

Biology FEST:

Faculty Explorations in Scientific Teaching

Biology FEST Luncheon Workshop #1

Tuesday, November 27th

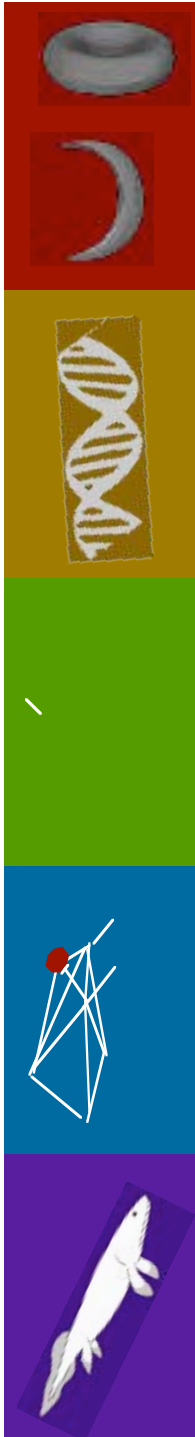
12:30-2 pm

*Simple Strategies to Promote
Active Learning and Engagement
in Biology Courses*



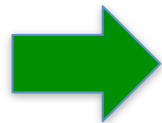
San Francisco State University

HHMI





Biology FEST: Faculty Explorations in Scientific Teaching Agenda



12:30 Welcome, Lunch, and Agenda

12:35 Discussion: Unpacking “Active Learning”

12:50 Activity: The Radish Experiment!

1:05 Tips on Using Active Learning Strategies

1:20 Activity: Drawing Water

**1:30 Experimenting with Active Learning &
Strategizing about Anticipated Barriers**

1:50 Reflection and Assessment

1:55 Looking Forward and Next Steps



Biology FEST: Faculty Explorations in Scientific Teaching

Goals for today...

- Begin to build a community in our biology department focused on exploring scientific teaching
- Experience two simple and concrete active learning strategies:
Index Card Quick Writes and Think-Pair-Share Discussions
- Consider colleagues reasons for and approaches to using more active learning in their classrooms
- Develop one way to experiment with an active learning strategy in one of your courses in the next two weeks



HHMI



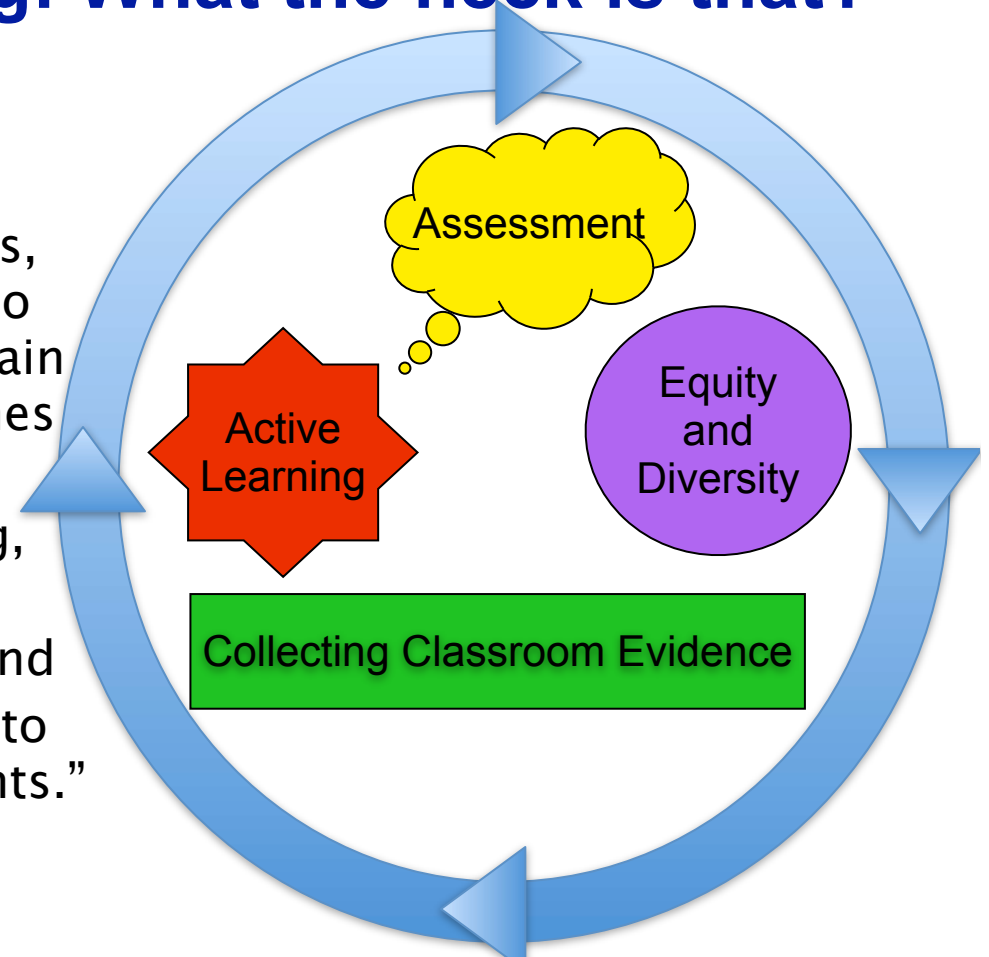
Biology FEST: Faculty Explorations in Scientific Teaching

Strategies to address our goals...

