Promoting Engagement in the (Sometimes Very) Large "Lecture" Classroom

Lori Kayes and Devon Quick

Session Outcomes

- Identify and discuss challenges and opportunities associated with teaching in the large lecture and for engaging students in this context
- Provide examples of strategies for promoting engagement in the large lecture classroom and evidence of success of different strategies for promoting engagement.
- Explain implementation tips utilizing strategies across a variety of classroom sizes.
- Describe ways to prepare students for success in the large lecture classroom

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Identify Challenges

(5 min)

- Discuss with your table:
  - What is the largest lecture you have ever given or attended?
  - What was the most successful teaching strategy in that lecture?
    - What made it successful?
  - What was the biggest failure in that lecture?
    - Why?

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Identify Challenges of the Large Lecture

(2 min)

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(2 min)

Identify Opportunities of the Large Lecture

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Student Engagement in the Large Lecture

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Why student engagement matters

- **Increase student performance**
  - **Students in active learning classes earn higher grades** compared to students in traditional lecture sections -enough to raise grades by half a letter.

- **Increase Retention**
  - **Students in lecture sections are 1.5 times more likely to fail**, compared to students in active learning classes

- Note: students who leave STEM bachelor's or associate's degree programs have GPA's 0.5 and 0.4 lower than persisters.

*Wenderoth, MP. End of the Lecture; the Future of Evidenced Based Teaching, OSU 2014.

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What is Active Learning?

1. Students are **involved** in more than passive listening
2. Students are **engaged** in activities
   (e.g., reading, discussing, writing)
3. **Less** emphasis on **information transmission** and
   greater emphasis on **developing student cognitive skills**
4. Student **motivation** is increased
5. Students receive **immediate feedback** from instructor
6. Students are involved in **higher order thinking**
   (analysis, synthesis, evaluation)

Bonwell, C.; Eison, J. (1991). *Active Learning: Creating Excitement in the Classroom AEHE ERIC Higher Education Report No. 1*. Washington, D.C.: Jossey-Bass. ISBN 1-878380-08-7.

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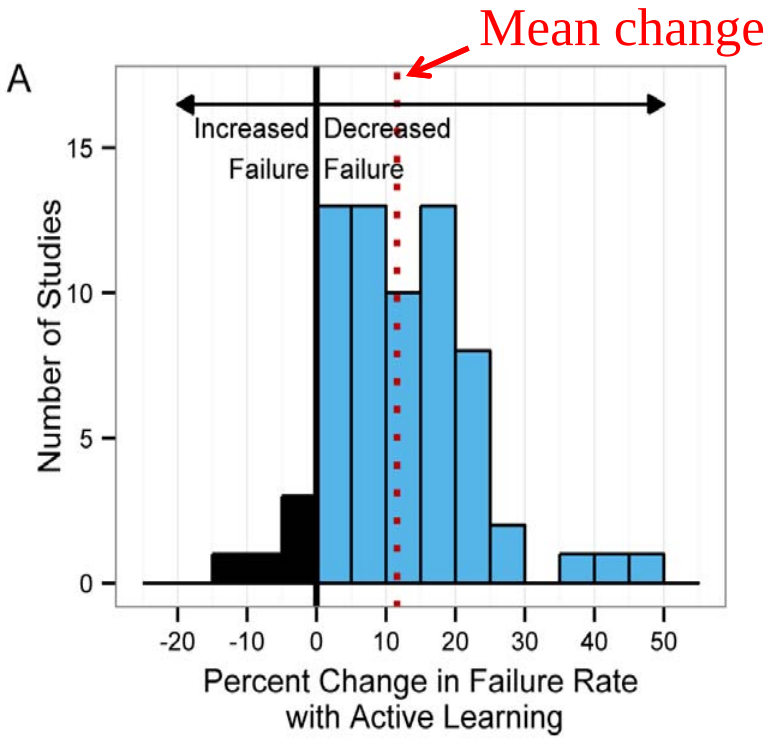
Active Learning Decreases Failure Rate

- Risk ratio = 1.5; **students in lecture are 1.5x more likely to fail**
- Average failure rate: active learning 21.8% vs. 33.8% for traditional lecture
- **55% increase in fail rate with traditional lecture**



*Scott Freeman, Sarah L. Eddy, Miles McDonoug, Michelle K. Smith, Nnadozie Okoroafor, Hannah Jordt, & Mary Pat Wenderoth. 2014 PNAS 1111(23): 8410-8415 www.pnas.org/cgi/doi/10.1073/pnas.1319030111

