

# STEM EDX 2020

## Faculty Development Workshop #3: Developing a Plan – Remote Course Learning Design and Assessment

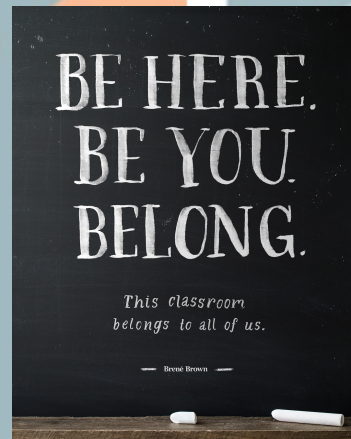


Image credit: Association for the Advancement of Computing in Education

# Introductions

## Workshop Coordinators



**Robin Côté**  
Dean  
College of Science  
and Mathematics  
UMass Boston



**Hannah Sevia**  
Professor  
Chemistry  
UMass Boston

## Workshop Facilitators



**Stacey Brydges**  
Teaching Professor  
Chemistry &  
Biochemistry  
UC San Diego



**Stanley Lo**  
Teaching Professor  
Cell & Developmental  
Biology  
UC San Diego

# Welcome!

## AGENDA

Friday, August 28, 2020

### ZOOM Link:

E-mailed to registrants.

### Pre-Workshop Activity

E-mailed to registrants.

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**Dr. Stacey Brydges** is Teaching Professor of Chemistry and Biochemistry at UC San Diego.

**Dr. Stanley Lo** is Teaching Professor of Cell and Developmental Biology at UC San Diego.

**Dr. Hannah Sevia**n is Professor of Chemistry at University of Massachusetts Boston.

### 1:00 PM Welcome and Re-Introductions

*Hannah Sevia, Stacey Brydges, Stanley Lo  
Participants*

### 1:20 PM Learning Outcomes

*Facilitated by Stacey Brydges*

### 2:00 PM Assessment Design: Big Picture

*Facilitated by Stacey Brydges*

### 2:30 PM BREAK

### 2:40 PM Assessment Design: Your Plans

*Facilitated by Stacey Brydges*

### 3:10 PM Your Course Syllabus: Communicating Expectations and Plans

*Facilitated by Stanley Lo*

### 3:50 PM Wrap-Up – Your Weekly Course Sequence and Summary Reflection

*Facilitated by Stanley Lo*

# Break-Out Room: Icebreaker

## Workshop Participants

### In breakout rooms on your own group Jamboard

1. Everyone introduces themselves with their name and department, as well as one non-work activity that they have been doing in the past week.
2. Pick one of the activities (e.g. watching Netflix, my child has been telling me all about dinosaurs, etc.) and use it as the inspiration for your communal art piece.
3. Sign and title your communal art piece!

“Life”



“The Final Moment”



**You will have 8-10. min.**



## Workshop 2 Recap: How People Learn



## Same and Different

**Cognition**  
Helps students to surface what is important to them. Sharing these anonymously in a poll invites recognizing some of what is important to students in their lives outside the class.



**Identity & Community**  
Creates community by facilitating student-student interactions. Fosters community as individuals share aspects of their identities with each other.

**Power**  
Elevates agency of students in a class by communicating that who they are is important to what goes on in the class.

## Word Cloud

**Cognition**  
Surfaces common ideas present in a class about a topic that is about to be learned. This allows faculty to pay attention to knowledge and beliefs that learners bring to a task.

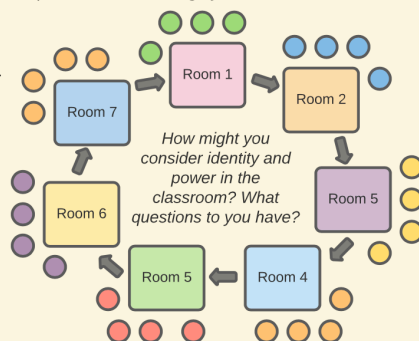
[illegible]

**Power**  
Addresses power dynamics by elevating students' voices in the classroom.

**Identity & Community**  
Gives students a way to see their own ideas valued, and also examine how their ideas connect with (and sometimes differ from) those of others in the class.

## Gallery Walk

**Cognition**  
Gives students ways to monitor their changing conceptions as learning proceeds.



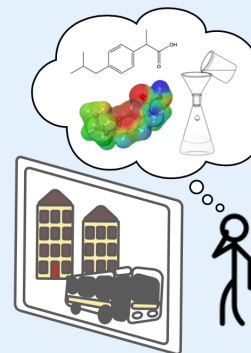
**Power**  
Elevates students to the role of co-teachers of each other.

## Identity & Community

Creates a space where students jointly solve problems that have connections to everyday life, doing so with more knowledgeable others (each other). Provides a mechanism for students to use new tools in increasingly expert ways.

## Utility Value Assignment

**Cognition**  
Creates a mechanism to focus on ways that what students are learning relates to who students are. Primes value for course material before an assessment by reducing stereotype threat and cultural mismatch.



**Identity & Community**  
Gives students ways to honor, use, and adapt cultural practices of their own to make sense of what they are learning.

**Power**  
Communicates a message that how students consider the relevance of what they are learning to their own lives is important in the discipline.

# Outcomes for this Workshop

In this workshop, we will:

1. **Explore** the value of intended learning outcomes and **practice** evaluating the cognitive levels of our assessments;
2. **Consider** the ways in which we can design robust and equitable assessments – formative and summative – for online; and,
3. **Assess** the effectiveness of our syllabi in integrating characteristics of integrity and inclusive course.



# Learning Outcomes

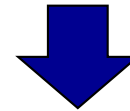
# Backward Design

**GOALS:** Content, Process, Attitudinal

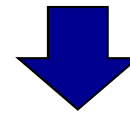
**EVIDENCE/ASSESSMENTS**

**ACTIVITIES**

Identify desired  
**learning outcomes**



Determine  
acceptable  
evidence



Plan learning  
experiences and  
instruction

## Poll: What is the value of learning outcomes?

Do you think students perceive learning goals as being valuable in a course?

- A. Yes
- B. No
- C. I'm not sure

**Please answer the poll in Zoom.**



## Findings from research

### What is the Value of Course-Specific Learning Goals?

**By Beth Simon and Jared Taylor**

*The authors examined student and faculty opinions regarding the use of detailed learning goals in three courses. Students reported the use of learning goals to be very positive, aiding them with studying, in lectures, and in determining the important material to learn. Likewise, faculty indicated that using learning goals was a positive experience, especially for communicating course material to students and other faculty and for creating course assessments.*