1. Scientific Teaching: What the heck is that?

“Scientific teaching does not attempt to provide particular solutions to teaching challenges, but rather charges instructors to apply their analytical skills to gain insights into effective approaches for:

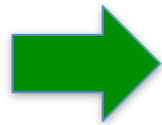
- engaging students in learning,
- designing assessments that gauge student conceptions, and
- promoting equity and access to science learning for all students.”





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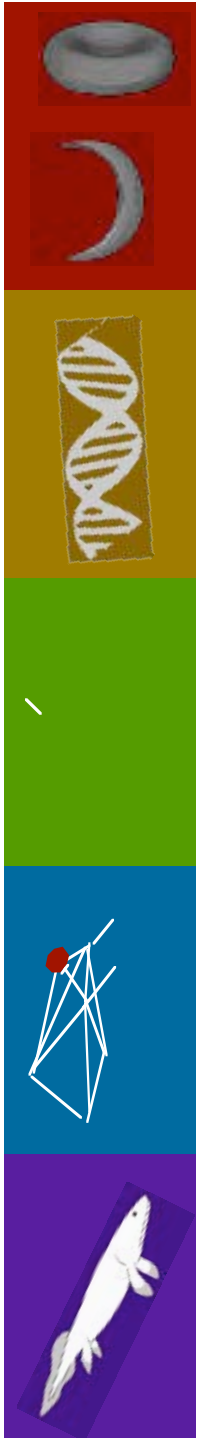
Introductions and Unpacking “Active Learning”

Share with the person sitting next to you:

1. Your name...
2. What does “active learning” mean to you?
3. What active learning strategies do you remember being used at the Launch Party (if you were there)?

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Analysis of Launch Party Index Card



Biology FEST:

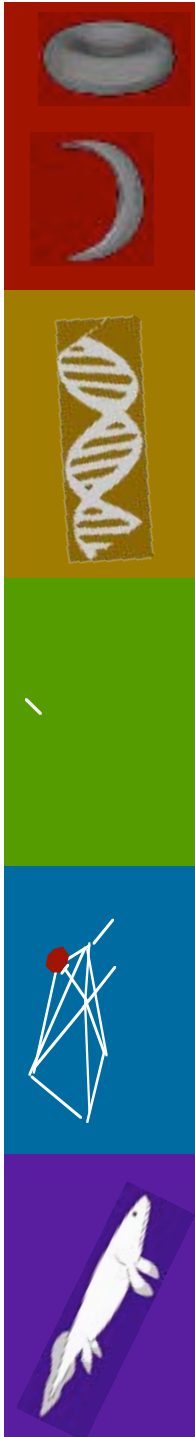
Faculty Explorations in Scientific Teaching

Experiencing two simple and concrete
active learning strategies:

Index Card Quick Writes

and

Think-Pair-Share Discussions

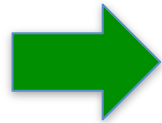




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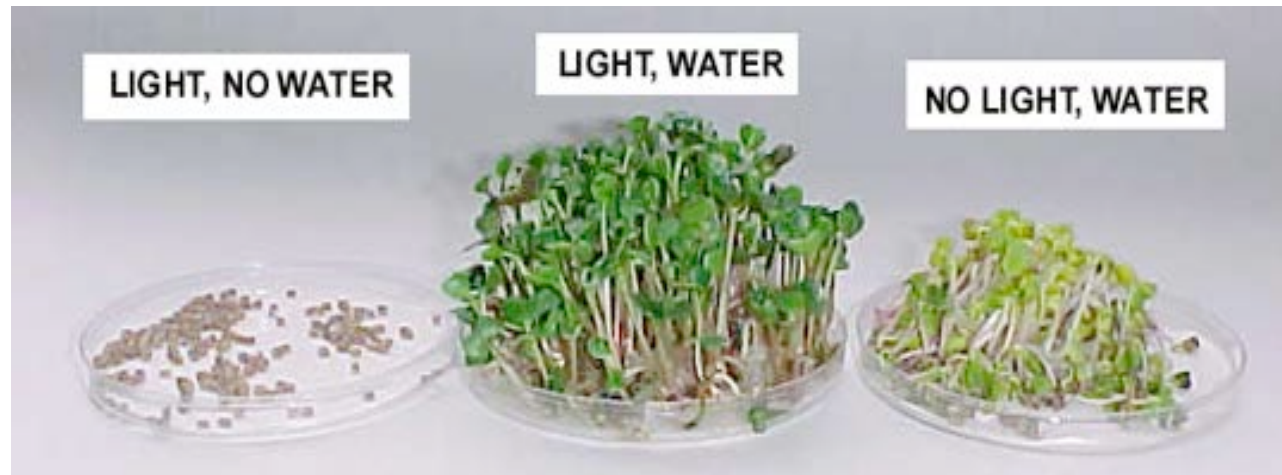
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A Common Active Learning Experience...
**Index Card Quick-Write:
The Radish Experiment**