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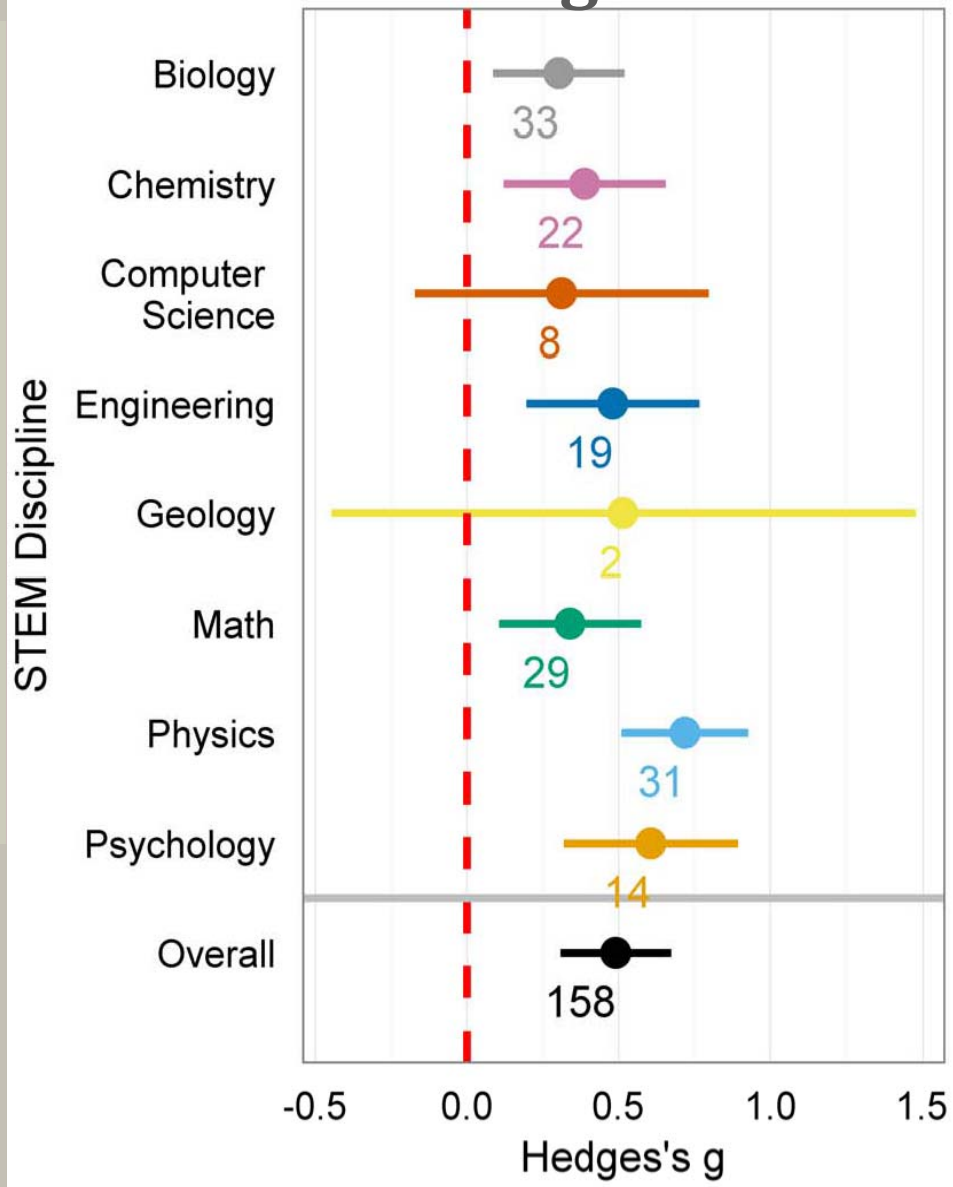
Active Learning Increases Exam Scores



- Overall effect size = 0.47 (**In K-12, 0.2 is large effect size)**
- Student performance with active learning **increased** by just under half a standard deviation

*Freeman et al. 2014.