## Findings from research

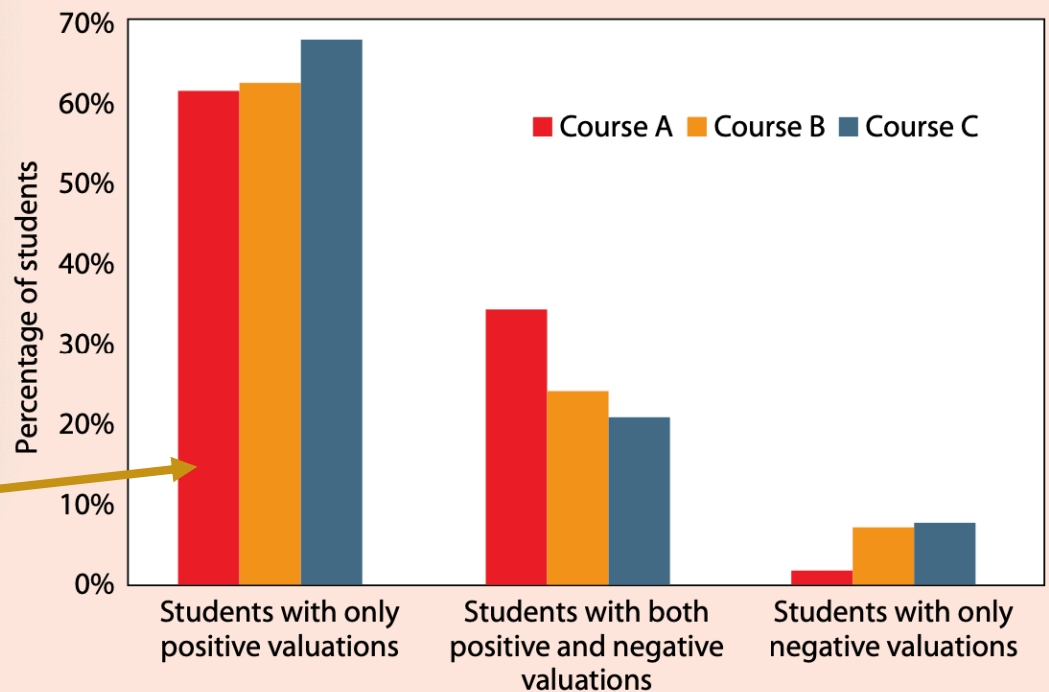
Do you think students perceive learning goals as being valuable in a course?

- A. Yes
- B. No
- C. I'm not sure

597 survey responses from 3 STEM u-grad classes at a research university:

> 85% are positive about LOs!

Percentages of students and valuations.



## Chatbox brainstorm: What is the value of learning outcomes?

What do you think students report about how they use learning goals?

**Please type your ideas into Zoom 'Chat'.**

Do you think this depends on the instructor and course?

- A. Yes
- B. No
- C. I'm not sure

**Please answer the poll in Zoom.**

# Findings from research

What do you think students report about how they use learning goals?

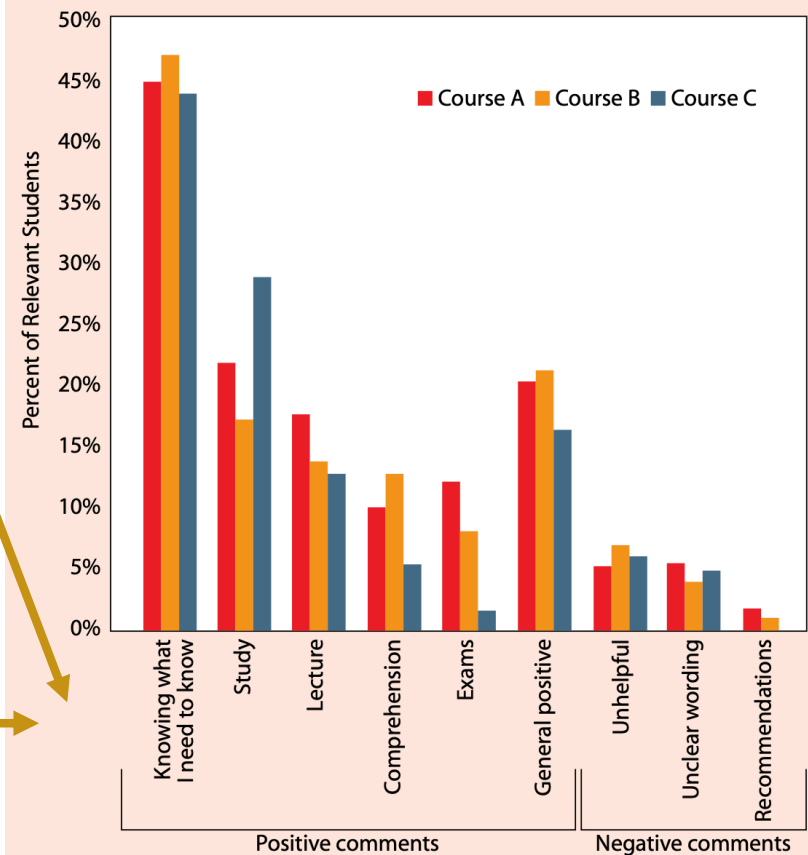
Explicit LOs help students recognize the organization and relative importance of course material.

Do you think this depends on the instructor and course?

All 3 course instructors presented LOs as part of lectures.

While LOs were linked to assessments, Course C had yet to have an exam.

Breakdown of valuation of learning goals, by percentage of total relevant comments. Totals for each course can be greater than 100% due to cross-coding of comments.



## Pro and Con List: What is the value of learning outcomes?

What do you see as the **value of learning goals** for **yourself as an instructor**?

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What are any **disadvantages or challenges** associated with using LOs?

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Please take 1-2 mins. to write down your ideas.  
Let's share out! (raise your hand).

# What are learning outcomes?

## Course-Level

- Give big picture, attitudes, behaviors – FEW
- Likely can't be assessed by a single test question
- Supported by many topic-level learning outcomes

## Topic-Level

- Define what it means to “understand” at this level – MANY!
- Can be repeatedly assessed on homework, quizzes, exams, etc.

(See Appendix A of pre-workshop reading)



## Writing learning outcomes (LOs)

Every learning outcome should complete the sentence,

**“By the end of this course / unit / lecture / section / lab, you should be able to ...**



Address  
to the  
student –  
it's for  
her/him/  
them!

**i.e. A student can ask themselves, “Can I / Did I”?**

## Writing learning outcomes (LOs)

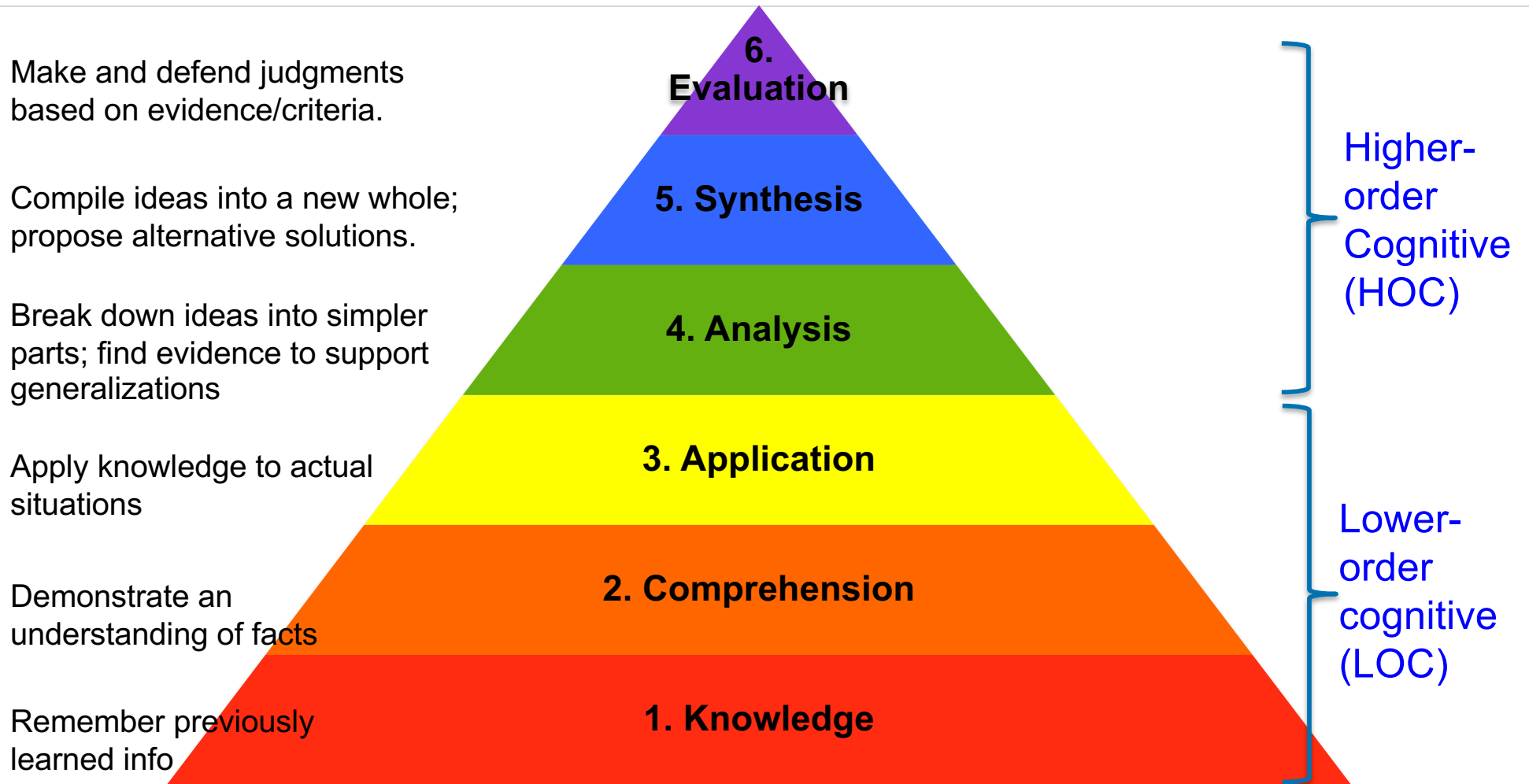
**Before you start**, ask yourself:

