is at the same time an aspect of understanding of first order importance.

At the highest level, there should be produced a paper, in an appropriate style, that analyzes, synthesizes or argues from a hypothesis and itself generates hypotheses; that produces knowledge, insight, or understanding in the reader and manifests it on the part of the writer; that shows a breadth of understanding in drawing out implications and making connections between remote features of the domain; that, in short, demonstrates a love of learning and an intelligent creativity. This requirement may readily be met in existing senior honours paper courses and the like.

Over the course of an undergraduate education, the level of difficulty of the material which the student can read,



comprehend, and utilize should increase. One way of securing this might be to encourage, in each discipline program where they do not now exist, reading courses requiring independent work at the 4000 level.

In general, the ability to read and comprehend materials of the highest difficulty is enhanced in semester-long research paper courses and in reading courses. Such courses contribute also to independence of thought and to depth and breadth of understanding.

In its broadest sense, the objective of literacy implies that it is desirable that the student have skill in another language, so as to be able to comprehend material of the appropriate level of sophistication in that language.

## Numeracy

For the purposes of this discussion, numeracy may be defined as the ability to use mathematics at a level and in a manner appropriate to good citizenship and to vocational fitness. Mathematics deals with quantity and form, with measurement, structures, and relations, and encompasses a richer intellectual domain than just the utilitarian skills of numerical computation. It is as a mode of thinking, no less than as a collection of useful techniques, that it justifies its place in any well-rounded curriculum.

Numeracy, in the sense adopted here, is an essential attribute of the informed and responsible citizen. A correct understanding of the proper use of numbers is necessary in a culture in which information routinely comes in numeric form and significant decisions of social policy often have quantification at their base. Without the ability to comprehend the use of quantitative data, and to detect instances of misuse, we may have to forego opportunities for independent judgment.

Numeracy, more generally, enforces an accuracy and precision of procedure and thought that is valuable to all educated persons. As a mode of conceptualization of thought, it should be part of the mental apparatus of all graduating students. While a grasp of the nature and principles of mathematical forms of inquiry is essential to an understanding of scientific thought, it can be of benefit in other areas of intellectual activity. Opportunities for fostering numeracy exist in more disciplines than those traditionally requiring a substantial knowledge of mathematics. A recognition that numeracy, in association with literacy, forms the foundation of most if not all of the other learning objectives, should result in greater exploitation of those opportunities than in their avoidance.

## Sense of Historical Development

All disciplines have a history, an understanding of which contributes to an understanding of the place each has in contemporary society. No discipline is self-sufficient, and no discipline is autonomous. "Historical development" should not be narrowly construed to mean only the history of the discipline within its own limits, but efforts should be made to connect developments in the discipline to wider coeval social conditions. Students may thereby be endowed with a sense of the fundamental relativity of knowledge and understanding at any given time.

This objective comports also a sense of the continuity of change (and, indeed, of discontinuities), over time.

This objective may facilitate the acceptance, on the part of students, of intellectual ambiguity or uncertainty; such acceptance is a mark of depth of understanding.

## Global Understanding

Global understanding may be associated with "Sense of Historical Development". It can be described as comprehension of the variety of political, religious, cultural, geographical, biological, environmental, and historical forces in the shaping of nature and the human condition. It conveys to the student an understanding of the ways in which specific cultural or geographical or other circumstances condition the differences between nations or peoples, and an understanding of the place of his or her discipline in the international setting. Global understanding may be enhanced by a sense of historical perspective, by breadth of understanding, and by independence of thought. In its turn it may itself contribute to these.

## Moral Maturity

Moral maturity is marked by depth and consistency of moral judgment; by recognition that any moral judgment may be fallible; that moral judgment is complex, in that moral principles, if they are to be applied to a specific case, may need to be interpreted. Moral maturity is a requirement in the person who is to apply a body of knowledge or a skill to the solution of a problem, or to the understanding of a situation, if the knowledge is not to remain abstract and the skill potential unrealized.

Attainment of this objective is probably best realized by appropriate consideration of moral issues in context, as they arise in the course of study. In this way, a moral perspective may be shown to be inherently important to study of a body of material, and not merely something

supplementary to it (guidelines for conducting ethical discussion in the classroom have been written by the Ethics Research Group in the Department of Philosophy).

Scope for demonstration of moral maturity can be provided in seminars and other assignments, if problems in the moral issues associated with a subject are set for consideration alongside problems in content and process.

## Aesthetic Maturity

Aesthetic maturity may be described as a quality of the critical response to some object, natural or artificial, external to the self. Or it may be a process of creation and development of the self. In the former case, aesthetic maturity may be attained by a sufficient exposure, not necessarily in courses alone, to works of art (inclusive of music, literature, and drama) and to the critical traditions concerning them. Such maturity may also be directed at aesthetic valuing of features of the natural environment.