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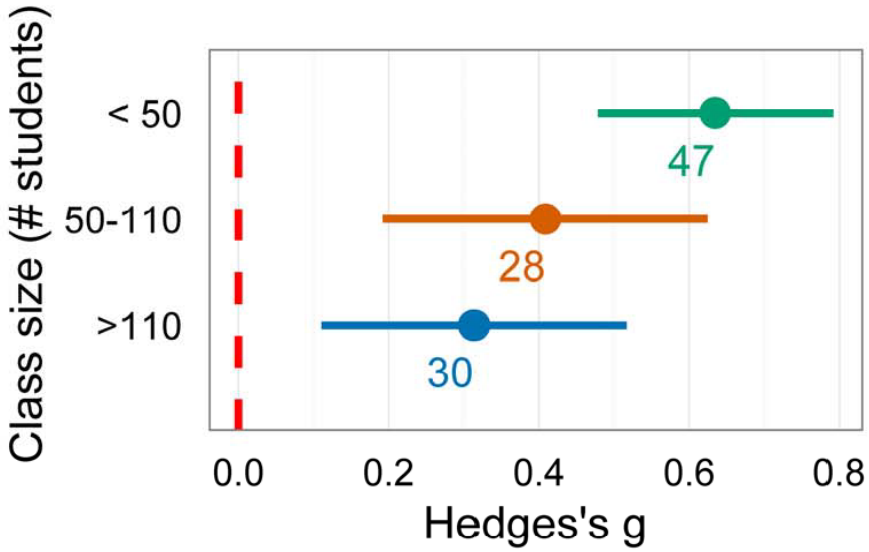
Exam Data by Class Size



Which of the following can you conclude from this graph?

1. Active learning only works in small classes
2. Active learning only works in large classes
3. Active works across a variety of class sizes

*Scott Freeman, Sarah L. Eddy, Miles McDonoug, Michelle K. Smith, Nnadozie Okoroafor, Hannah Jordt, & Mary Pat Wenderoth. 2014
PNAS 1111(23): 8410-8415 www.pnas.org/cgi/doi/10.1073/pnas.1319030111

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Examples from our Classroom

- Clickers
- POGIL
- Biological Data Interpretation

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Human Anatomy & Physiology

- A content heavy, 3-term, upper division sequence course that is required for those interested in most health care related fields.
- Is a large lecture (500-700 students each term) in auditorium classroom with balcony.
- Class meets 3x 50-minute lectures per week at 8 am all year long (10 week terms).
- Student population is consistent throughout year, but diverse:
- No prerequisites.

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Features of a POGIL activity

- Cooperative, self-managed teams of 3-4
  - Manager, recorder, reporter, reflector (consensus builder)
- A POGIL activity guide (explorative worksheet)
- Embedded activity includes development of process skills that are not dependent upon the facilitator

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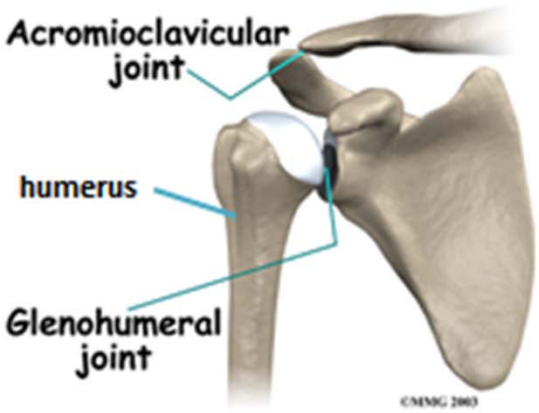
Anatomy and Physiology Active Learning Joint Activity

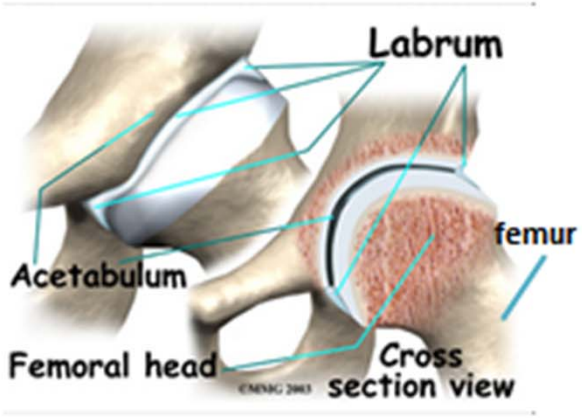
(5 min)

- Arrange yourself into groups of 3
  - Tallest person is the recorder; shortest is the manager; middle is the consensus builder
- Everyone gets a worksheet
- Talk through the questions with each other

Shoulder
(glenohumeral)



Hip
(femoracetabular)