- What do I want my students to know, to do, to feel?  
(i.e. knowledge, skills, attitudes)
- Do I have a way that I can assess this learning outcome?

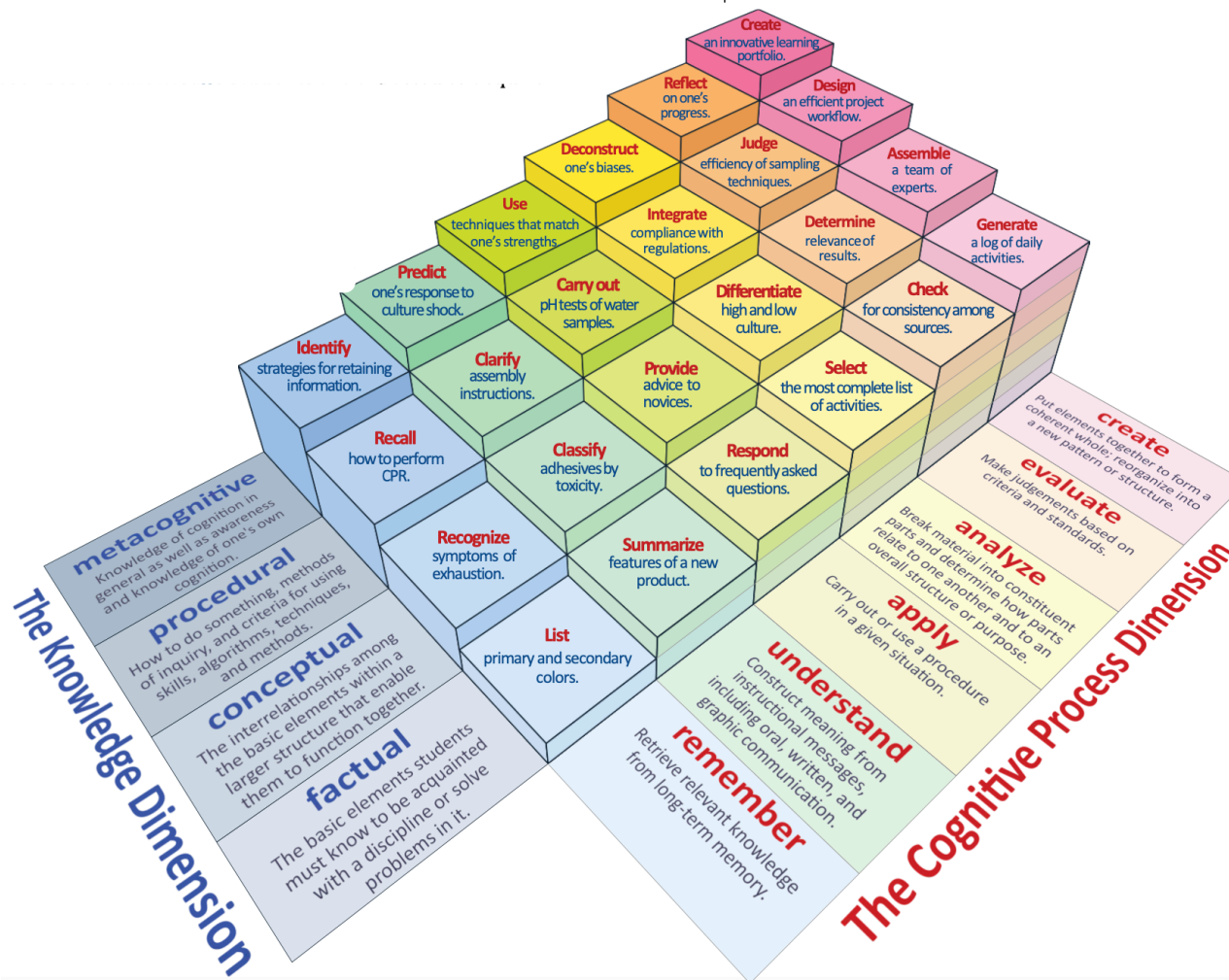
**To start**, **pick a verb** that describes the action the students will perform to demonstrate mastery of the concept.

- Do not use “understand” – it’s too vague.
- Do use other ‘action verbs’ ...

