Matching Assessments to Learning Outcomes

This handout has been developed for use with the following LTO documents:
- *Creating Effective Assessments*
  (*http://ryerson.ca/content/dam/lt/resources/handouts/NFOeffectiveassessments.pdf*)
- *Designing Multiple Choice Questions*
  (http://ryerson.ca/content/dam/lt/resources/handouts/MCQs.pdf)

When designing assessments, it is important to make sure that any exams or assignments match the learning outcomes of the course. Assessments should be based on material you've covered in the course, and students should perceive the material as relevant and fair. As summarized in the *Stanford Testing Handbook*:

> Testing not only lets you and your students know how much they have learned, it also provides a chance for more learning to take place, by reinforcing course material or by requiring students to use or think about what they have learned in a new way. Tests should be designed with primary course objectives in mind and should cover material from all components of a course (sections, lectures, textbooks, etc.)… The nature of the exam will directly influence how students prepare, study and learn. For this reason, the format and frequency of your testing will directly influence what and how much students learn. If students have reason to believe that you will mainly stress recall of information, for example, then they are much less likely to devote time to the mastery of concepts and the synthesis of material. On the other hand, if your tests will demand a deep knowledge of the ideas discussed, students are likely to respond accordingly.

Designing an Assessment

When designing a new assessment or revising an old one, "the most important component is to be sure there is a match between the objectives of the unit/course/lesson being assessed, the teaching/learning activities used, and the assessment tool." Indiana University suggests asking the following questions:

- What are the objectives of the course/unit/lesson that are being assessed?
- What level from Bloom's taxonomy is being assessed: knowledge, comprehension, application, analysis, synthesis and/or evaluation. Is the level appropriate given the objectives for the course/unit/lesson?
- Is the assessment at a level appropriate to the level of the course (first year, graduate etc.)?
- How well does the content of the assessment match the objectives being assessed?
- How well does the content of the assessment match the learning opportunities presented in the unit/lesson/course (i.e., does the assessment assess what was taught)?
- Is the assessment organized in such a way as to aid clarity and understanding of its requirements?

(excerpted from *Evaluating Your Assessment Instruments*,
http://www.ipfw.edu/celt/insite/teaching_assessment.shtml)

Matching Assessments to Learning Outcomes

"Learning outcomes are statements that predict what learners will gain as a result of learning…
A carefully thought-out learning outcome will give a solid indication of what kinds of assessment
are appropriate, and of the skills and knowledge the learner will have to demonstrate to pass.
Finally, the clearer the learning outcome, the easier it will be to devise an appropriate
assessment"

(*Enhancing Student Learning through Assessment*, http://www.tcd.ie/vpcao/academic-development/assets/pdf/250309_assessment_toolkit.pdf)

As summarized by Deakin University, "each intended learning outcome should describe the
observable knowledge or skills that you expect students to be able to **demonstrate** as a
result of their work in the unit. It should contain:
- A **verb** that is appropriate to the type of knowledge or skill required
- A **noun** that describes the content that the verb is meant to address."

(excerpted from *Writing Intended Learning Outcomes*,
http://www.deakin.edu.au/itl/dso/strategies-teaching/tips/d2l-writing-ilo.php)

When designing assessments to match learning outcomes, remember:

- "The assessment should align firstly with the overall desired learning outcomes and
  secondly with the more detailed content of the course.
- Be clear about what you are trying to assess. This will make writing assessment tasks or
  questions much easier. Most courses will need a range of assessment methods to
  adequately assess the content and desired learning outcomes.
- Pay attention to the cognitive level of the assessment task or question… Some tasks operate
  at a low level of factual recall, while others asks students to analyze, synthesize, or evaluate
  information. The cognitive level of the task or question should match your goals in the
  desired learning outcomes or curriculum plan."