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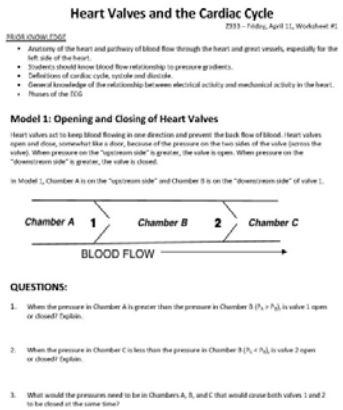
In Spring 2014, 24 LAs facilitated group work among 500 students in Milam Aud on Fridays



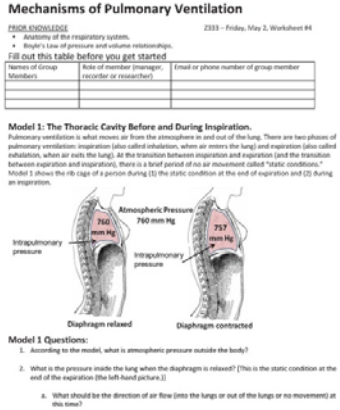
Heart Valves and the Cardiac Cycle

Model 1: Opening and Closing of Heart Valves

Chamber A 1 Chamber B 2 Chamber C

BLOOD FLOW

QUESTIONS:



Mechanisms of Pulmonary Ventilation

Model 1: The Thoracic Cavity Before and During Inspiration.

Atmospheric Pressure 760 mm Hg

Intrapulmonary pressure

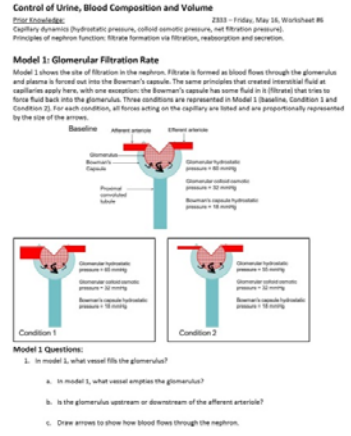
760 mm Hg

757 mm Hg

Diaphragm relaxed

Diaphragm contracted

Model 1 Questions:



Control of Urine, Blood Composition and Volume

Model 1: Glomerular Filtration Rate

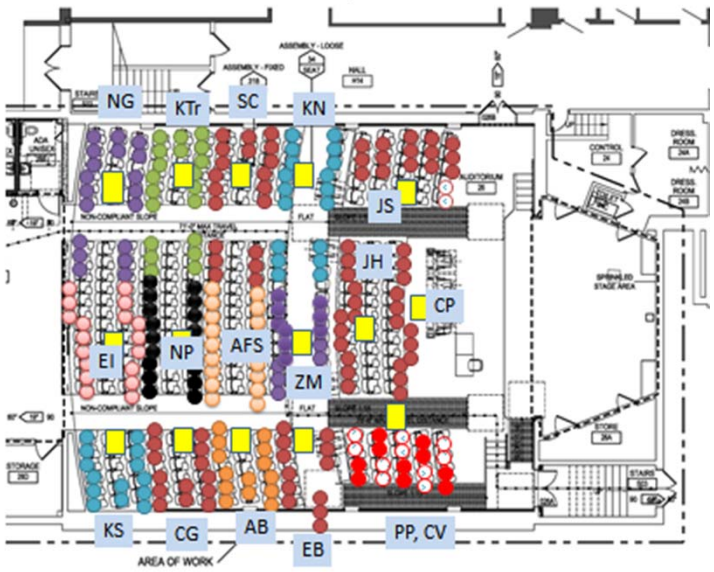
Baseline

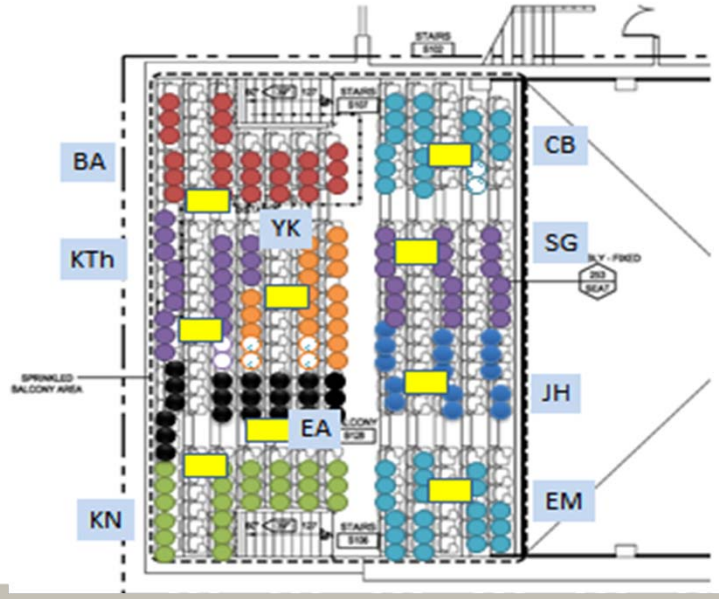
Condition 1

Condition 2

Model 1 Questions:

Nicole G.
Kaitlyn T.
Sam C.
Klare N.
Jana S.
Jacob H.
Caroline P.
Paige P.
Christina V.
Eric B.
Ambor B.
Crystal G.
Kathryn S.
Emily I.
Nik P.
Ariel F-S
Zach M.



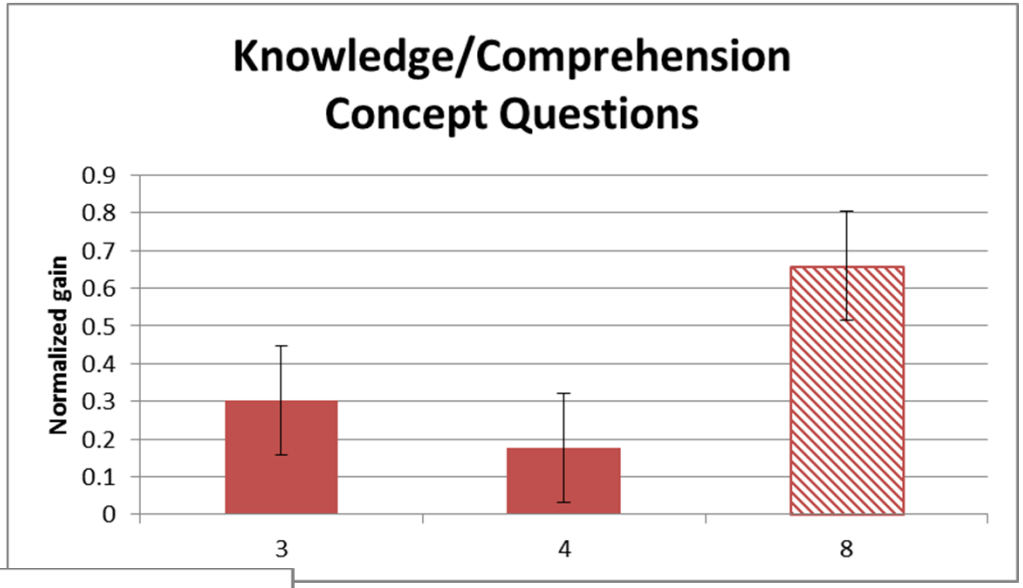


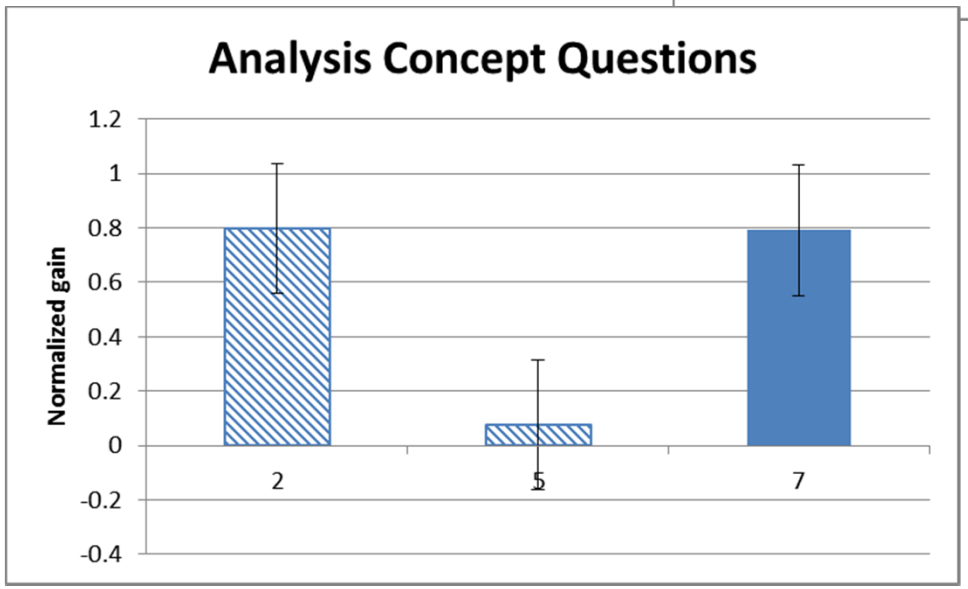
Charles B.
Shelby G.
Brittany A.
Kayla Th.
Emily M.
Josh H.
Youngheе K.
Eric A.
Karlee N.