# Using Bloom's taxonomy

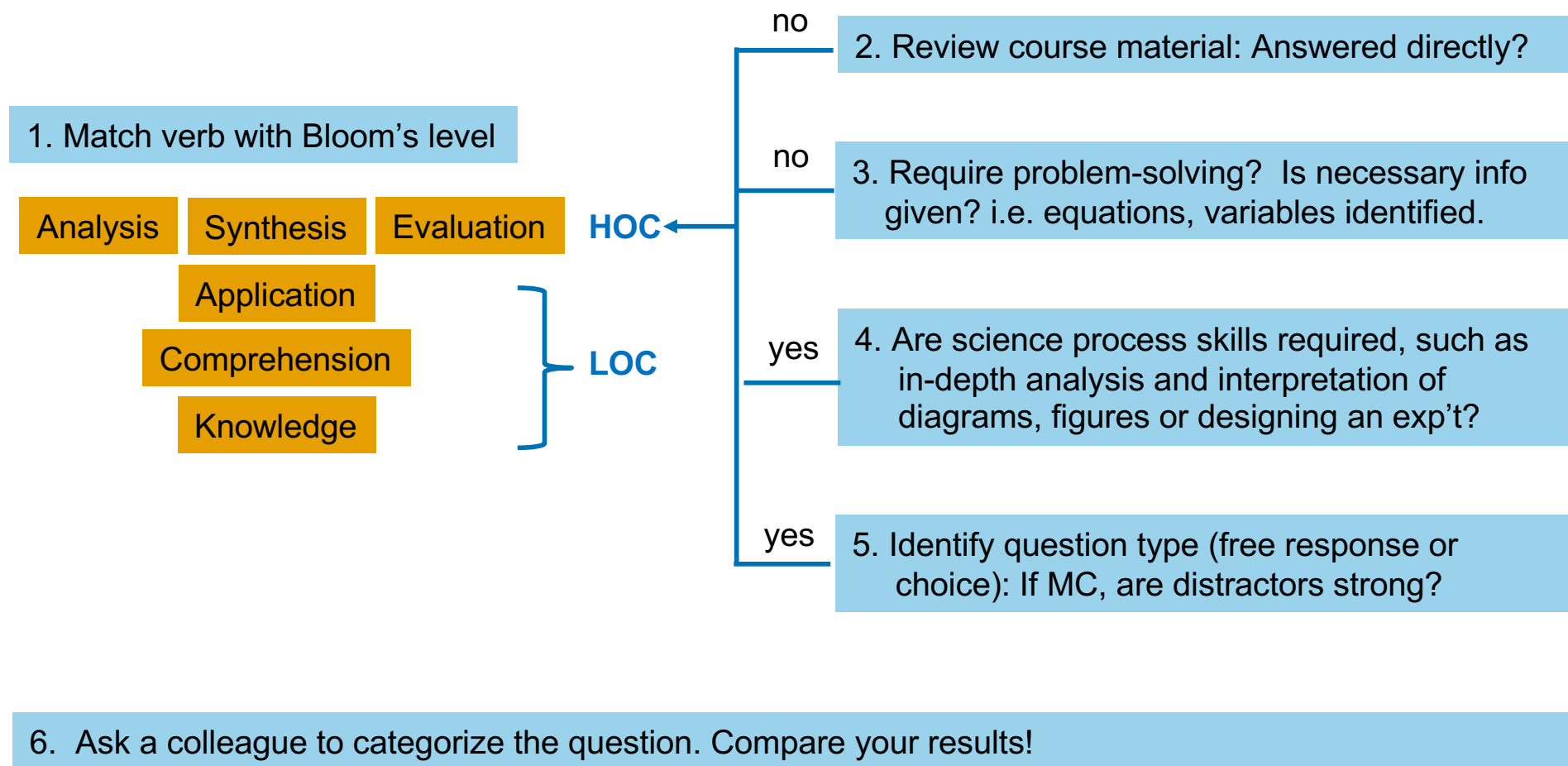


# Using Bloom's taxonomy



We can make LOs accessible, but we also want to be sure that our course components – intended outcomes, learning activities, and assessment tasks – are aligned!

# Evaluating the cognitive level of our course materials



## Breakout Room: What is the LO? Is it LOC or HOC?

Let's take some time to review our sample assessments, identifying LOs and their cognitive levels. We'll then share with colleagues and come to a consensus.



**You will have 20-25. min.**





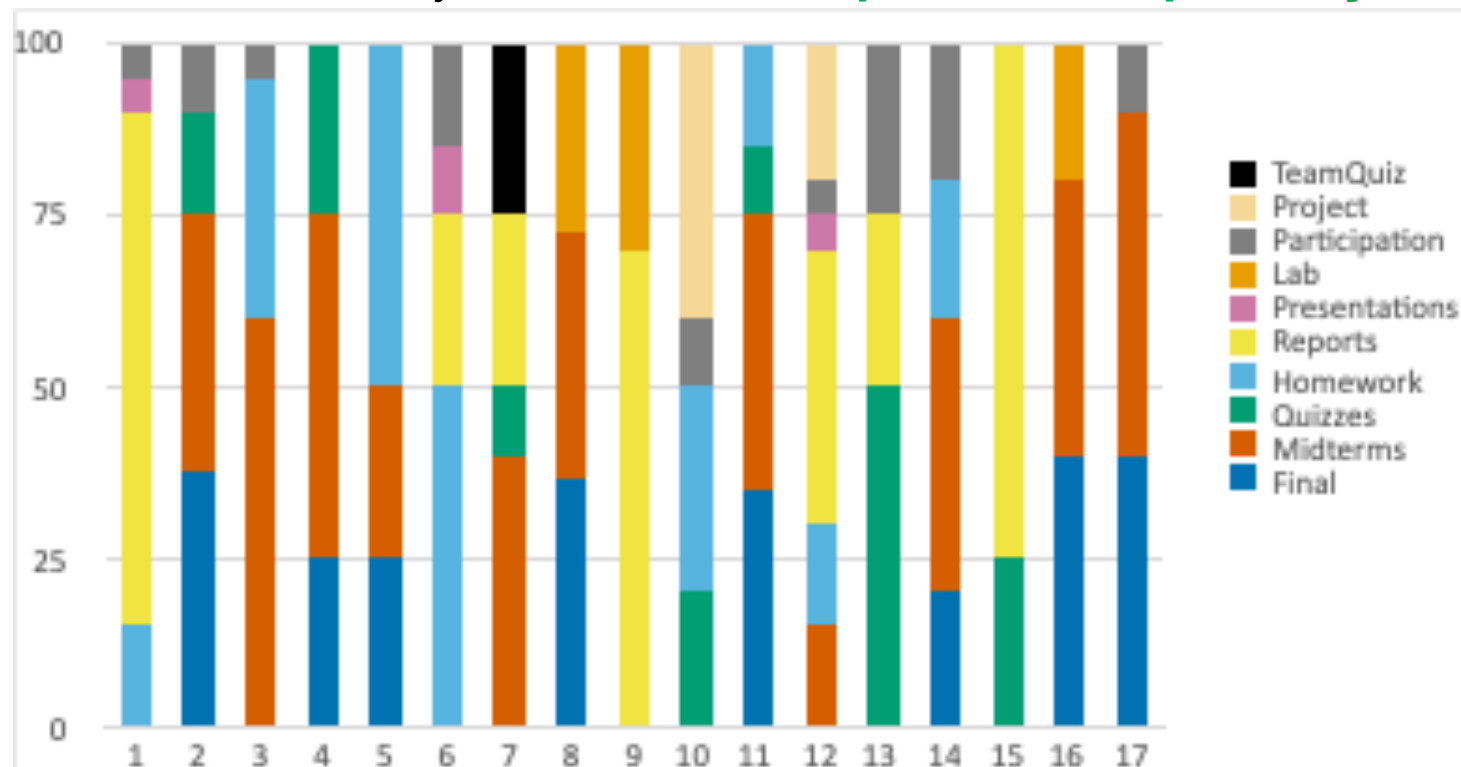
## KEY TAKEAWAY

If we want our students “to be proficient at interpreting data, solving problems, critically reading, and evaluating different types of literature” etc., we need to provide the structures to help them learn at these higher cognitive levels. **Bloom’s Taxonomy is one pedagogical tool we can use.**

# Assessment Design: The Big Picture

# What are your practices in FTF instruction?

Here is what you shared on the [pre-workshop survey](#):



Proctored, high stakes summative exams are common in our STEM courses.  
**Replicating this structure online is neither easy nor equitable.**

## As you pivot to remote, what are your goals?

Here is what you shared on the **pre-workshop survey**:

Assess the extent to which students can apply the material (computationally, to real-world contexts, etc. ...)

Check that students have learned how to conduct an experiment, acquire and analyze data, and communicate findings

Remove attendance and synchronous requirements

Incorporate other forms of participation (e.g., weekly check-in worksheets)

Use different assessment methods, give students opportunities who don't do well on written exams.

Continue with projects, changing the mode of presentations.