In the latter case, attainment of the quality will require an active involvement in the work of creation itself. A different order of aesthetic maturity may be attained by practice of that form of manipulation and recreation of the original object known as criticism (as distinct from appreciation).

Viewed this way, aesthetic maturity has a certain resemblance to both independence of thought and depth of understanding, in requiring an active creativity.

Aesthetic maturity need not be divorced from the specific character of individual disciplines. By possession and exercise of aesthetic maturity, students may be brought to appreciate the order, elegance, and harmony not only of the subject matter, but also of the procedures, of the discipline.

## Understanding of Forms of Inquiry

Inquiry, the search for truth, information, knowledge and understanding, follows a methodology based upon systematic study, reflection, intuition and innate creativity. Inquiry involves resolving an identified problem, collecting relevant information, evaluating the information and observing relationships in order to reach a conclusion. The student is the active inquirer and must be able to undertake the process independently. Scientific method represents a form of inquiry concerned with hypotheses development, data collection, analyses and interpretation. Just as an understanding of scientific inquiry is necessary for the educated citizen functioning in the midst of the technologies of the contemporary world, so too an appreciation of other modes of inquiry is an essential characteristic of an

educated citizen. Graduates should be familiar with the modes of inquiry utilized, for example, by historians, by philosophers and by scholars concerned with the various fields of creative expression.

As outcomes of this objective, students will understand the strengths and limitations of the various forms of inquiry, and the cultural, intellectual and historic impact of these forms. The student will be able to describe similarities and differences between the inquiry methods of the physical scientist, the biological scientist, the social scientist and the scholar of the humanities.

## Depth and Breadth of Understanding

Breadth of understanding is an expression of the ability to operate across disciplinary boundaries in a coherent and productive way, with principles drawn from different disciplines. Depth of understanding depends upon mastery of a body of knowledge, but it is not to be confused with knowledge, and is not necessarily commensurate with the number of courses taken in a subject.

Depth and breadth of understanding depend upon, and themselves contribute to, independence of thought; they contribute also to a love of learning. Possession of a historical perspective may be essential to a broad and deep understanding of a subject.

At the lowest level of experience, in courses introductory to a subject, students might be shown how sets of facts may be related to others both laterally and vertically (or hierarchically). The outcome of this might be simply consciousness, on the part of the student, of the possibilities of understanding, as distinct from simply knowing.

The next higher level moves from demonstration to the student of interrelationships to the development of the student's own ability to create interrelations. The experience provided will develop a creative imaginativeness skillfully exercised on a body of material mastered in some detail. But the experience, like that provided for independence of thought, goes beyond display of erudition, and requires alert curiosity and a refusal to be content with mere assemblage of data. At this level, the student should be expected to integrate knowledge and modes of interpretation and comprehension from different disciplines so as to generate a new understanding. The highest level takes the student to the ability to deal in abstractions, to generate abstractions.

In general, depth and breadth of understanding are characterized by the ability to recognize the implications of the information at hand and to put it into a broader context;

and by the ability to draw upon different disciplines to provide a clearer and deeper understanding of the discipline with which the student is immediately concerned.

These outcomes might be assessed in a piece of written work such as an independent research paper, in the design of an experiment, in the identification and solution of a problem, or in a work of aesthetic creation.

## Independence of Thought

At the lowest level, students are shown the possibilities of independent thinking, by an instructor who, in the classroom and elsewhere, challenges orthodoxies and criticizes received opinions. The experience provided is that of imitation or emulation of a role model. At this level, the outcome might be no more than a receptivity, on the part of the student, to critical thinking and an openness to reasoned skepticism about the authority of the expert.

At a higher level, students become actively engaged in learning and thinking. At this level, they should be given the opportunity, in seminars, tutorials, or structured small group discussions, to offer their own challenges. The bases for such challenges may be unformed, and so the challenges themselves will be open to challenge. As students become more independent in thought, they are better able to combine ideas and to generate new ideas.

At the highest level, independence of thought is a manifestation of love of learning, and it may contribute to a sense of self worth and of well-being. At this level, opportunities are provided for self-directed learning. One accomplishment may be the ability to ask the right kinds of questions, rather than the ability always to have answers.

## Love of Learning

Love of learning is perhaps the quality that activates all other qualities that are the focus of learning objectives. Its expression is not easily separable from demonstration of other virtues. Thus, the true lover of learning will demonstrate both independence of thought and depth of understanding. As a consequence, setting an objective for love of learning comports also setting an objective for other qualities as well. But love of learning is not exhausted by, for example, independence of thought.