Typical Friday Session (50 minutes)				
2 min	15-25	5-10 min	10-15 min	2-5 min
Intro-duction	Students work through first models on worksheet (timer shown on projector) as LAs facilitate & give feedback	Clicker questions & group discussion	Continue to work through worksheet as LAs facilitate & give feedback	Clicker questions, "sticky issues," final thoughts

Content Data From POGIL

- Concept questions





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Engagement Data from POGIL

- There was no change in engagement as measured by lecture attendance for the entire year cohort.
- There was no change in engagement as measured by on-line quiz participation.

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Provide Examples

- Clickers
- POGIL
- **Biological Data Interpretation**

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Principles of Biology

- Introductory biology course for life science majors at Oregon State University.
- Is a large lecture (1200 students split into 2 lectures) and lab (40-48 students/lab) course.
- Is team taught by 2 tenure-track faculty (1 each from the Botany and the Zoology Depts.) in five week segments.
- Perceived as a difficult, “weeding out” course by students.

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Active Learning

- Activity from Pearson “Practicing Biology”
- Students work on data interpretation using graphs
- Students must apply complex concepts of evolution to real data
- Short lecture in consequences of two similar species interacting in a hybrid zone – followed by data analysis activity

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Lecture 16: Speciation and hybridization

Themes

What are the causes of speciation?

What happens when species come in contact?

How do rates of speciation and extinction vary?

Readings

Chapter 24, sections 3-4 (pg. 498-504)

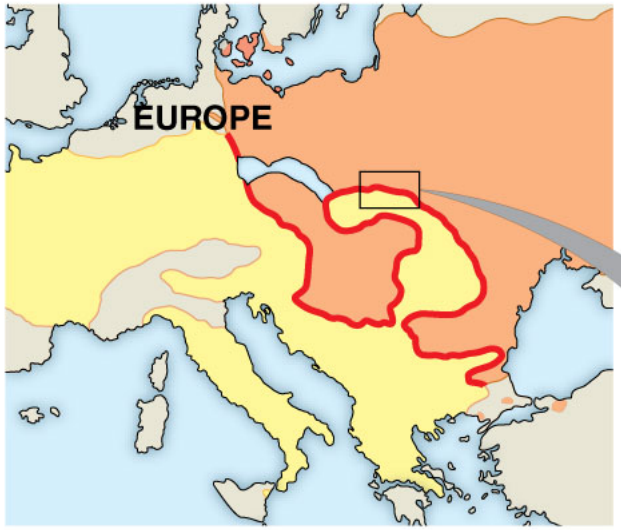
You should be able to:

Describe pre- and postzygotic reproductive isolating barriers and give an example.

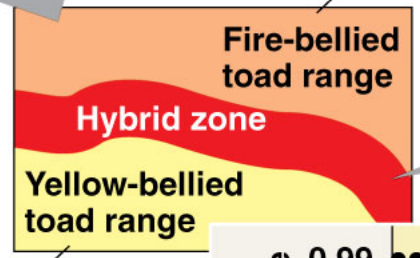
Describe the three outcomes if hybrids survive over evolutionary time.

Compare and contrast gradualism with punctuated equilibrium.

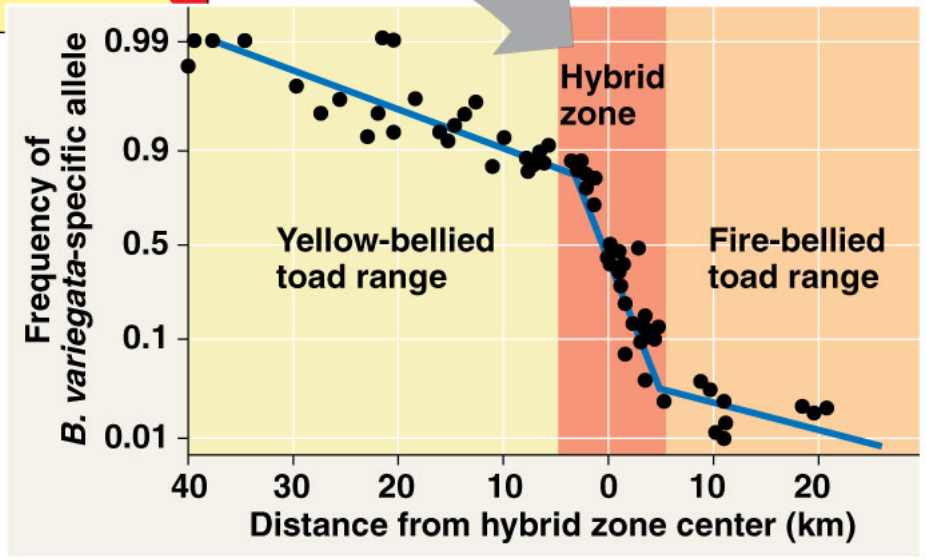
Describe the rate of speciation and some factors that affect this rate.