Create open book exams.

Replace exams with term paper.

## Jamboard: What are major considerations for online courses?



Flexibility & timing

Class size and level

Technologies

Academic Integrity

**You will have 15. min.**

# What did we learn in the Spring term?

## From students ...

*"It feels very **invasive** to have to show my government-issued ID"*

*"I really appreciated the **flexible deadlines**."*

*"The **practice upload** assignment was helpful in making me understand the process for quizzes and exams."*

*"I **ran out of time taking pictures and uploading my files**. Please extend the length of timed exams."*

*"I'm **concerned about privacy** and video overall – I usually keep my webcams covered for day-to-day use and the idea of being recorded through my camera is unnerving and adds stress during exams."*

*"I **don't have my own (study and testing) space** – my roommates are always around."*

# What did we learn in the Spring term?

## From instructors ...

*“Generally, students are very nervous about online exams. **They don’t know what to expect**, so be as explicit as possible about the exam process in advance. I.e. the resources they can/can’t use, the timing, the format and how they will input in their answers, etc.”*

*“I learned that **students need coaching in how to study for and take an online exam** (I made the incorrect assumption that they would easily transfer these skills from their in-person classes). ... They also **need to consider the space where they will take the exam** (Is it comfortable? Quiet? Non-distracting (I.e. did you notify family in advance not to disturb you?))? Internet ready? Do they have extra paper, a calculator, etc. on hand and ready to go?). Also, **some students reported studying less** because they were under the impression they could 'just look up an answer.' However, the free response format required them to reason ... and they discovered that the open resources were less useful unless they understood what information they needed.”*

*“Once I got over the fear of alternate assessment forms, **I had fun creating new types of questions and activities.**”*

*“I needed to **regularly prime my students about academic integrity.**”*



During the break, think about how you will factor these considerations into your assessment plans.



# Assessment Design: Your Plans

# How can you incorporate equitable assessment strategies?

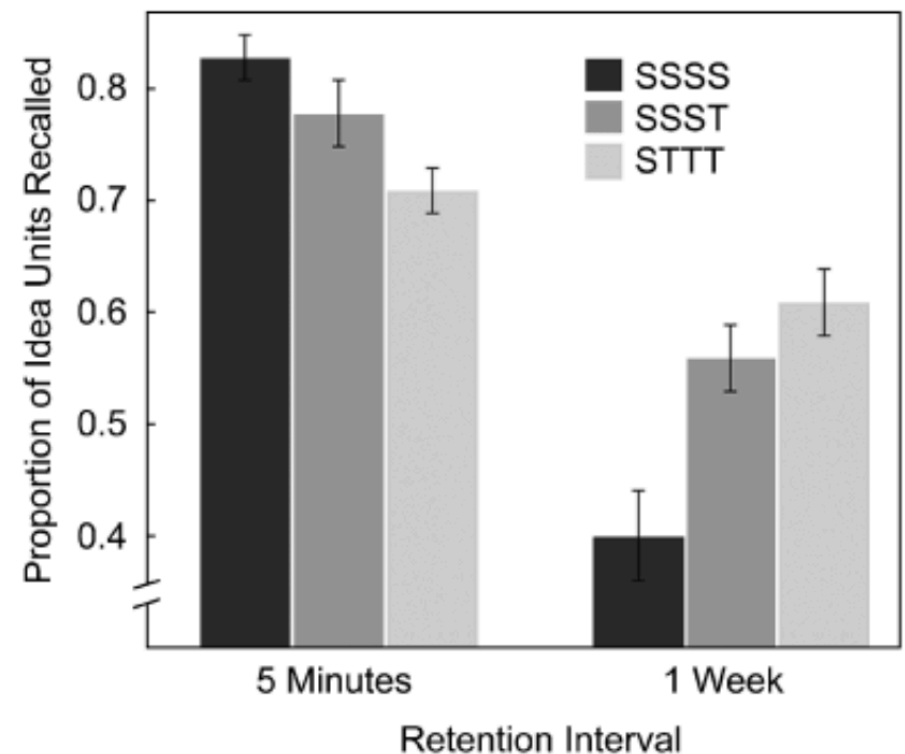
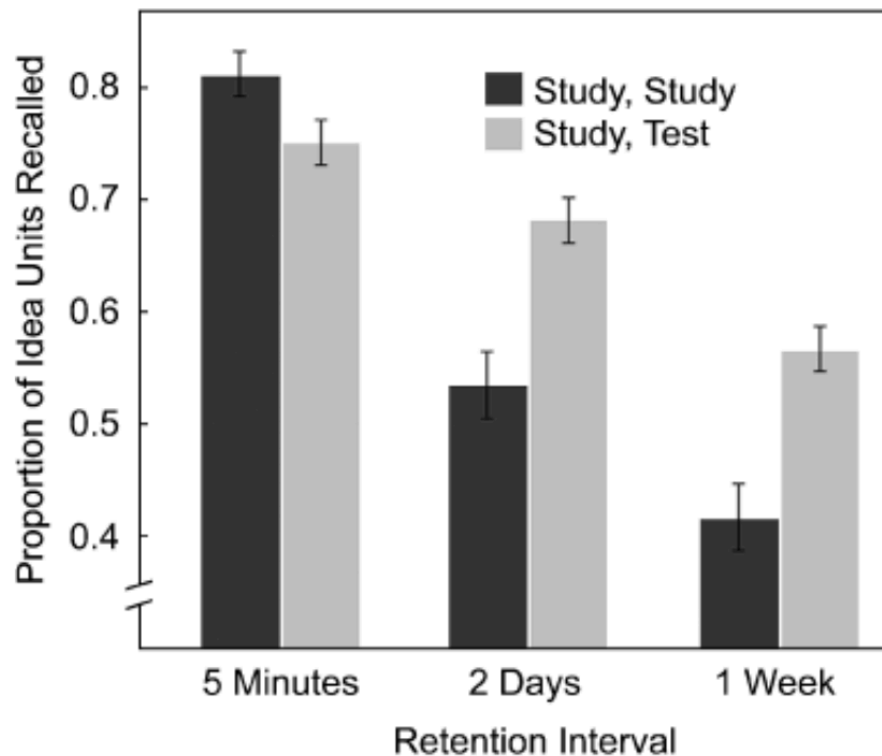
## Reinforce mastery of major ideas and skills by:

- ☐ Sharing LOs and connecting them to each assessment;
- ☐ Providing students choice and control (e.g. how much of their final grade will come from assignments versus exams); and,
- ☐ Allowing for multiple attempts at several low/no-stakes assessments before summative assessments

**Emphasize “process/soft skills development”** (e.g., see ELIPSS)

**Re-weight various assessments** (placing less emphasis on high-stakes exams)

## "The Testing Effect": improving (not just assessing) learning



# What are the right assessments for your course(s)?

## Formative

(for practice and understanding check)

homework / problem sets

one-minute papers

polling questions

reflections

exam wrappers

... and more!

# Sample Reflection

One of our goals this quarter is to help you (to continue to) develop effective learning strategies. And one important way to do this is to reflect on your learning.

To this end, this survey comprises five **questions** related to your experiences in **Week 4** of CHEM6C this Spring 2020 quarter. It should take ~ 10 minute to complete. The survey is graded on completeness, and the credit you earn will be applied to your 10% course participation grade.

## Question 1

1 pts

*How are you holding up?* Are you keeping well, physically and emotionally? Managing to stay safe, active, in touch with others, and on top of your academics (amongst other responsibilities)? Please share as you feel comfortable, and if there is anything the instructional team can do to lend support, let us know.

