2016 Learning Outcomes Conference:
Evolution of Assessment

Evaluating and Mapping Course and Major Progressions using a Learning Outcomes Framework

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Monday, October 17
11:15-12:15
San Francisco Room

Presentation HANDOUTS

What is an appropriate relative emphasis on Learning Outcomes?

DISCUSSION INSTRUCTIONS

1. **Form discussion groups**, 4-5 people
    a. Assign a time-keeper – keeps track of time and the group on task
    b. Assign a note-taker – suspends judgement and writes down everything
    c. Assign a liaison – asks clarification questions of facilitator during discussion
    d. Assign a reporter – will report out the group's thoughts
2. Examine the data on the following page (**Figure 1**)
3. **For SEVEN minutes**, discuss these questions:

Questions:
Which MLO has the most connections to CLOs?

MLO5 is often called the Knowledge learning outcome. What's your opinion of the balance between knowledge and skills in the MCB Core courses?

How do you think the following people would feel about the balance of CLO-to-MLO connections among the MCB Core courses?

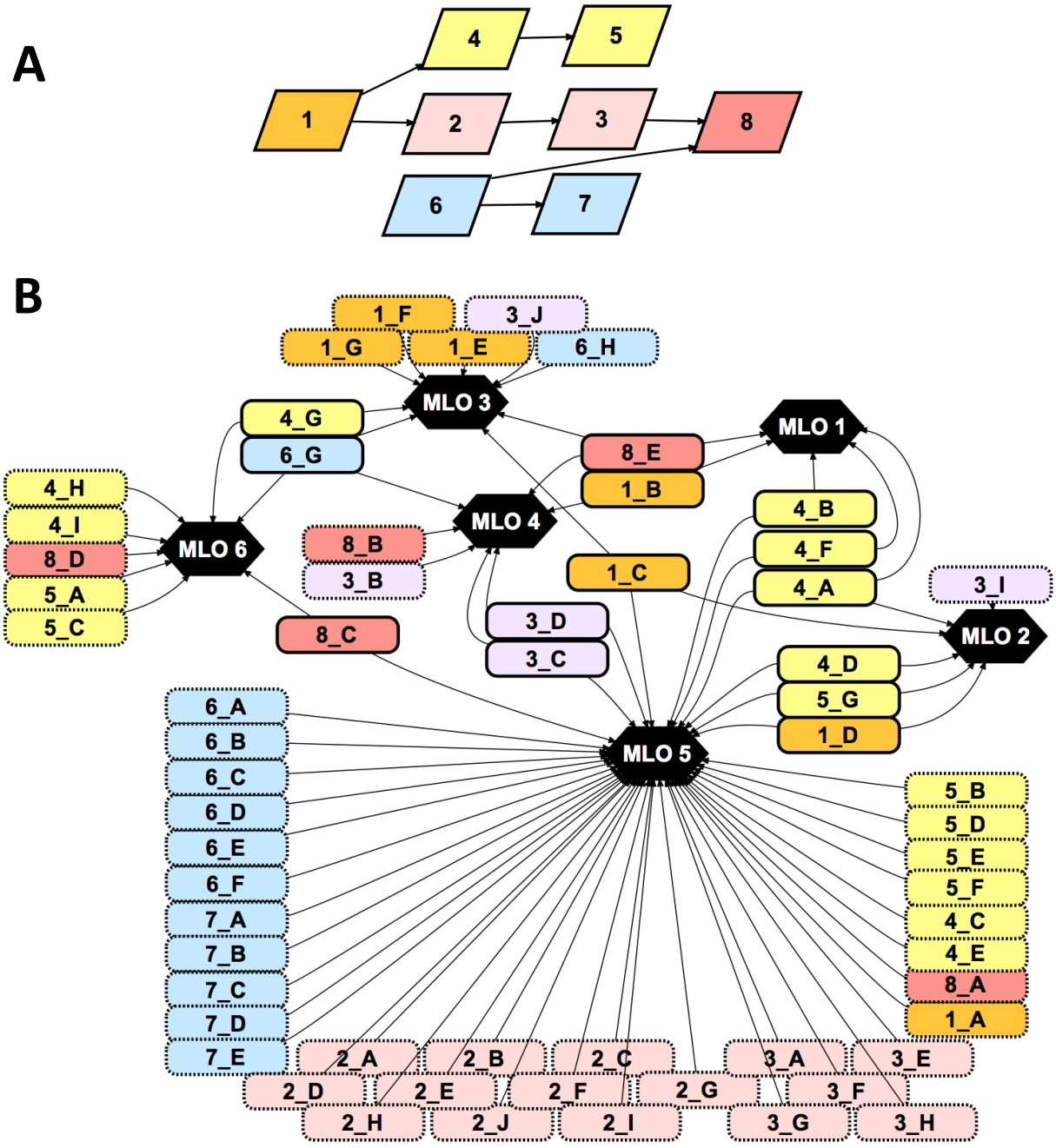
- a professor in the discipline
- a pharmaceutical company aiming to hire an entry-level biochemist and looking at a Guelph grad
- a policy-maker formulating a new funding model for tertiary education based on learning outcome achievement

Which MLO has *no* CLOs connected to it alone? What do you think this observation says about how that MLO is taught and assessed?