Fire-bellied toad, *Bombina bombina*

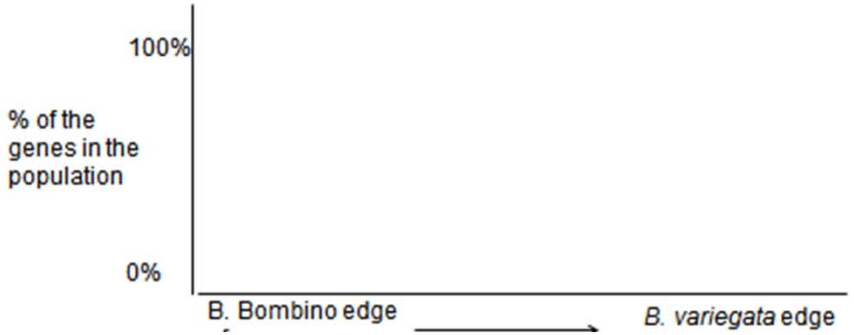


Yellow-bellied toad, *Bombina variegata*



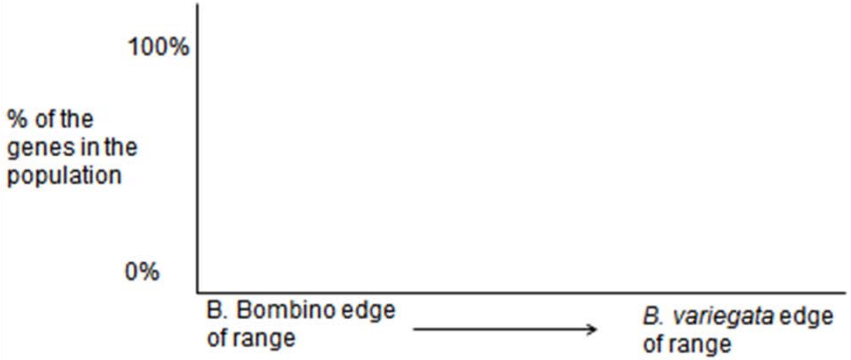
In Class Activity

1. Graph the percentage of each type of species specific genes present across the hybrid zone. Use an X to indicate *B. bombino* and O to indicate *B. variegata*.



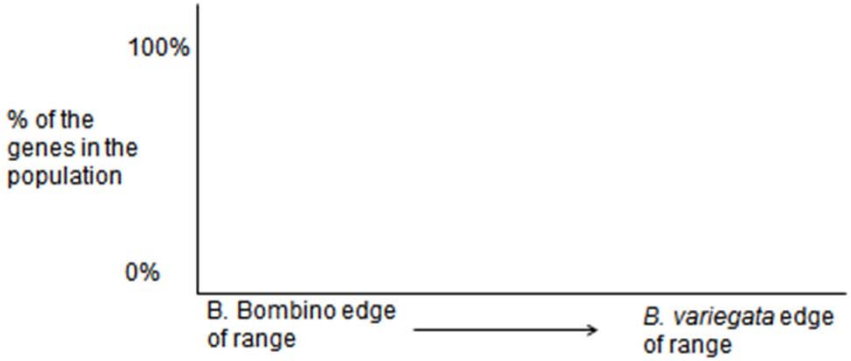
In Class Activity

- What would the graph from Bombino frog alleles look like over time if fusion were occuring?



In Class Activity

- What would the graph of alleles in the population of *Bombino* frogs look like if reinforcement were occurring?



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In Class Activity - Discussion

Is reinforcement or fusion more likely to occur if environmental conditions vary gradually across the species ranges such that on end of the range is, for example, much colder than the other. Explain.