## Question 2

1 pts

Consider the learning goals for this week. Select the category that **best describes your progress** towards meeting each goal.

I can ...

1. Explain how reactions proceed spontaneously toward equilibrium ( $\Delta S_{\text{total}} > 0$ ) but proceed no further at equilibrium ( $\Delta S_{\text{total}} = 0$ ). [ Select ]
2. Derive the expression for free energy change ( $\Delta G$ ) from the Second Law,  $\Delta G = \Delta H - T\Delta S$  and  $DG^\circ = \Delta H^\circ - T\Delta S^\circ$  [ Select ]



## Question 3

1 pts

What questions were sparked this week as you completed your reading, viewing, and problem-solving practice related to the 2nd Law of Thermodynamics, Gibbs Energy and equilibrium?

## Question 4

1 pts

Let's think about the 'big picture' thus far this quarter! How are your views of chemistry and the world around you changing as we explore the major themes related to chemical processes? i.e. will it happen? (thermodynamics), to what extent? (equilibrium), and how fast and by what path? (kinetics). *Offline, we encourage you to create a concept map of the course, so that you can see how ideas are connected {This is a great study tool!}*

**I can't do this yet** (even if I look at my notes or another source)

**I can probably do this**, but I'd have to look my notes or another source.

**I can definitely do this** without looking at my notes or another source.

# What are the right assessments for your course(s)?

## Summative

(to evaluate learning at some end point)

infographic, brochure, fact sheet

research essay / paper

presentation

project

May incorporate  
peer review,  
collaboration  
real-world context

oral exam or digital badging

frequent, short quizzes

unproctored online exam  
(open book/internet?)



**HOCs questions**  
**Multiple question types**  
**Question pools**  
**Randomized questions**

# Sample Alternative Questions – Concept Maps

## BICD 102, Genetic Inquiry – A Midterm Question

### Abstract

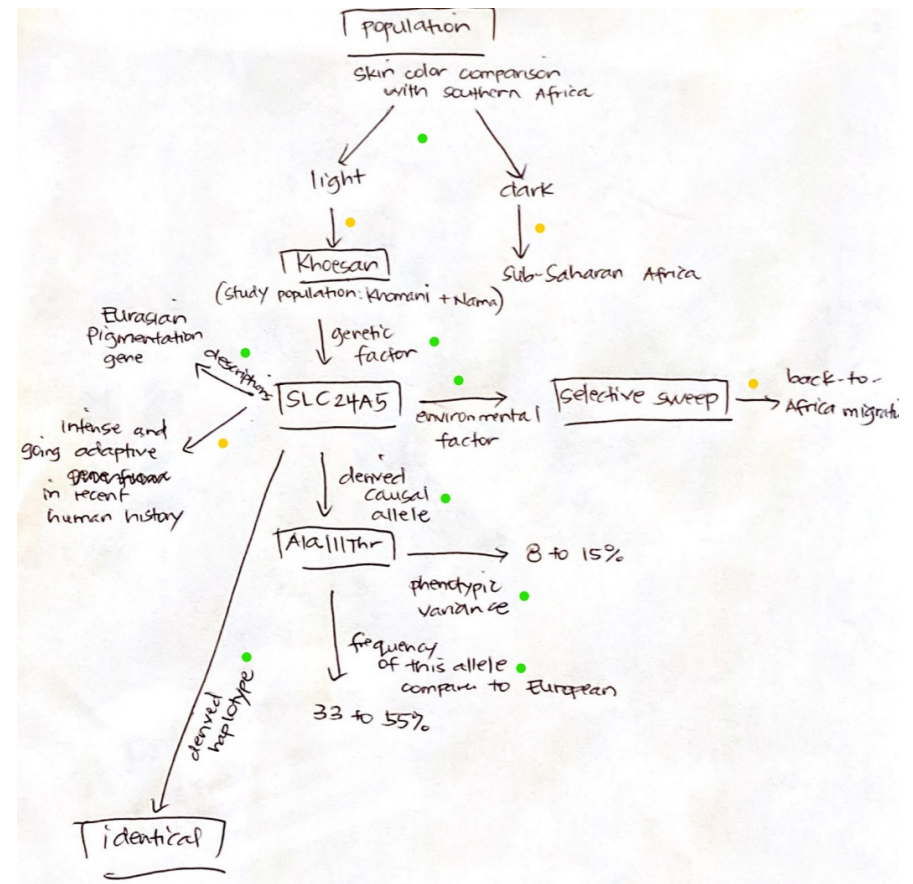
Please use the following information for Questions 3-4.

**Abstract:** Skin pigmentation is under strong directional selection in northern European and Asian populations. The indigenous KhoeSan populations of far southern Africa have lighter skin than other sub-Saharan African populations, potentially reflecting local adaptation to a region of Africa with reduced UV radiation. Here, we demonstrate that a canonical Eurasian skin pigmentation gene, SLC24A5, was introduced to southern Africa via recent migration and experienced strong adaptive evolution in the KhoeSan. To reconstruct the evolution of skin pigmentation, we collected phenotypes from over 400 individuals from two KhoeSan populations (called Khomani and Nama) and high-throughput sequenced candidate pigmentation genes. The derived causal allele in SLC24A5, Ala111Thr, significantly lightens basal skin pigmentation in the KhoeSan and explains 8 to 15% of phenotypic variance in these populations. The frequency of this allele (33 to 53%) is far greater than expected from colonial period European gene flow; however, the most common derived haplotype is identical among European, eastern African, and KhoeSan individuals. Using demographic simulations with selection, we show that the allele was introduced into the KhoeSan only 2,000 years ago via a back-to-Africa migration and then experienced a selective sweep. The SLC24A5 locus is both a rare example of intense, ongoing adaptation in very recent human history, as well as an adaptive gene flow at a pigmentation locus in humans.