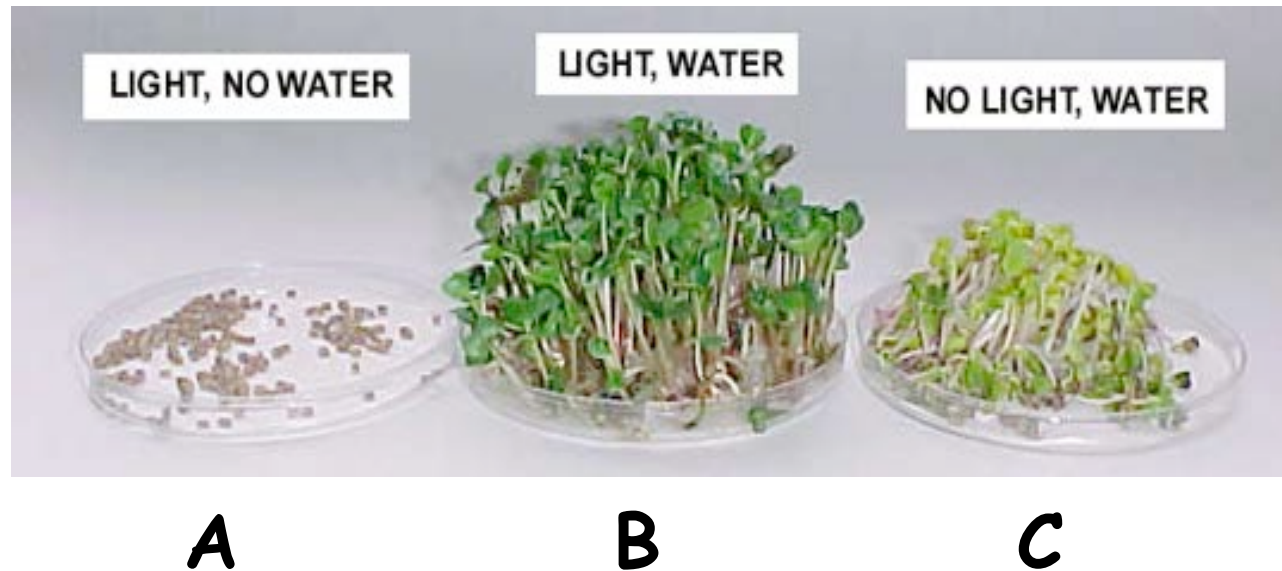
A

B

C

- Three batches of radish seeds – each 1.5 grams – were weighed out.
- The following experimental treatments were done:
 - A. Seeds not moistened (left DRY) placed in LIGHT
 - B. Seeds placed on moistened paper towels in LIGHT
 - C. Seeds placed on moistened paper towels in DARK
- After 1 week, all plant material was dried in an oven overnight and the plant's **dry biomass** was measured in grams on a scale.

A Common Active Learning Experience...
**Index Card Quick-Write:
The Radish Experiment**



First, THINK!!! Then, WRITE on your index card:

- 1. Your prediction about the relative DRY BIOMASS of A, B, and C using mathematical symbols like $<$, $>$, and $=$.**
- 2. Write at least 2 sentences using *the language of biology* about *why* you are making this prediction!**

Index Card Quick-Write: The Radish Experiment



A

B

C

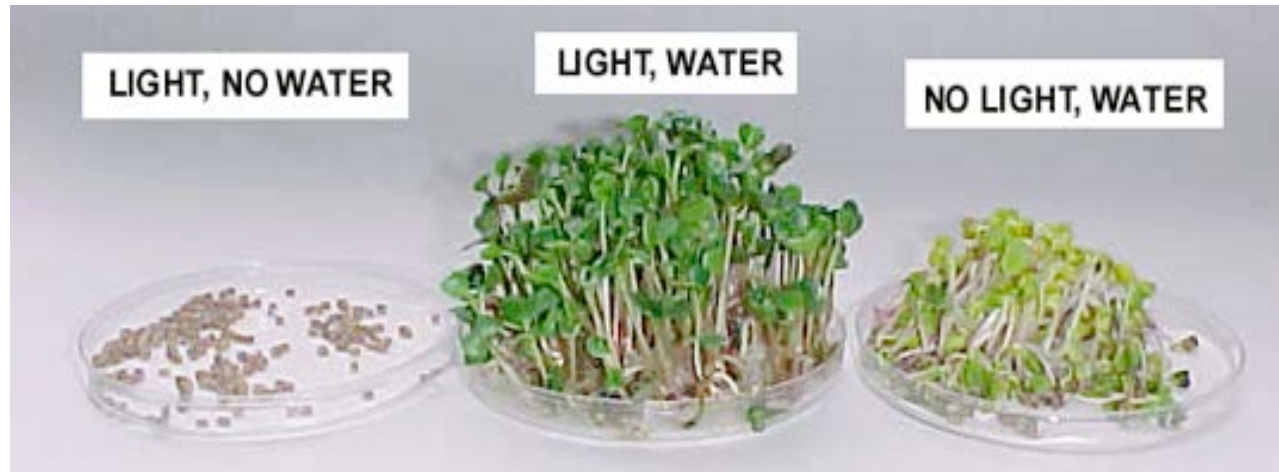
First, **THINK!!!** Then, **WRITE** on your index card:

1. Which of the following best matches your prediction? Why?

- A. $B > C > A$
- B. $B > A > C$
- C. $A = B = C$
- D. $B > C = A$
- E. None of these options matches my prediction.

2. Write at least 2 sentences using *the language of biology* about *why* you are making this prediction!

Index Card Quick-Write: The Radish Experiment



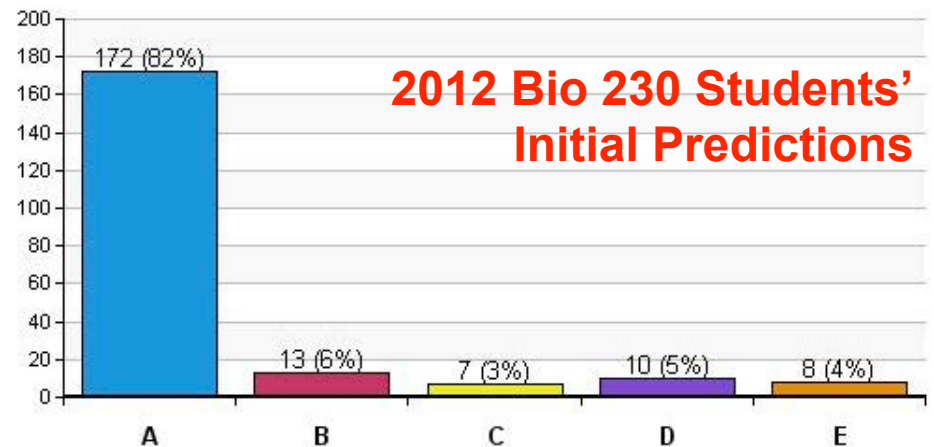
A

B

C

Which of the following best matches your prediction? Why?

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- D. $B > C = A$
- E. None of these options



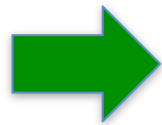


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TIPS ON USING SIMPLE ACTIVE LEARNING STRATEGIES

JONATHAN KNIGHT












WHY?

- TO GET STUDENTS ACTIVELY INVOLVED IN CLASS
- TO FIND OUT WHAT STUDENTS ALREADY KNOW
- TO DISCOVER MISCONCEPTIONS - WHAT DO I NEED TO CHANGE THEIR MINDS ABOUT?
- TO PROMOTE SHARING AMONG STUDENTS WITH DIFFERENT LEVELS OF PREPARATION
- TO SOLIDIFY AND CONSOLIDATE KNOWLEDGE
- TO EVALUATE COMPREHENSION

WHEN?




- AT THE END OF A CLASS
 - AT THE BEGINNING OF CLASS
 - IN THE MIDDLE OF CLASS
 - ANYTIME
- ➔ EVEN PRIOR TO CLASS (GOOGLE FORM)

EXAMPLE: "TEASER" DUE BEFORE CLASS

-  Purdue Online Writing Lab
-  Writing Ethics Papers - A Guide
-  Essay Assignment
-  Slightly off the beaten track essay ideas
-  Essay Scoring Rubric
-  Zotero Referencing Tool
-  Bioethics 2012 - Where do the candidates stand?
-  APA style guide for reference list format
-  Interested in a CAREER in bioethics? See this interview with Dr. Ruth Faden
-  Jonathan Haidt is a moral psychologist with some thoughts on the election, liberals and conservatives
-  **Teaser 19**

1

Doing Ethics

-  Vaughn, Chapters 1, 2 and 3 (Provided to bridge the gap until you get your REQUIRED copy)
-  TED talk by Sam Harris Feb 2010
-  Velasquez et al., Thinking Ethically

TO ENCOURAGE READING AND CHECK COMPREHENSION

Teaser 19

due by class time on 11/27

* Required

Your Name *

After reading the Rise of Animal Law, are you convinced that chimpanzees should be granted the rights of legal personhood? Why or why not? *

Submit

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TO GAUGE FAMILIARITY WITH KEY TERMS

Teaser 13

Due Oct 23 before class

Your Name

Consider the case of Nancy Cruzan on page 537 of the text. Then look at the list of Key Terms on the preceding page.

