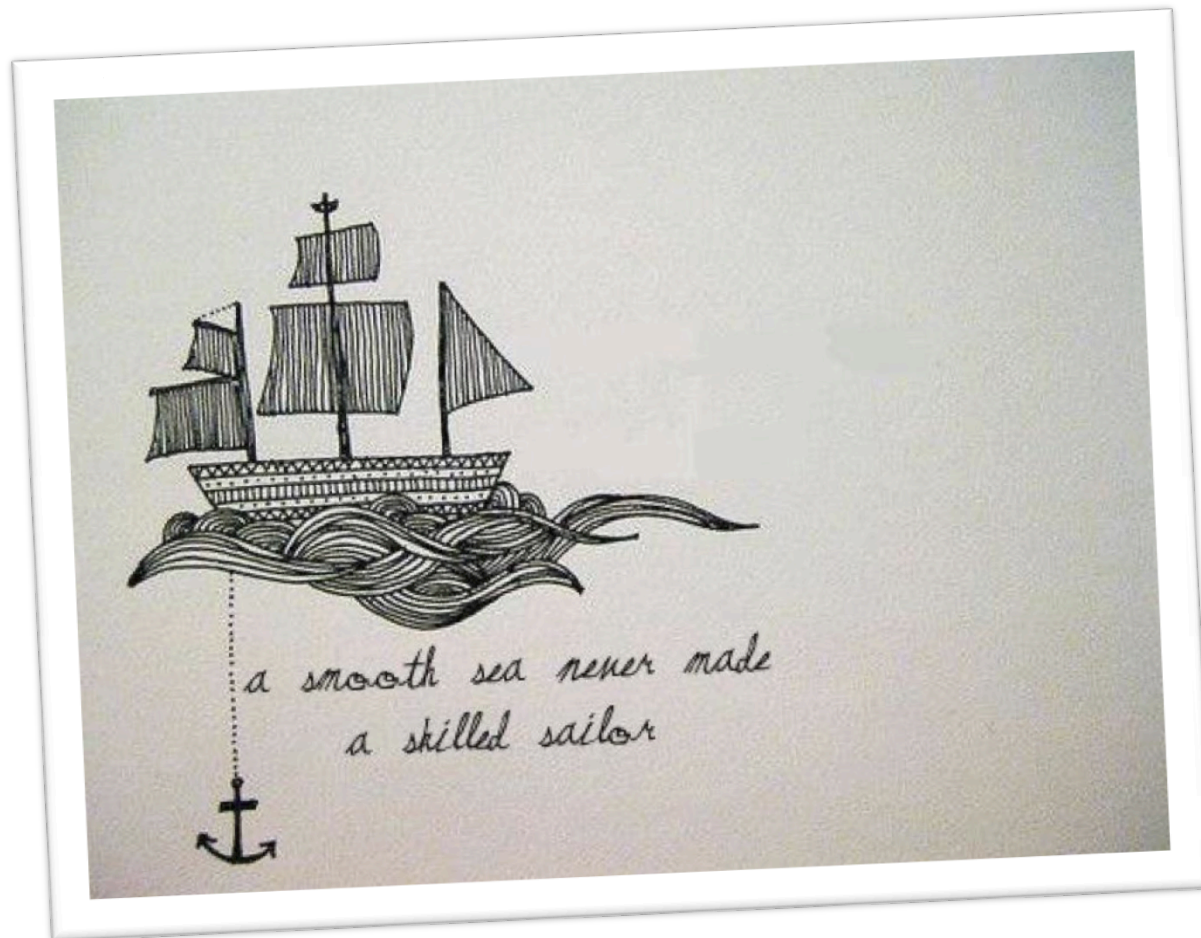


Learning Objectives & Outcomes

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...an easy problem never made a skilled engineer.

Why are you here?