Love of learning may be reflected in, or expressed in terms of, intellectual curiosity; the ability (as in independence of thought) to ask useful kinds of questions (rather than the ability always to have answers); the ability to see far reaching implications; the ability to make connections between disparate topics; energy and passion in the pursuit of

knowledge and understanding; dissatisfaction with simply accumulating facts or data; and critical ability.

Testing and instruction must minimize rote learning, and, so far as possible, give scope for the exercise of individual patterns of learning and individual interests.

Love of learning may be impeded by the demands of frequent evaluation of students' performance. The time frames imposed at an institutional level, to provide an organizational framework for the university experience, may also impair love of learning.

Love of learning may best be enhanced by the provision of opportunities for the student's personal involvement in learning. Such opportunities are perhaps best furnished in independent research projects initiated by the student. In such autonomous, but supervised, study the student can not only engage with the conflicting views of published authorities but also see in action, close at hand, the supervisor's own love of learning.

In courses of formal instruction, the use of team teaching might help to encourage a student's own love of learning, especially if members of the teaching team take an appropriate role as "students", and if true dialogue is developed between the teachers.

## Appendix B: University Undergraduate and Graduate Degree Level Expectations

Undergraduate Degree Level Expectations:	Baccalaureate/bachelor's degree	Baccalaureate/bachelor's degree (honours)
Depth and breadth of knowledge	<p>This degree is awarded to students who have demonstrated the following:</p> <ul style="list-style-type: none"> <li>a) General knowledge and understanding of many key concepts, methodologies, theoretical approaches and assumptions in a discipline</li> <li>b) Broad understanding of some of the major fields in a discipline, from an interdisciplinary perspective, and how the fields may intersect with fields in related disciplines</li> <li>c) Ability to gather, review, evaluate and interpret information relevant to one or more of the major fields in a discipline</li> <li>d) Some detailed knowledge in an area of the discipline</li> <li>e) Critical thinking and analytical skills inside and outside the discipline</li> <li>f) Ability to apply learning from one or more areas outside the discipline</li> </ul>	<p>This degree is awarded to students who have demonstrated the following:</p> <ul style="list-style-type: none"> <li>a) Developed knowledge and critical understanding of the key concepts, methodologies, current advances, theoretical approaches and assumptions in a discipline overall, as well as in a specialized area of a discipline</li> <li>b) Developed understanding of many of the major fields in a discipline, including, where appropriate, from an interdisciplinary perspective, and how the fields may intersect with fields in related disciplines</li> <li>c) Developed ability to: gather, review, evaluate and interpret information; and compare the merits of alternate hypotheses or creative options relevant to one or more of the major fields in a discipline</li> <li>d) Developed, detailed knowledge of and experience in research in an area of the discipline</li> <li>e) Developed critical thinking and analytical skills inside and outside the discipline</li> <li>f) Ability to apply from one or more areas outside the discipline</li> </ul>
Knowledge of methodologies	<p>An understanding of methods of enquiry or creative activity, or both, in their primary area of study that enables the student to: a) evaluate the appropriateness of different approaches to solving problems using well established ideas and techniques; and b) devise and sustain arguments or solve problems using these methods.</p>	<p>An understanding of methods of enquiry or creative activity, or both, in their primary area of study that enables the student to:</p> <ul style="list-style-type: none"> <li>a) evaluate the appropriateness of different approaches to solving problems using well established ideas and techniques;</li> <li>b) devise and sustain arguments or solve problems using these methods; and</li> <li>c) describe and comment upon particular aspects of current research or equivalent advanced scholarship.</li> </ul>
Application of knowledge	<p>The ability to review, present, and interpret quantitative and qualitative information to:</p> <ul style="list-style-type: none"> <li>a) develop lines of argument;</li> <li>b) make sound judgments in accordance with the major theories, concepts and methods of the subject(s) of study; and</li> </ul> <p>The ability to use a basic range of established techniques to:</p> <ul style="list-style-type: none"> <li>a) analyze information;</li> <li>b) evaluate the appropriateness of different approaches to solving problems related to their area(s) of study;</li> <li>c) propose solutions; and</li> <li>d) make use of scholarly reviews and primary sources.</li> </ul>	<p>The ability to review, present and critically evaluate qualitative and quantitative information to:</p> <ul style="list-style-type: none"> <li>a) develop lines of argument;</li> <li>b) make sound judgments in accordance with the major theories, concepts and methods of the subject(s) of study;</li> <li>c) apply underlying concepts, principles, and techniques of analysis, both within and outside the discipline;</li> <li>d) where appropriate use this knowledge in the creative process; and</li> </ul> <p>The ability to use a range of established techniques to:</p> <ul style="list-style-type: none"> <li>a) initiate and undertake critical evaluation of arguments, assumptions, abstract concepts and information;</li> <li>b) propose solutions;</li> <li>c) frame appropriate questions for the purpose of solving a problem;</li> <li>d) solve a problem or create a new work; and</li> <li>e) to make critical use of scholarly reviews and primary sources.</li> </ul>
4. Communication skills	<p>The ability to communicate accurately and reliably, orally and in writing to a range of audiences.</p>	<p>The ability to communicate information, arguments, and analyses accurately and reliably, orally and in writing to a range of audiences.</p>