Which of these terms best describes the kind of death Nancy Cruzan eventually underwent?

Submit

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TO IDENTIFY PRECONCEPTIONS OR MISCONCEPTIONS

Teaser 11

Due before class on Thursday, March 15

* Required

Name *

I eat genes every day *

- True
- False
- I don't know

I have never eaten a genetically modified food product *

- True
- False
- I don't know

The first human practices which altered the genetic make-up of plants began *

- about 10 years ago
- about 20 years ago
- about 100 years ago
- about 10,000 years ago

Submit

WHY?

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INTRODUCING A COURSE MODULE WITH A CASE

Bill Wong's Dilemma

Bill Wong's grandmother once told him that he was descended from a line of Chinese emperors who ruled more than 3000 years ago during the Shang Dynasty. Now, with two kids of his own, Bill was beginning to wonder what he would tell his children about their heritage.

He found several genealogy companies on the Internet that promised to give him the answer if he mailed a scraping of cells from his cheek. The companies said they would extract his DNA and compare it to the DNA of thousands of people from around the world. Bill signed up with two companies, figuring if they both gave him the same answer, there might be some truth to it.

INTRODUCING A COURSE MODULE WITH A CASE

Bill Wong's Dilemma (cont.)

Three weeks later, a letter arrived from the first company, invergenes.com, which said, "your ancestors lived in southern Siberia around the peak of the last ice age." The letter went on to talk about Y chromosomes and something called *Alu* insertions, before concluding that Bill shared a common ancestor with most modern Europeans: a man who had lived in Central Asia 35,000 years ago. "I guess maybe mom could have been right," thought Bill, "but what's this about Europeans?"

The next day, Bill got a letter from the second company, genexpert.com. When he opened it, he got a surprise. "Using the most up-to-date mitochondrial DNA sequence databases," it read, "we have traced your family background to northern Europe, most likely Scandinavia." Bill just threw up his hands. "Now what am I going to tell my kids," he sighed. "And what do I tell mom?"

ANALYZING THE CASE

- WHAT IS THIS CASE ABOUT? (AS A CLASS, LIST ON BOARD)
- WHAT DO WE ALREADY KNOW? (SMALL GROUP BRAINSTORM, SHARE OUT)
- WHAT DO WE NEED TO KNOW? (SMALL GROUP BRAINSTORM, SHARE OUT)

SAMPLE “WHAT DO WE KNOW” RESULTS

- MT DNA inherited from mother
- Y chromosome inherited from father
- Mitochondrial “Eve” ancestor of all modern humans
- Whole DNA sequence from a cheek cell
- “Out of Africa”: modern humans originated in Africa
- *Alu* insertions are short DNA sequences that occur in primates
- Populations migrated across land bridges
- Genetic traits vary from one population to another

SAMPLE “NEED TO KNOW” RESULTS

- What routes did humans take out of Africa?
- What do we look at in the Y for ancestry studies?
- Do epigenetic modifications disrupt DNA analysis?
- Can DNA prove descent from Shang dynasty?
- How many people needed for DNA ancestry study?
- Would looking at the Y and MT DNA produce the same results? And why?
- What techniques are used at DNA ancestry companies to do ancestry?
- How definite are the results? Are there uncertainties?

ACTIVITY DONE: NOW WHAT?

- LAUNCH INTO LECTURE: THEY ARE PRIMED.
- USE QUESTIONS TO STRUCTURE NEXT LECTURE: AGAIN, PRIMED BRAINS
- ASSIGN RESEARCH (TEAMS OR INDIVIDUALS): BRIEF REPORTS NEXT CLASS OR ONLINE
- CASE THEME CAN NOW BE INTERWOVEN THROUGH REST OF MODULE (E.G. WHEN DISCUSSING MTDNA: "HERE ARE SEVERAL WAYS GENEXPERT.COM COULD HAVE PLACED BILL'S ANCESTORS IN EUROPE.")

TOTAL TIME FOR BILL WONG



25 MINUTES

The Origins of Genetic Engineering

(With thanks to Professors Bob Goldberg (UCLA) and Kimberly Tanner (SFSU) for some of the following slides, adapted for use in Biology 349/849)

Moving Towards Biotechnology...

Which of the following would you predict are genetically engineered organisms?

A)



B)

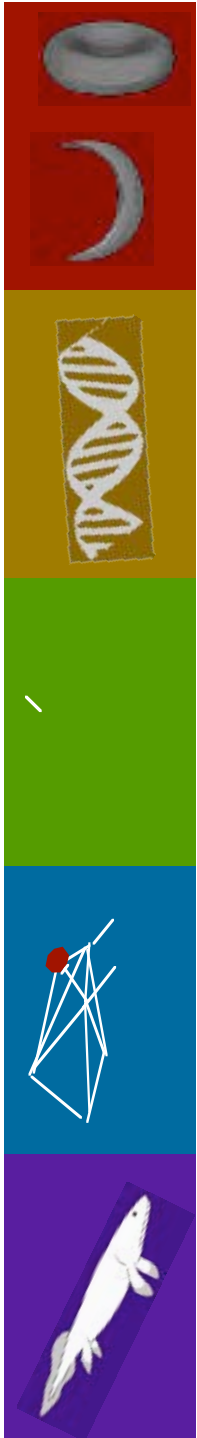


C)



D) All of the these

E) None of the these



Which of the following would you predict are genetically engineered organisms?