(1st version)

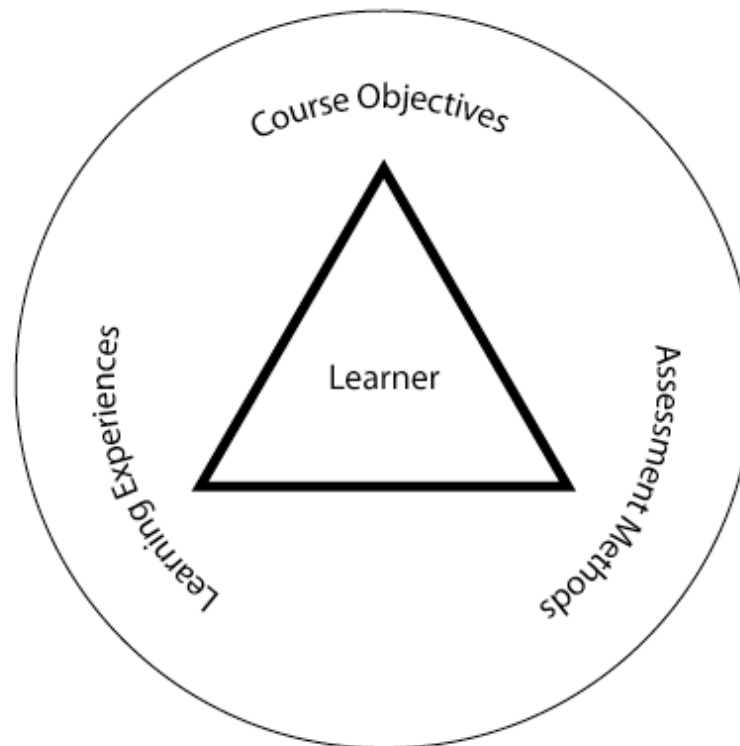
1. To learn about learning objectives and outcomes terminology
2. Every year on your USRI's students say they want more examples...like the ones that will be on the final exam...
3. To learn how to better fill out the teaching portion of the FEC form!?

10,000 Foot View

- Select/set Teaching Goals for a particular course
- Match Bloom's Taxonomy to goals
- Brainstorm on Learner Outcomes that support goals
- Draft 2-3 intended learner outcomes
- Assess outcomes for level of cognition
- Get feedback from peers on intended learner outcomes
- Improve outcomes through revision

Audience Poll...

- What is the difference between Learning Objectives & Learning Outcomes?





Goals

Objectives

Outcomes

Differences...are subtle

Objectives

- focus the overall purpose of the learning experience
- help to determine where the particular learning experience best fits within the larger curriculum
- help to select the appropriate learning experience
- help to select the appropriate method of assessment
- may outline the material the instructor intends to cover or the disciplinary questions the class will address

Outcomes

- focus on what the student should know and realistically be able to do by the end of an assignment, activity, class, or course
- help students self assess their own learning
- a subset of objectives
- focusing on the application and integration of the course content from the perspective of the student, learning outcomes can more explicitly and directly address expectations for student learning.

Examples

Objectives

Instructor Centered Objective	Learner Centered Objective
During this session the instructor will present three skills that relate to the evaluation of new drugs	By the end of this session the student will be able to describe three methods used to evaluate the efficacy of a new drug

❖ Learning objectives should describe the:

A = Audience expected to perform the desired behaviour

B = Behaviour that the learner can now engage in

C = Condition(s) under which the objectives should be attained

D = Degree of competency expected upon completion of the objective

*By the end of this session the **first year medical student** will be able to **describe three methods** used to evaluate the efficacy of any new drug when presented with evidence from the literature.*

A = first year medical student

B = describe three methods

C = when presented with evidence from the literature

D = any new drug

No level of **performance** has been stated – big issue!

Level of performance is often an important distinction of an outcome in comparison to an objective...

A good learner outcome...

- Is a ***learner-centered*** statement that:
 1. Indicates the **level of gain in knowledge, skill, or attitude** the student should be able to exhibit after a prescribed teaching intervention
 2. Identifies **key concept** areas for the student
 3. Is **measurable** (capable of being assessed)
 4. Is written in **robust** language for students to comprehend
 5. Indicates a **level of performance** which the student should achieve
- If achieved will raise the student to the desired cognitive level and transform the learner as a person