Should all learning outcomes at the Major / Program / University level be emphasized equally throughout our curricula?

4. Be prepared to report back your thoughts!

Figure 1: Connections between Course Learning Outcomes (CLOs) and Major Learning Outcomes (MLOs).
A. Progression of 8 courses offered in the Molecular and Cellular Biology department that are required in several majors (MCB Core courses). Arrows indicate prerequisites. Colours indicate discipline emphases: *orange,* broad foundational; *yellow,* Microbiology; *blue*, Biochemistry; *pink*, Molecular Biology and Genetics; *red*, techniques course.
B. Connections between course learning outcomes (CLOs) and major learning outcomes (MLOs; see attached descriptions) assigned by ***undergraduate analysts***. CLOs are coded as X_#, where X is the course (coloured as in A) and # is the specific CLO. Dashed borders indicate CLOs that are connected to one MLO.



Major Learning Outcomes: Molecular and Cellular Biology

MLO #1: Problem Solving & Critical Thinking

- Dissect a problem into its key features by thinking in an integrated manner and examining problems from different perspectives.
- Gather, critically assess, and utilize primary scientific literature to research a topic.

MLO #2: Communication

- Present scientific reports with clear, concise language using oral, written and visual modes to science-literate and general audiences.

MLO #3: Professional and Ethical Behaviour

- Work effectively individually or in a group of disciplinarians or a multi-disciplinary setting.
- Apply the principles of academic integrity and ethics of scientific research.
- Demonstrate a good work ethic by setting goals and meeting deadlines.
- Plan for professional growth and personal development within and beyond the undergraduate program

MLO #4: Scientific Method

- Gather, critically assess, and utilize primary scientific literature to research a topic
- Conduct research with relevant computational and bioinformatics tools.
- Qualitatively and quantitatively analyze and interpret scientific data based on sound scientific principles and reasoning
- Record and analyze the results of experiments
- Evaluate the limitations of and troubleshoot experimental approaches

MLO #5: Breadth & Depth of Understanding in a Particular Scientific Discipline

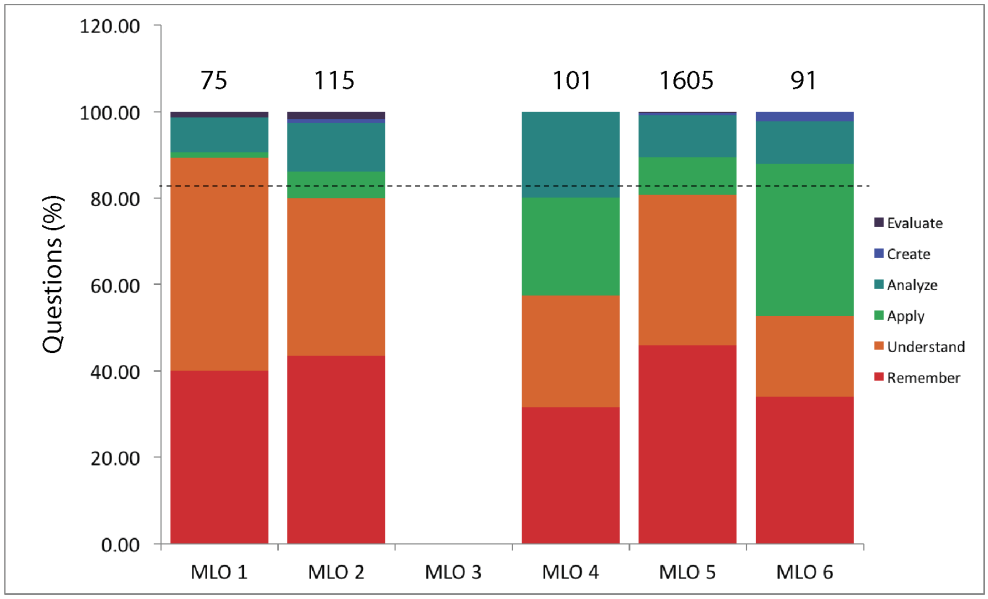
- Describe basic biological concepts and principles and underlying chemical, physical and mathematical foundations.
- Be aware of the environmental, health, economic and ethical implications of scientific discoveries and technical innovations.
- Integrate the different levels of biological organization, from molecules to cells to organisms.
- Demonstrate advanced, contemporary and relevant knowledge in Biochemistry, Microbiology, or Molecular Biology and Genetics.

MLO #6: Scientific Technology & Techniques in a Scientific Discipline

- Design and implement experimental procedures using relevant techniques.
- Work safely and effectively in the laboratory to generate reproducible and reliable results.

Figure 2. Cognitive levels of written assessments in the MCB Core Courses.
Undergraduate analysts assigned Modified Bloom's Taxonomy cognitive levels to the written assessment questions from MCB Core Courses and connected each question with the CLOs and MLOs assessed.
A. Proportion of cognitive levels by **MLO**. The number of questions assessing each MLO is indicated above the bar. *Note:* some questions are connected to more than one MLO and were "double counted." Thus, the total in panel A and B do not match.
B. Proportion of cognitive levels by **aggregate CLOs in courses**. The number of questions assessing CLOs in all the MCB Core courses (All) or each course (numbered as in Figure 1A) is indicated above the bar. The dashed line indicates the proportion at Understand in All courses.

A



B