### Concept map

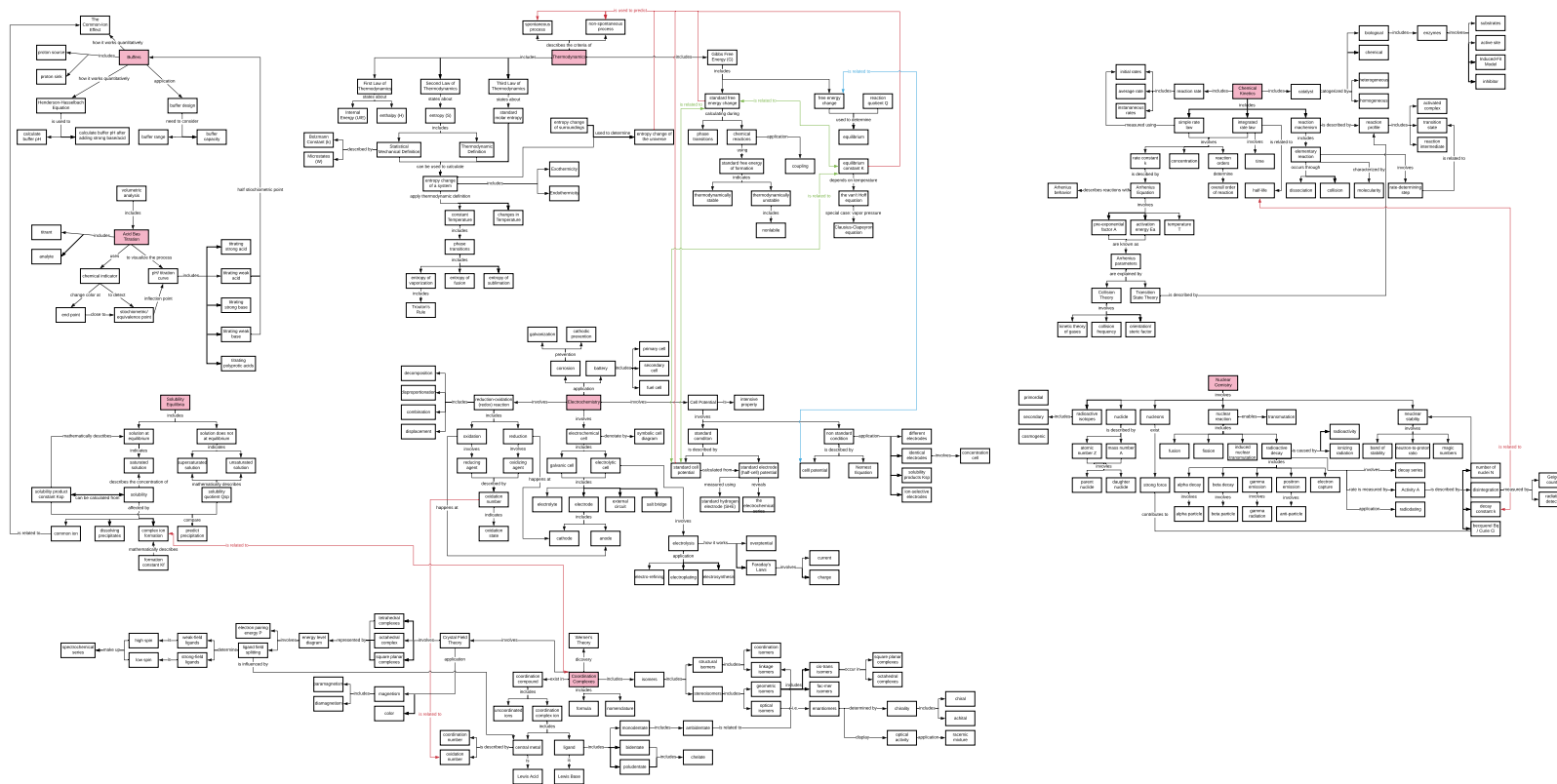
12 pts

Create and upload a concept map to summarize the information in the abstract (above). The concept map should contain at least 12 connections. Each accurately described connection will be award +1 point, and each inaccurately describe connection will be counted as -1 point.



# Sample Alternative Questions – Concept Maps

## CHEM 6C, General Chemistry – In lieu of / as part of Final Exam



**LOC (knowledge):** Student fills in missing linking phrases or missing concepts (from list) to a given structure.  
**HOC (synthesis):** Student generates structure, concepts, & linking terms; map must be sufficiently complex.

Courtesy of Stacey Brydges



## Breakout Room: What Are Your Plans?

Let's return to our sample assessments and discuss: What changes will you make as you move your assessment online? Are there alternative assessment types that would allow students to demonstrate they've met the same LOs?



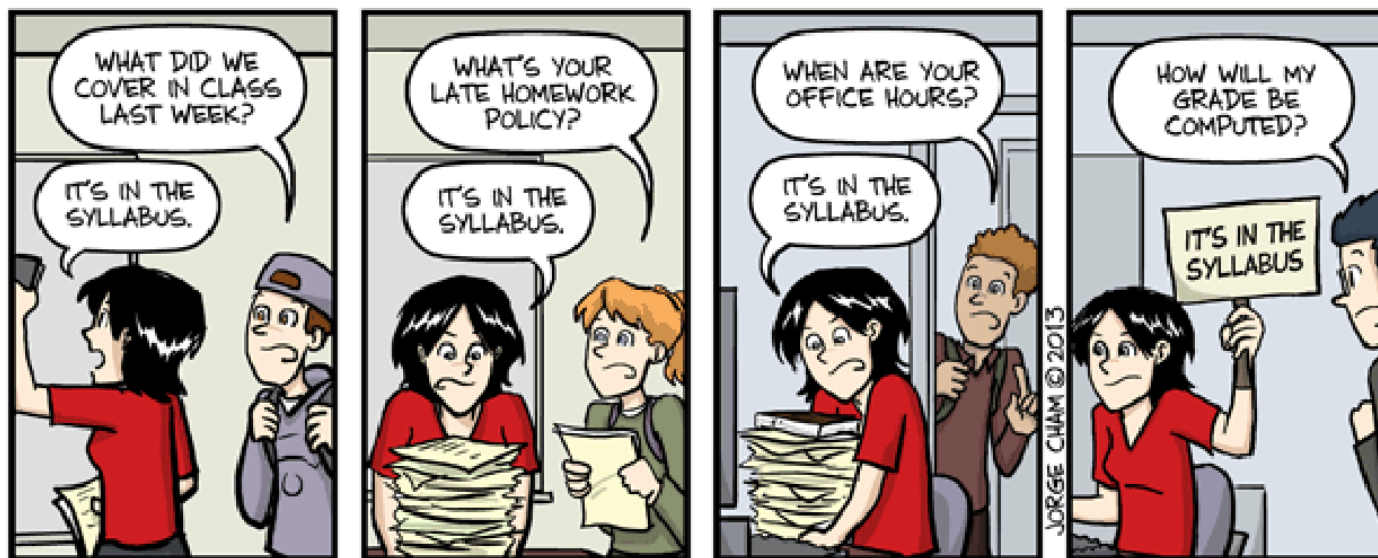
**You will have 15. min.**



## KEY TAKEAWAY

Regular, ongoing assessment helps make learning a **process of reflection** and **analysis**, with specific markers of achievement, rather than simply an **end point** and a **grade**.

# Your Course Syllabus: Communicating Expectations & Plans



## IT'S IN THE SYLLABUS

This message brought to you by every instructor that ever lived.

WWW.PHDCOMICS.COM  
"Piled Higher and Deeper" by Jorge Cham

## Chat box brainstorm: What's in a syllabus?

What would you consider to be essential components in a course syllabus? **Please type your responses directly into the Zoom chat box!**



## Breakout room: Syllabus peer review

Let's share our syllabi within the group for feedback using the syllabus checklist for creating an inclusive and integrous classroom.



## Syllabus for an inclusive and integrous classroom

According to research, the same classroom characteristics that delineate **an inclusive classroom** also delineate **an integrous classroom** (one in which integrity is the norm and cheating is the exception).