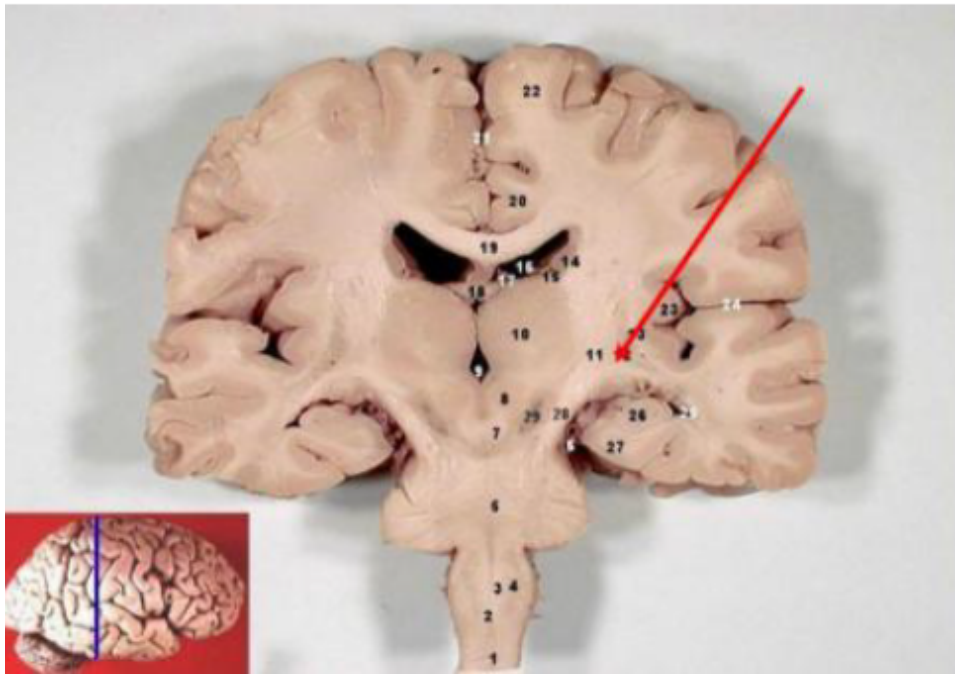
Examples of ? learner outcomes

- (a) You will be able to discuss the political economy of the United States in the 19th century.
- (b) You will be able to show how economic factors were a contributory cause of the Civil War.
- (c) You will have an appreciation for the work of the French post-impressionist painters.
- (d) You will know about the subcortical nuclei of the brain
- (e) You will have an understanding of the role of the basal nuclei in controlling motor function of the body

Example 1:

You will know about the subcortical nuclei of the brain

VS.

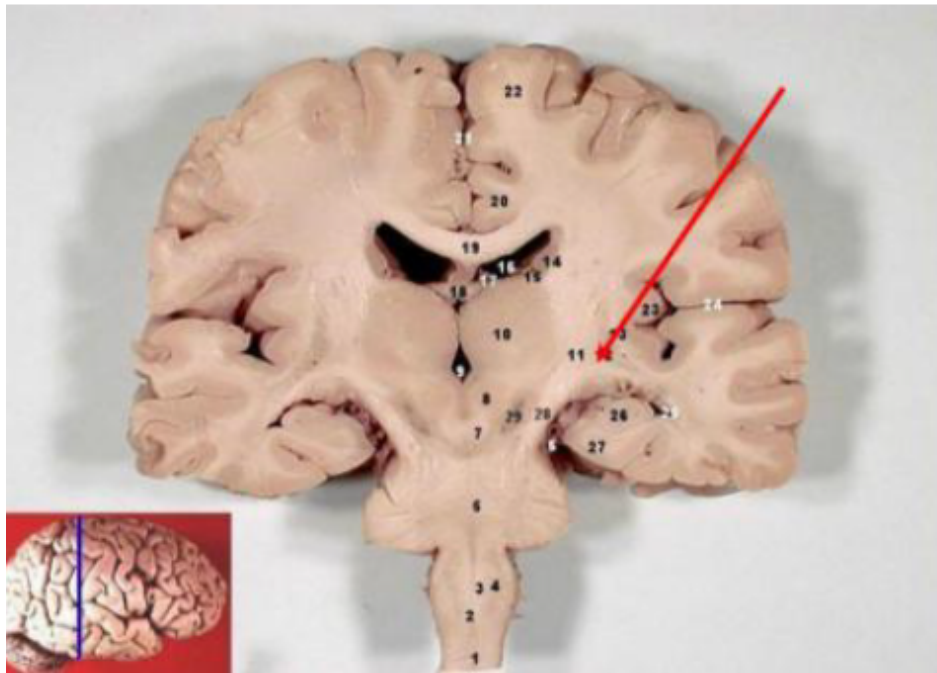


- The student will be able to identify the numbered structures on this coronal section of the brain.