(excerpted from *Developing Effective Assessments*,
http://www.griffith.edu.au/__data/assets/pdf_file/0005/52862/gihe_tipsheet_web_dea.pdf)

Several examples of learning outcomes matched to appropriate assessments can be found on
the LTO website. The following are samples of outcomes and assessments for an
undergraduate English course:

1. **Outcome:** Describe and discuss an overview of various authors, major movements, and
   periods in western literature
   Assessment: Essay
2. **Outcome:** Demonstrate appropriate use of literary terminology
   Assessment: Written test or exam

Structuring Assessments with Learning Frameworks

Learning frameworks organize the many potential forms of learning into a concise structure detailing what is to be learned and at what level. One type of learning framework is Bloom's Taxonomy. Matching assessments to Bloom's Taxonomy is also discussed in the "Creating Effective Assessments" handout. It may also be helpful to review the Degree Level Expectations, which are set out by the Ontario Universities Council on Quality Assurance

The full set of undergraduate and graduate DLEs are available on the LTO website:
http://www.ryerson.ca/lt/programs/curriculum/degreelevelexpectations/

Learning Frameworks: Bloom's Taxonomy

As explained by the University of Central Florida, the goal using Bloom's Taxonomy is "to encourage higher-order thought in students by building up from lower-level cognitive skills."

The levels of Bloom's Taxonomy, starting with the lowest and moving up to the highest order skills, are: knowledge, comprehension, application, analysis, synthesis, and evaluation.

When structuring summative assessments, there are certain formats that are more appropriate for assessing specific levels of Bloom's Taxonomy than others. The University of Central Florida has broken it down in the following way:

Knowledge
Rote factual knowledge. Assessed by the ability to recall appropriate information on command.
- **Assessment Method**
    - Exam items of the form: define, label, list, reproduce
- **Example**
    - Label the parts of the human eye

Comprehension
Understanding the meaning of information. Assessed by the ability to translate information from one form to another through explanation, summarization, or prediction.
- **Assessment Method**
    - Exam items of the form: describe, explain, summarize, identify, or select
    - Student presentations
- **Example**
    - Trace the path the stimulus takes from the time light enters the eye to processing in the visual cortex

Application

Using information to solve new problems or respond to concrete situations that have a single or best answer. Assessed by the application of learned material such as rules, methods, concepts, principles, laws, and theories.

- **Assessment Method**
    - Exam items of the form: apply, use, solve, demonstrate, employ
    - Problem set
    - Student presentations
- **Example**
    - Apply the Opponent Processes color theory to predict how the world appears to the major varieties of color blindness and vision anomaly

Analysis

Breaking materials down into their component parts so they can be examined and understood. Assessed through the ability to develop multiple conclusions concerning the motives, causes, inferences, and generalizations that can be derived from the material's component parts and organization.

- **Assessment Method**
    - Exam items of the form: analyze, compare, distinguish, examine, test
    - Portfolio entries focused on analyzing case studies or clinical experiences
    - Essays
    - Student presentations
- **Example**
    - Compare and contrast Hemholtz's (1865) "Place Theory" to Rutherford's (1886) "Frequency Theory."

Synthesis

Using new and creative applications of prior knowledge or skills. Assessed through the ability to produce a new or original end product.

- **Assessment Method**
    - Exam items of the form: develop, plan, prepare, propose, construct, design, formulate, create, assemble
    - Student presentations
    - Portfolio
    - Design or build a model
    - Create a work of art
    - Develop a unique plan to serve some purpose
- **Example**
    - Choose a perceptual disorder and create a device that would mitigate its effects

Evaluation

Judging the value of materials based on personal values/opinions or definite criteria (either external or internal), evaluating material to determine if it fulfills a given purpose. Assessed through the production of an end product that fulfills a given purpose rather than being right/wrong.

- **Assessments**
    - Exam items of the form: evaluate, argue, assess, defend, judge, predict, rate, support
    - Student presentations
- **Example**
    - Evaluate the ADA guidelines in light of what you have learned about blindness and critique its strengths and weaknesses. Do you believe the guidelines are effective? Why or why not?

(Adapted from *Bloom's Taxonomy*, Karen L. Smith Faculty Center for Teaching and Learning, University of Central Florida, Orlando, http://www.fctl.ucf.edu/teachingandlearningresources/coursedesign/bloomstaxonomy/)

Learning Frameworks: ICE

Another learning framework is the **ICE Model**, which is "based on a natural learning progression where student understanding deepens gradually." ICE stands for Ideas, Connections, and Extensions.

Ideas "represent the building blocks of learning. They can be discrete 'chunks' of information; facts, definitions, vocabulary, steps in a process; or discrete skills." They are "assessed by tasks requiring (or allowing) recall and repetition of information from books or from lectures."