5. Awareness of limits of knowledge	An understanding of the limits to their own knowledge and how this might influence their analyses and interpretations.	An understanding of the limits to their own knowledge and ability, and an appreciation of the uncertainty, ambiguity and limits to knowledge and how this might influence analyses and interpretations.
6. Autonomy and professional capacity	Qualities and transferable skills necessary for further study, employment, community involvement and other activities requiring: a) the exercise of personal responsibility and decision-making; b) working effectively with others; c) the ability to identify and address their own learning needs in changing circumstances and to select an appropriate program of further study; and d) behaviour consistent with academic integrity and social responsibility.	Qualities and transferable skills necessary for further study, employment, community involvement and other activities requiring: a) the exercise of initiative, personal responsibility and accountability in both personal and group contexts; b) working effectively with others; c) decision-making in complex contexts; d) the ability to manage their own learning in changing circumstances, both within and outside the discipline and to select an appropriate program of further study; e) and behaviour consistent with academic integrity and social responsibility.

Source: Council of Ontario Universities, Quality Assurance Framework (2010)

Graduate Degree Level Expectations	Master's degree	Doctoral degree
	This degree is awarded to students who have demonstrated the following:	This degree extends the skills associated with the Master's degree and is awarded to students who have demonstrated the following:
Depth and breadth of knowledge	A systematic understanding of knowledge, including, where appropriate, relevant knowledge outside the field and/or discipline, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study, or area of professional practice.	A thorough understanding of a substantial body of knowledge that is at the forefront of their academic discipline or area of professional practice including, where appropriate, relevant knowledge outside the field and/or discipline.
Research and scholarship	A conceptual understanding and methodological competence that: a) Enables a working comprehension of how established techniques of research and inquiry are used to create and interpret knowledge in the discipline; b) Enables a critical evaluation of current research and advanced research and scholarship in the discipline or area of professional competence; and c) Enables a treatment of complex issues and judgments based on established principles and techniques; and On the basis of that competence, has shown at least one of the following: a) The development and support of a sustained argument in written form; or b) Originality in the application of knowledge.	a) The ability to conceptualize, design, and implement research for the generation of new knowledge, applications, or understanding at the forefront of the discipline, and to adjust the research design or methodology in the light of unforeseen problems; b) The ability to make informed judgments on complex issues in specialist fields, sometimes requiring new methods; and c) The ability to produce original research, or other advanced scholarship, of a quality to satisfy peer review, and to merit publication.
Level of application of knowledge	Competence in the research process by applying an existing body of knowledge in the critical analysis of a new question or of a specific problem or issue in a new setting.	The capacity to: a) Undertake pure and/or applied research at an advanced level; and b) Contribute to the development of academic or professional skills, techniques, tools, practices, ideas, theories, approaches, and/or materials.



4. Professional capacity/autonomy	<p>a) The qualities and transferable skills necessary for employment requiring:</p> <p>i) The exercise of initiative and of personal responsibility and accountability; and</p> <p>ii) Decision-making in complex situations;</p> <p>b) The intellectual independence required for continuing professional development;</p> <p>c) The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and</p> <p>d) The ability to appreciate the broader implications of applying knowledge to particular contexts.</p>	<p>a) The qualities and transferable skills necessary for employment requiring the exercise of personal responsibility and largely autonomous initiative in complex situations;</p> <p>b) The intellectual independence to be academically and professionally engaged and current;</p> <p>c) The ethical behavior consistent with academic integrity and the use of appropriate guidelines and procedures for responsible conduct of research; and</p> <p>d) The ability to evaluate the broader implications of applying knowledge to particular contexts.</p>
Level of communications skills	The ability to communicate ideas, issues and conclusions clearly.	The ability to communicate complex and/or ambiguous ideas, issues and conclusions clearly and effectively.
Awareness of limits of knowledge	Cognizance of the complexity of knowledge and of the potential contributions of other interpretations, methods, and disciplines.	An appreciation of the limitations of one's own work and discipline, of the complexity of knowledge, and of the potential contributions of other interpretations, methods, and disciplines.

Source: Council of Ontario Universities, Quality Assurance Framework (2010)

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