# Syllabus for an inclusive and integrous classroom

Classroom Characteristics	Description	Benefits	Practices
Students feel a <b>Sense of Belonging</b>	A <b>sense of belonging</b> means that students feel a “connection with others” (Booker, 2016, p. 218) and have a “sense of being accepted, valued, included, and encouraged...an important part [of the class]” (Goodenow, 1993, p. 25)	Students who feel connected to (included in) the learning environment are more likely to perform well and persist through graduation (Booker, 2016), without resorting to cheating (Finn & Frone, 2004)	<ul style="list-style-type: none"> <li>• Get to know your students (start with their names) &amp; help them get to know you</li> <li>• Use examples that are diverse</li> <li>• Use small groups in large classes</li> <li>• Facilitate student participation</li> </ul> <p>(Finn &amp; Frone, 2004; Tanner, 2013)</p>
<b>Varied Active Learning Approaches</b> are used	Such approaches engage students <b>actively</b> in the <b>learning</b> process with “continual opportunities to master skills through repeated attempts in the presence of instructional guides or coaches who encourage critical thinking” (Bertram Gallant, 2017)	Active learning encourages mastery orientation and intrinsic motivation, both of which are associated with increased integrity (Bertram Gallant, 2017). Also, varying the learning strategies creates a classroom where people with different learning preferences feel included (Tanner, 2013)	<p>Any active learning approach including, but not limited to:</p> <ul style="list-style-type: none"> <li>• problem-based learning</li> <li>• team-based learning</li> <li>• peer instruction</li> <li>• case studies</li> <li>• quick writes</li> <li>• discussion</li> </ul> <p>Also, consider vary the approaches throughout the term or even within a unit</p>



Classroom Characteristics	Description	Benefits	Practices
Students believe that <b>the class is just</b>	A <b>belief in a just world (BJW)</b> or classroom, is a belief that one will “get what they deserve” in that environment (Donat, et al, 2014).	When people have a BJW, they are “motivated to preserve a just world” by being just themselves (Donat et al., 2014), thus less likely to rationalize cheating as an option (Alt, 2014). Also, a BJW creates a community in which teachers and students are in relationships with each other, rather than opposed to one another, which makes students feel included.	<ul style="list-style-type: none"> <li>• Make expectations explicit and fair</li> <li>• Be explicit about how values (honest, respect, responsibility, fairness, trustworthiness) will be upheld</li> <li>• Articulate reasons behind choices (e.g., choice of assessments; choice of deadlines)</li> <li>• Create values statements/ethics codes together with students</li> <li>• Allow students some choice &amp; control over grades/assessments and missing class/assessments</li> </ul> (Bertram Gallant, 2017; Tanner, 2013)
<b>Positive Language</b> is used throughout	Using <b>positive language</b> means communicating with students in a “warm” or welcoming tone, rather than authoritarian or punitive tones (Accessible Syllabus)	When the syllabus rhetoric is positive, students view the professor as “warm” and rate the professor as more friendly and more approachable, and the course as more “doable” (Accessible Syllabus). Talking to students about academic integrity in warm values language, rather than punitive language (e.g., “don’t cheat or else!”), encourages academic integrity.	<ul style="list-style-type: none"> <li>• Use “I” and “we” and “you” language (rather than “the student” or “the professor”)</li> <li>• Focus on possibilities for action vs. prohibitions against actions</li> </ul> (Accessible Syllabus; also google “Bill Taylor’s Letter to his students”)
There is a tone of <b>cooperation</b> in the classroom	A <b>cooperative tone</b> is struck when professors communicate what students can rather than what they can’t do and students are provided some choice and control of their environment	A cooperative environment helps create a sense of agency in students and a sense of community (Accessible Syllabus). A sense of agency can also increase their intrinsic motivation and enhance their mastery orientation, both of which are known to reduce cheating.	<ul style="list-style-type: none"> <li>• Create values statements/ethics codes together with students</li> <li>• Communicate a sense of shared responsibility for the class</li> <li>• “phrase policies as logical consequences of student actions instead of retributive punishments” (Accessible Syllabus)</li> </ul>



## References

Accessible Syllabus (2015). Retrieved January 4<sup>th</sup> 2017 from <https://accessiblesyllabus.tulane.edu>. CCL by-sa/4.0

Alt, D. (2014). Assessing the connection between students' justice experience and attitudes toward academic cheating in higher education new learning environments. *Journal of Academic Ethics*, 12 (2), 113-127.

Bertram Gallant, T. (2017). Academic integrity as a teaching and learning issue: From theory to practice. *Theory into Practice*, 56 (2), 88-94.

Booker, K. (2016). Connection and commitment: How sense of belonging and classroom community influence degree persistence for African American undergraduate women. *International Journal of Teaching and Learning in Higher Education*, 28 (2), 218-229.

Donat, M., Dalbert, C., & Kamble, S.V. (2014). Adolescents' cheating and delinquent behavior from a justice-psychological perspective: The role of teacher justice. *European Journal of Psychology of Education*, 29 (4), 635-651.

Finn, K.V. & Frone, M.R. (2004). Academic performance and cheating: Moderating role of school identification and self-efficacy. *The Journal of Educational Research*, 97 (3), 115-121.

Goodenow, C. (1993). The psychological sense of school membership among adolescents: Scale development and educational correlates. *Psychology in the Schools*, 30, 79-90.

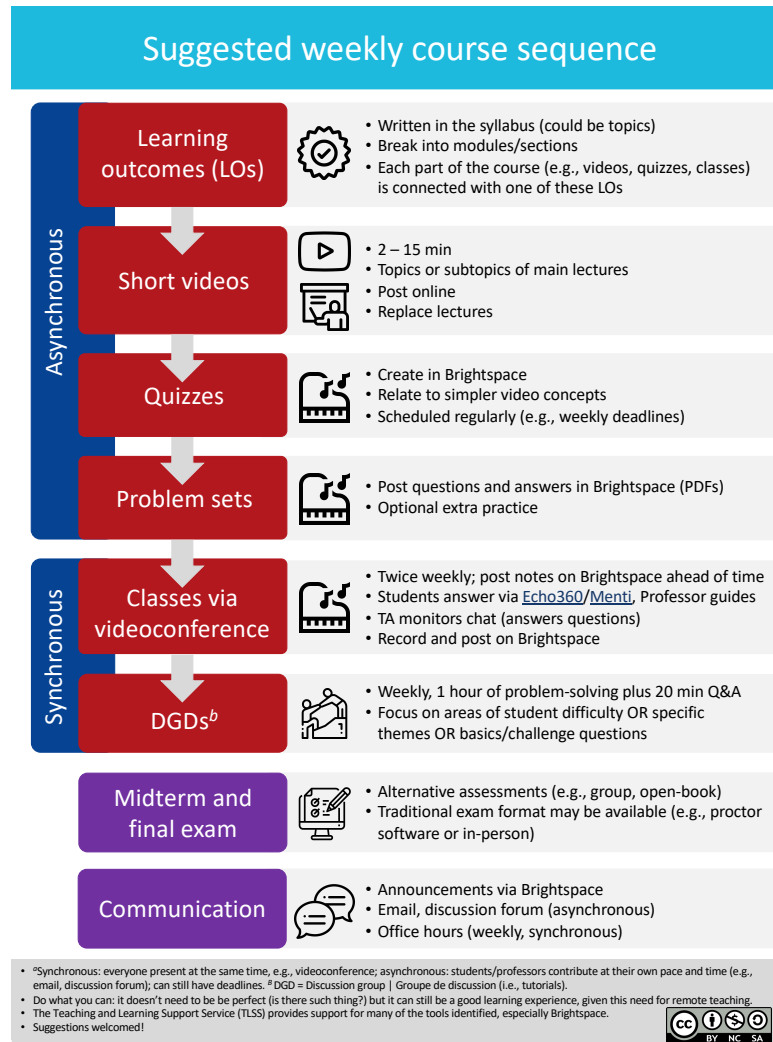
Tanner, K.D. (2013). Structure matters: Twenty-one teaching strategies to promote student engagement and cultivate classroom equity. *CBE-Life Sciences Education*, 12, 322-331.



## KEY TAKEAWAY

We can set the tone for an inclusive and integrous online (and face-to-face) classroom using intentional and evidence-based syllabus design.

# Thinking ahead: Your weekly course sequence



A good starting point ...

## Keeping in touch with colleagues and students

For organized chat (channels) with  
file uploading:



For group text messaging:



## Summary reflection

**On our shared Google doc, please write:**

1. A one-sentence summary of today's workshop.
2. One idea you might use.
3. One word that describes how you feel.

Thank You