Connections are made at the subject or topic level "by making appropriate links between ideas (or chunks of information). At the personal or broader level, connections are made by relating new knowledge to what is already known, in a course, in other courses, or in a student's personal or professional experience."

Extensions "involve re-working students' knowledge and understanding by extrapolating, predicting outcomes or working out implications."

(adapted from *What is Assessment?,* Queens University, http://www.queensu.ca/ctl/resources/topicspecific/assessment.html)

Strategies for Developing Assessments

Creating effective assessments can be accomplished through the use of "blueprinting"—mapping out the assessment tasks and how they align with learning outcomes, or mapping out the content of an exam against course content. Effective assessments must be both valid and

reliable. Validity "refers to what the assessment is actually testing," and reliability to "the consistency of the assessment" (Griffith University). In the words of Roberta Burke, validity is the "true measure of learning," and reliability is the "consistent measure of learning."

Getting Started

- If you are taking over a pre-existing course, review old tests to see what material was covered and how knowledge was assessed.
- Inform students, at the beginning of the course, what kinds of assessments will be used.
- If possible, provide sample copies of at least one previous exam to all students.

(adapted from the *Stanford Testing Handbook*, http://ctl.stanford.edu/handbook/testing.html)

Building Your Assesment

Create a table to help align your assessment with your course outcomes. This table can have a column for each of the following:
- Learning to be measure (course outcomes)
- Weighting (relative importance)
- Level and domain of knowledge (for example, Bloom's Taxonomy)
- Timing/Pacing

(adapted from "Matching Outcomes with Assessments," by Roberta Burke
http://cedp.mohawkcollege.ca/documents/Phase2_2010/Matching_outcomes_with_assessment_2010_burke.pdf)

Reviewing Your Assessment

- Can the assessment be reasonably completed in the time provided?
- Is each section preceded with clear directions and an indication of its point value?
- Does the assessment require any skills, knowledge, or vocabulary that wasn't central to the course content? Are you assessing something you haven't taught?
- Do the problems echo examples or exercises previously used in the course?
- Are the problems of graduated difficulty, going from simplest to most difficult?
- Do the problems create a potentially frustrating situation in which the solution to one problem depends on the successful completion of another?

Review how the assessment will be marked

- Is each question clear and unambiguous?
- Is there only one possible correct answer for each question?
- Have any partially correct answers been identified?
- Does each question test at the desired level of knowledge, skill, or attitude?

(adapted from *Developing Written Tests,* British Columbia Institute of Technology,
http://www.lanecc.edu/fpd/documents/htdeveloptests.pdf)

Choosing the Right Assessment Format

Each assessment format has its own strengths and weaknesses, and is best used to assess different kinds of learning and skills. Assessments can be either subjective or objective

Objective Assessments
Objective assessments require students to choose a response. These assessments include multiple choice, true/false, or matching questions. It can be more time consuming to develop effective objective assessments, however they are easier to score.

Subjective assessments
Subjective assessments require students to construct a response. These types of assessments include essays, short and long answer questions, case studies, projects, or demonstrations. It can be easier to develop a subjective assessment than an objective assessment, however they are harder to score.

Types of Exam Formats

Short Answer
Short answer questions are most effective at checking computational skills or an understanding of the correct sequence for procedures. Their strength lies in their ability to test recall rather than mere recognition of information, and in preventing students from guessing answers, as in multiple choice questions.

Long Answer
Long answer questions are effective at assessing not just recall, but also analysis, evaluation, and the organization and synthesis of ideas.

Multiple Choice Questions
MCQs are effective at measuring multiple learning outcomes in the course of one test, however they cannot test the organization ideas or the application of concepts. They also allow students to recognize rather than recall information. For more on designing effective multiple choice questions, see our handout: http://ryerson.ca/content/dam/lt/resources/handouts/MCQs.pdf

True/False Questions
True/False questions require students to identify relationships, recognized correct statements of fact, or identify attitudes, values, and beliefs. N.B.: Some studies have suggested that T/F questions may be biased against female students (Kelly, 2009).

(adapted from "Matching Outcomes with Assessments, by Roberta Burke http://cedp.mohawkcollege.ca/documents/Phase2_2010/Matching_outcomes_with_assessment_2010_burke.pdf)