Transforming Teaching while Focusing on Learning

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July 20, 2020
face-to-face
on-site
online
online asynchronous
remote synchronous
hyflex
individualized
clinical/practica
….. and more

INSTRUCTIONAL MODALITIES

Learning: Some Basics

- Humans actively seek information.
- Knowledge is constructed from prior knowledge, skills, and beliefs.
- Culture is critical in shaping how people learn.
- Mental models and metacognition are key to developing knowledge.
- Learning cannot happen without motivation.

Drawn from HPL I and II
Learner-Focused Instruction Examples (independent of instructional modalities)

Example 1: Dr. Tim Boester, Assistant Professor of Mathematics; *Mathematics 122, Precalculus*

*prior knowledge, skills, and beliefs influence ability to learn*

Example 2: Dr. Melissa Maginnis, Assistant Professor or Microbiology; Dr. Sally Molloy, Assistant Professor of Genomics; and Dr. Melody Neely, Associate Professor, Molecular and Biomedical Sciences; *Honors 150/155 Phage Genomics*

*metacognition*

Example 3: Dr. Julia McGuire, Lecturer in Biology; *Biology 100, Basic Biology*

*culture and motivation*
Student responses:

• A unit of measurement for determining the difference in direction between 2 vectors that have the same origin.
• A measure of distance between two intersecting rays
• A space between 2 lines that is measured in degrees
• The measurement between two lines
• An angle is a measurement of the distance between two intersecting lines.
• The precise measurement between 2 corners
Student responses:

• When two straight lines intercept one another and have space between them
• The space between two lines that intersect
• Two rays going different directions that are connected at a point, or vertex.
• When two rays shoot out from the same point
• Space between two rays that connect at a vertex.
• It’s a line that bends at a certain degree
Phage Genomics Course Learning Cycle Leads to Achievement of Student Learning Objectives (SLOs)

Example 2: Understanding gene structure and transcription

1. Independent learning: Students acquire content knowledge for SLO through reading assignment and videos
2. Classroom Activity: assess student misconceptions on content SLO and students reflect on experience with learning skill
3. Active-Learning: students practice manipulating content and applying learning skills
4. Weekly Written Reflection: students reflect on their learning experience; metacognitive assessment
5. Unit Quiz: assess students ability to meet SLOs

Instructor feedback
Peer feedback

Interactive lecture on SLO concepts
Improves students’ ability to meet SLO
Improves students’ abilities to meet SLO

Slide courtesy of Melissa Maginnis & Sally Molloy
Example 2: Understanding gene structure and transcription

2. Classroom Learning Activity

**Written student activity**

- Students reflect on their own experiences to learn the skill
- Students use what they understand from reading assignment to answer a content question
- Students draw it to learn it

**Interactive lecture**

Instructor helps students collectively outline approach to learning skill and students and instructor actively discuss content of SLO using that learning skill

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Slide courtesy of Melissa Maginnis & Sally Molloy
3. Classroom Activity

I. Understanding Gene Structure and Transcription.

For the double stranded sequence below, identify or determine the following:

a. The −10 box
b. The −35 box
c. The +1 site
d. The start codon and coding region.
e. The template strand
f. The coding strand

Students Practice Learning Skill

Applying knowledge to a new situation

Demonstrate understanding of gene structure

Slide courtesy of Melissa Maginnis & Sally Molloy
4. Classroom Learning Activity

Students reflect on the content (promoters) and their success applying knowledge to challenging problems

Number 3 was definitely the hardest problem in Activity 2. My first approach was to look for the things that I understood; the start & stop codons and the template versus coding strands. Even that proved to be difficult but I made some progress and I thought that I had a good grasp on it. Then, our group met and it turned out that I had nothing written that looked like what they had. I had mixed up the coding and template strand, so the start codon that I had found was in fact not correct. By working with them, I realized that I definitely needed to look at transcription and focus on all the little parts that are crucial to looking at sequences, such as the -35 box and the +1 site. Just going off of my previous knowledge and the slight reading I had done was not even close to cutting it when it came to identifying the coding region or any of the other stuff. I was surprised about how hard it can be to attack a problem like this that you’ve never seen before. In previous classes, all of the “critical thinking” questions were basically just for you to regurgitate knowledge back but you had to make sure to string together as much as you could. They never really asked us to apply our knowledge like this problem did.
“Meeting students where(ever) they are: After piloting this lab, we know we can. This spring we had several students who were, or had family who were immunocompromised. We were able to adapt this lab so students can sample from their windows and apply the same concepts—even from a 16th floor apartment building!”
Example 3: Understanding biology with ecological sampling across scales

The data they first collect along a line in their yard, (or a park, the woods, a street) are: latitude, longitude, agricultural zone, counts of abiotic (non-living) and biotic (living) things and observed interactions, and environmental conditions, like temperature, precipitation, and cloud cover.

After their first lab of general observations of living and non-living things along a line (transect) that they walk in their yard (or other location), students propose a question to study, find some previous research about it, and propose a hypothesis to test. These are all the data that they will add to the map each week of their study.
Example 3: Understanding biology with ecological sampling across scales

**Week 1 - general observations**

I predict that with each weekly transect, there will be more plants and animals, as spring onset begins, and plant resources are available for animal communities [1,2,3]. I will observe generally, and also do quadrat sampling. I will count plants and animals, and graph changes over time.

March 18, 2020
11am - 1pm
50 paces across my front yard

- Chilly, sunny, windy
- My yard is close to the river, and mostly bare with a little snow, covered in fall maple leaves and dead grass.
- Early plants species (n=18)
- Few animals species (n=8)

Slide courtesy of Julia McGuire.