Example 1 revisited:

You will know about the subcortical nuclei of the brain

VS.



- Name the structure numbered '11', near the end of the red arrow, on this coronal section of a human brain.

How do we set outcomes?

- Start with goals first...

Identify your goals

- What are 3-4 important teaching goals you intend to achieve in your course? Write them down!
 - E.g. In this course we will:
 - Develop ability to synthesize and integrate information and ideas (TGI#5)
 - Develop ability to work productively with others (TGI#36)
 - Learn terms and facts of this subject (TGI#18)
 - Learn concepts and theories in this subject (TGI#19)
 - See handout for details on how to take a TGI

Learner Outcomes:

What should the student be able to do?

- Outcomes should be **written** with:
 1. Specific and **common** language
 2. Focused on a **concept**, task, skill, or ability
 3. Best **matched** to a cognitive level
 4. Indication of level of **performance**
 5. A **timeline** (arguments for and against)
- Outcomes are **intended** – who knows what the student will actually learn?

Activity

Intended Learning Outcomes (ILOs)

(Phrenology 101)

Examples to consider, critique, and perhaps improve from *Phrenology 101*

1. On completion of this module, you should be able to:

- A. Demonstrate enhanced knowledge of the basic tenets of phrenology and its history
- B. Demonstrate understanding of what was current best practice of phrenology in England of the 1840s

2. When you have completed this module, you should be able to:

- A. List the six basic tenets of Gall's phrenological system
- B. Identify, locate, and explain the functions of at least 30 of the "organs" of the brain
- C. Explain the significance of organ size and shape
- D. Identify and summarise the key contributions of at least six major figures in the history of phrenology

3. In order to successfully complete this module, you must demonstrate that you can:

- A. Correctly locate and label all 35 organs on a map of the skull
- B. Phrenologise three subjects in one hour, summarise your analyses of all three in writing in the second hour, and achieve at least 85% agreement with expert analyses
- C. Prepare a character analysis and related career and marriage advice for a fourth subject, achieving at least 85% agreement with the expert responses
- D. Develop a 20-minute talk on your case study (C above), complete with visuals, for presentation at the ESP (Edmonton Society of Phrenologists) and evaluation by the members.
[Presentation quality must be rated "Very Good" or "Excellent" by at least 80% of those in attendance.]

Activity

Intended Learning Outcomes (ILOs) (Phrenology 101)

- Which set of outcomes:
 - Resonates with you?
 - Would an undergraduate student clearly understand what is expected of them?
 - Could a student self-monitor?
 - Would be easiest to assess?
 - Appears to provide the holistic approach that Bloom intended? Why or why not?
 - How would instruction, activities and assessment vary to meet each outcome?

Fill in the blank(s). [20]

A crystalline material contains both _____ and _____ order. [2]

The family of planes which describes the faces of a simple cubic unit cell is _____. [2]

A crystal basis is defined as _____. [2]

Bragg's Law is written as _____. Where n is usually assumed to be equal to _____. [2]

If copper $K\alpha$ radiation (1.54\AA) is used in an X-ray diffraction experiment, then the angle at which diffraction occurs from (111) in silver ($r = 0.144\text{ nm}$) is _____°. [4]

The crystal structure of silver must be _____. (Hint: diffraction occurs in question (e), and silver is ductile). [1]

The planar density on (110) in silver is _____ atoms/ nm^2 . [3]

The theoretical density of silver ($M = 107.87\text{ g/mol}$) is _____ g/cm^3 . [4]

Show your work here:

GOALS? OBJECTIVES? ILOs?