A)



B)

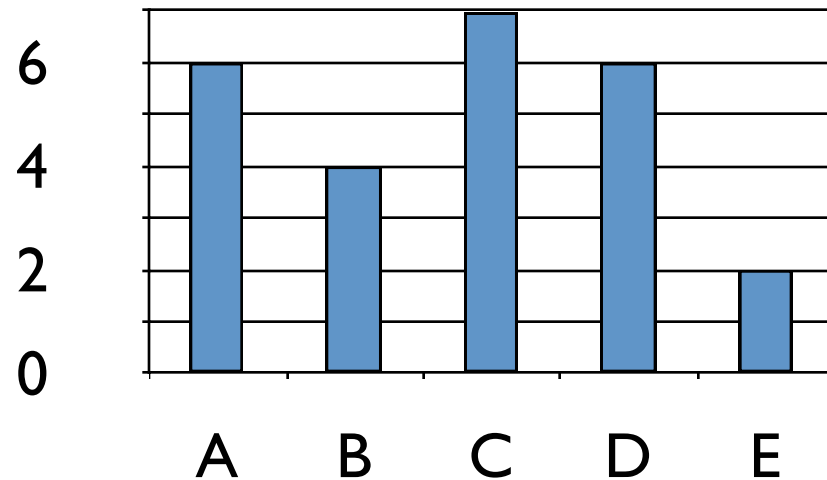


C)



D) All of the these

E) None of the these





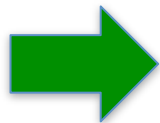
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SUMMARY

- ACTIVE LEARNING CAN BE INCORPORATED GRADUALLY
- EXERCISES CAN TAKE A MINUTE, AN HOUR, OR EVEN SPAN SEVERAL CLASSES
- STUDENTS CAN WORK ALONE, IN PAIRS, OR IN GROUPS
- EXERCISES CAN BE FOR INTRODUCTION, PRACTICE OR EVALUATION OF SKILLS OR CONCEPTS
- TIP: WORK BACKWARDS FROM YOUR GOAL

Another Common Active Learning Experience...

Index Card Quick-Write:

Drawing Water

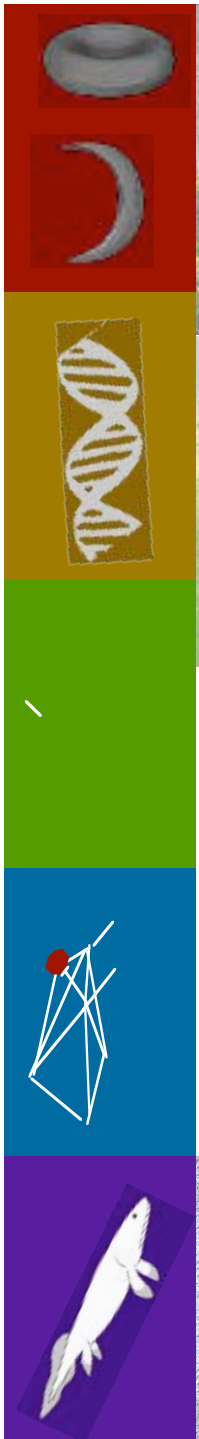
Draw a picture of the 3 water molecules in this water bottle on your index card.

Include any details about the structure of water molecules that you can remember!



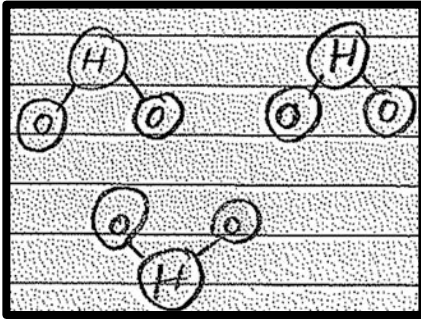
**We record your PARTICIPATION.
We do NOT grade you on your answer.**

**Be brave! Stand your ground! A big part of
THINKING LIKE A BIOLOGIST is being willing
to have different ideas than others.**

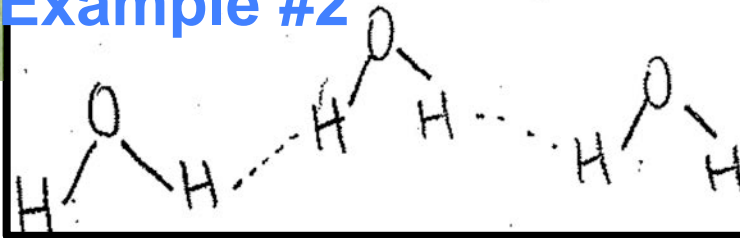


Another Common Active Learning Experience... Index Card Quick-Write: Drawing Water