INTENDED LEARNING GOALS FOR THIS ASSIGNMENT

AFTER YOU HAVE COMPLETED THIS ASSIGNMENT YOU SHOULD BE ABLE TO:

Declarative knowledge

Identify the structural differences between amorphous and crystalline solids

Identify different features of the potential energy function

Identify structures of metals (e.g., BCC, FCC)

Describe the meaning of mathematical quantities from bond energy curves

Identify four types of point defects

Procedural knowledge

Determine atomic packing factor, mass density, linear density

Calculate various unit cell characteristics using elemental data (e.g., atomic radius, number of atoms per unit cell)

Convert Miller indices for directions and planes into graphical representations

Draw graphs of force and energy versus distance functions

Convert composition in atomic % to weight % for binary alloys

Use proper units, nomenclature, and vocabulary

Conditional knowledge

Compare materials with different properties and rationalize their differences based on bond energy fundamentals and curves

Reflective knowledge

Explain the relationships between structure and density, elastic modulus, and ductility

Explain the different origins for terms in the bond energy function, and how energies vary over distance

Explain the reason for the presence of thermal vacancies in materials and their effect on properties

Rank and explain the different energies of formation for various point defects

Practice!

(handout)

Draft Learning Outcome: _____
Who? _____
Does What? _____
To/For Whom? _____
By When? _____
Where? _____
How? _____
How well? _____
Why? _____

Adapted from Tom Angelo: <http://wwwctl.ualberta.ca/documents/WorkshopIII.pdf>

Assessment of Outcomes

(Handout)

- Test Blueprint:
 - Matching outcomes with cognitive levels can be checked
 - Outcome-cognition matrix
- Get some feedback from others
 - Colleagues
 - Students
- Reflect and Revise!
- Categorize ILOs

Example: Blueprint

Blueprint of a Test to match outcomes with cognitive level (outcome-cognition matrix)

Goals/Outcomes	Knowledge/Comprehension	Application/Analysis	Evaluating/Creating	Total %
Develop a personal understanding of science, scientific literacy, and a philosophy of effective science teaching and learning.	Describe the history of science education and shifts in thinking about the purpose(s) of science education 10%		State a philosophy of science teaching. 15%	25%
Develop an understanding of the Alberta Program of Studies for Science.	Name and briefly summarize the four foundations 10%			10%
Develop skills in planning and implementing effective science lessons		Analyze components of a sample lesson plan 20%	Critique sample lesson plan Create a lesson plan 30%	50%
Become aware of the literature and research that informs current trends in science education.			Justify strategies used with support from the literature 15%	15%
Total %	20	20	60	100

Adapted from: "Test Blueprint" http://www.ctl.ualberta.ca/Teaching_Services/TES_Docs/TES_Resources.html

Activity

In pairs, share 1 learning outcome, and provide feedback to your partner.

- **Suggested questions to consider:**

- Is the outcome learner-centered?
 - Is the outcome constructively aligned with the intended teaching goals and the concepts?
 - Is a single level of cognition addressed?
 - Can the students identify with the language, and be able to list what is expected of them?
 - Can the outcome be measured? By you? By the students?
 - Will achievement of the outcome result in a gain in knowledge, skill, or attitude?
- **Revise your outcome based on the feedback**

Group work

- Share what you do well (handout)
- Start thinking about mapping ILOs to provide evidence of learning (handout)
- Realize that setting informed ILOs will make you a more **efficient** and **effective** instructor
 - Students are given real opportunity to self-assess

Why are you here?

(Intended Outcomes for NFF Attendees)

Why are you here?

Define learner outcomes by the end of NFF being sure to capture at least 3 of the 5 main qualities as indicated by educational researchers.

Through activities:

By the end of Session 1 you will be able to construct learner outcomes to address previously identified teaching goal. In the creation of your outcomes you will be able to choose appropriate verbs for Bloom's Taxonomy which correspond to the associated cognitive level desired in achieving your goal.

Before Session 1 ends, you will give and receive feedback about one of your new **learner outcomes** with a partner. After receiving the feedback you will evaluate the outcome and revise it for improvement according to the 5 qualities of "good" ILOs.

No shortage on Learning Objectives/ Outcomes!!!

In addition to those in the slides:

<http://www.teaching.utoronto.ca/topics/coursedesign/learning-outcomes/outcomes-objectives.htm>

<http://www.nwlink.com/~donclark/hrd/templates/objectivetool.html>

http://www.entcanada.org/Word_Files/CreatingLearningObjectives.pdf