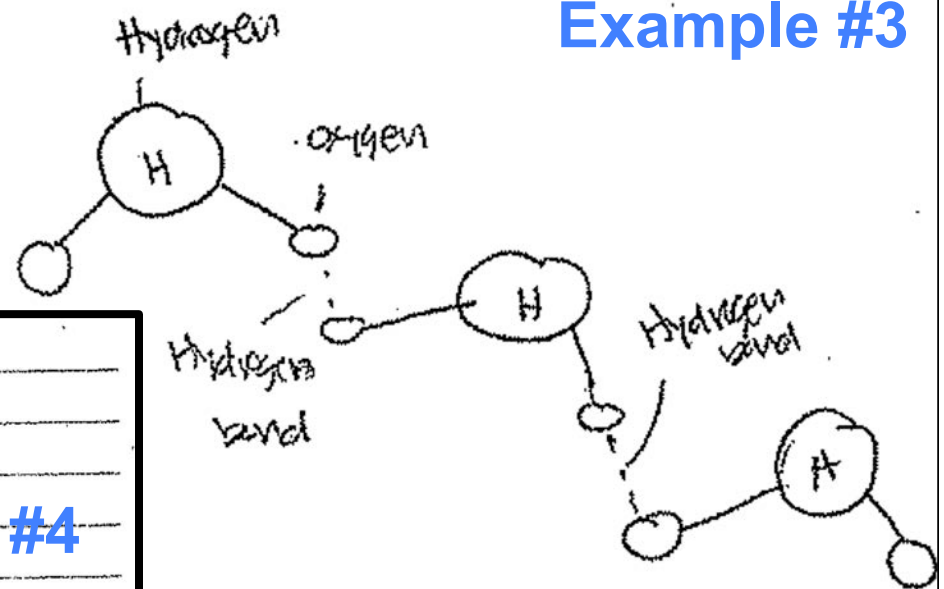
Example #1



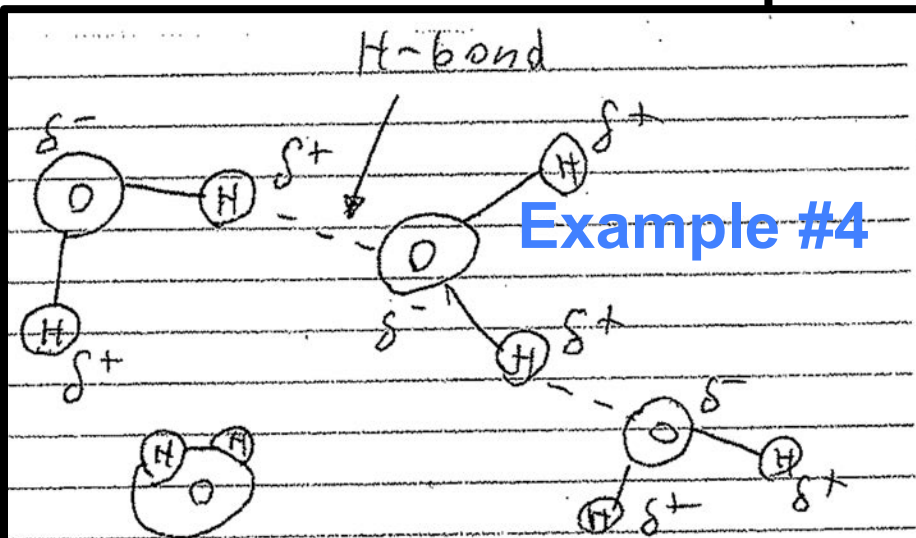
Example #2



Example #3



Example #4





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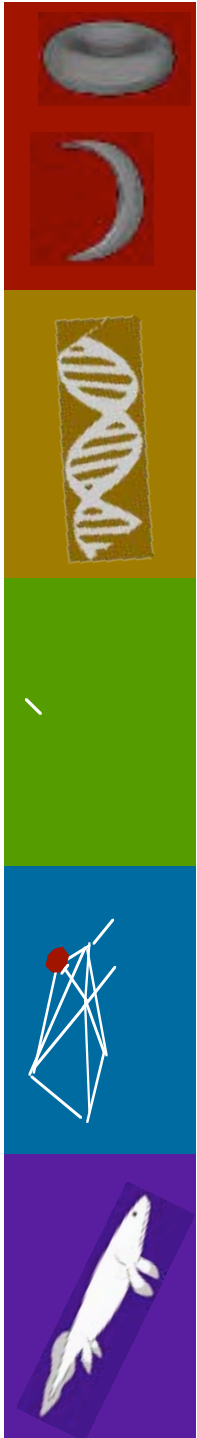
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Table Discussion: Experimenting with Active Learning

- What is one biological idea that you would like to know more about how your students are thinking before you teach them about that idea?
- In which course, could you most easily go and try the simple active learning strategies we've used today – **Index Card Quick-Writes and Pair Discussions?**
- What challenges do you anticipate in trying out these active learning strategies?

Strategizing Together about Potential Barriers to Active Learning



- ?
- ?
- ?
- ?
- ?
- ?



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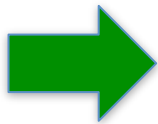
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Biology FEST:

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Looking Forward & Next Steps

Biology FEST Luncheon Workshops

Tuesdays, 12:30-2 pm, Spring 2013

*Topics to be chosen in part based on
your input right now!*

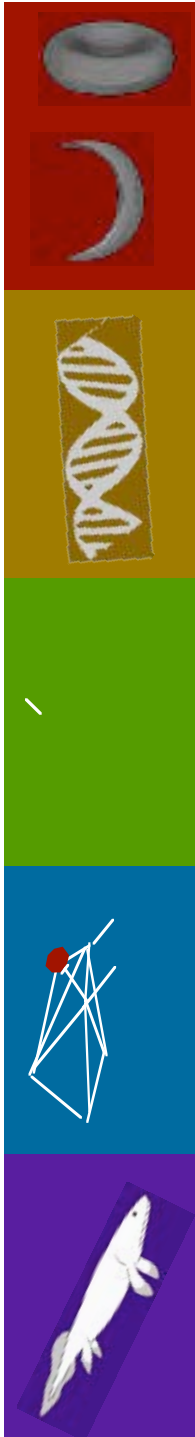
&

Biology FEST 2013 Summer Institute

Summer 2013

Dates for both to be announced in January!

...invitation and rsvp links will arrive in your email inbox...





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Reflection and Assessment

- On one side of an index card...
Will you go and use index cards as an active learning strategy in your classrooms in the next two weeks? Why or why not?
- On the other side...
What would you like to see as the focus of some of the Spring 2013 HHMI Biology FEST Workshops?

Anonymous!

Actual Experimental Results for The Radish Experiment...



A

1.46 g

B

1.63 g

C

1.20 g

Therefore, $B > A > C$

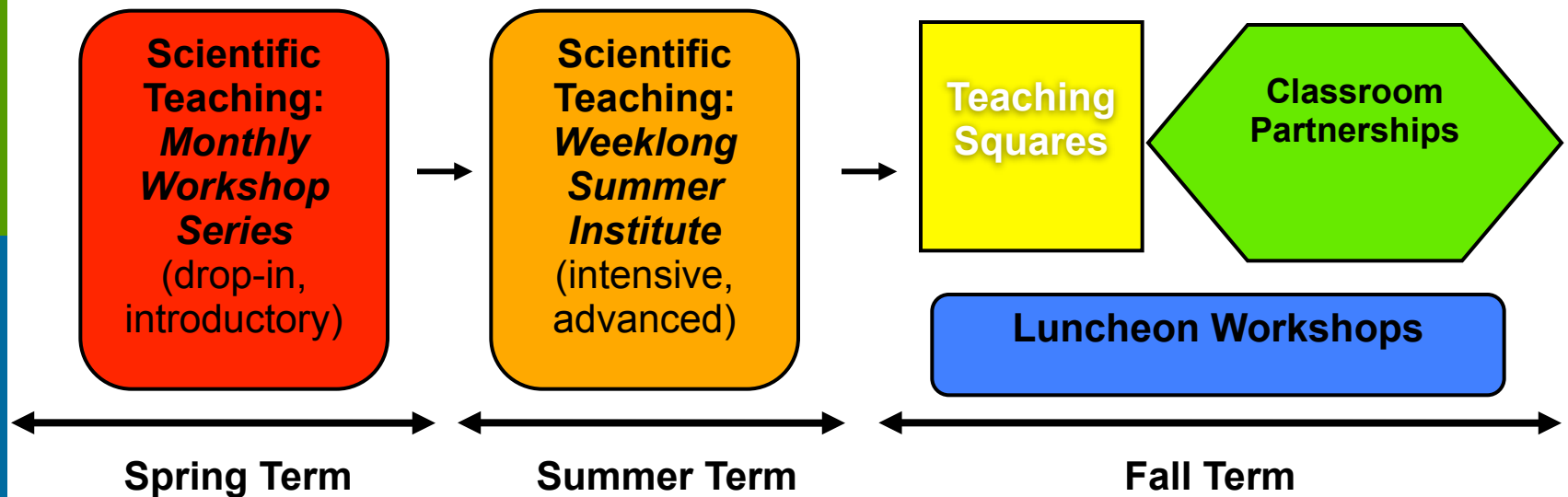
How well does the data align with your predictions?

What is happening here that you may have not considered
in making your initial predictions?

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Strategies to address our goals...

2. Provide multiple ways to participate...



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Opportunities to be Involved...

Please see
handout!