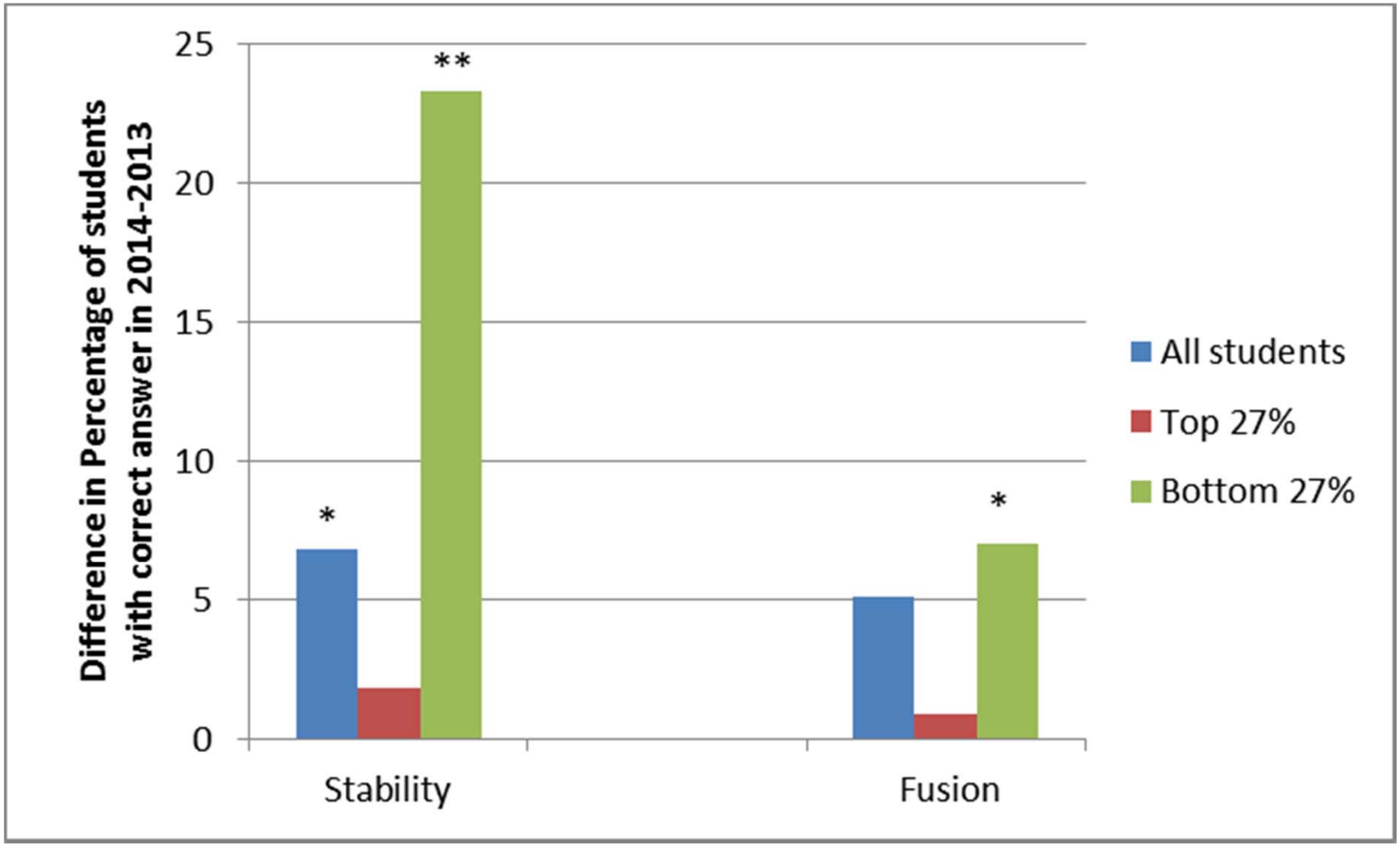
Is reinforcement or fusion more likely to occur if all environmental conditions are very similar across the species ranges. Explain.

Clicker Question Follow-up

Is reinforcement or fusion more likely to occur if environmental conditions vary gradually across the species ranges.

A. Reinforcement

Exam Improvement from 2013 to 2014



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Wrap-up Discussion

(5 min)

- If you do active learning in your class, what do you do?
- What does it look like when your students are engaged?
- How would you implement/facilitate this type of activity?

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Implementation Tips

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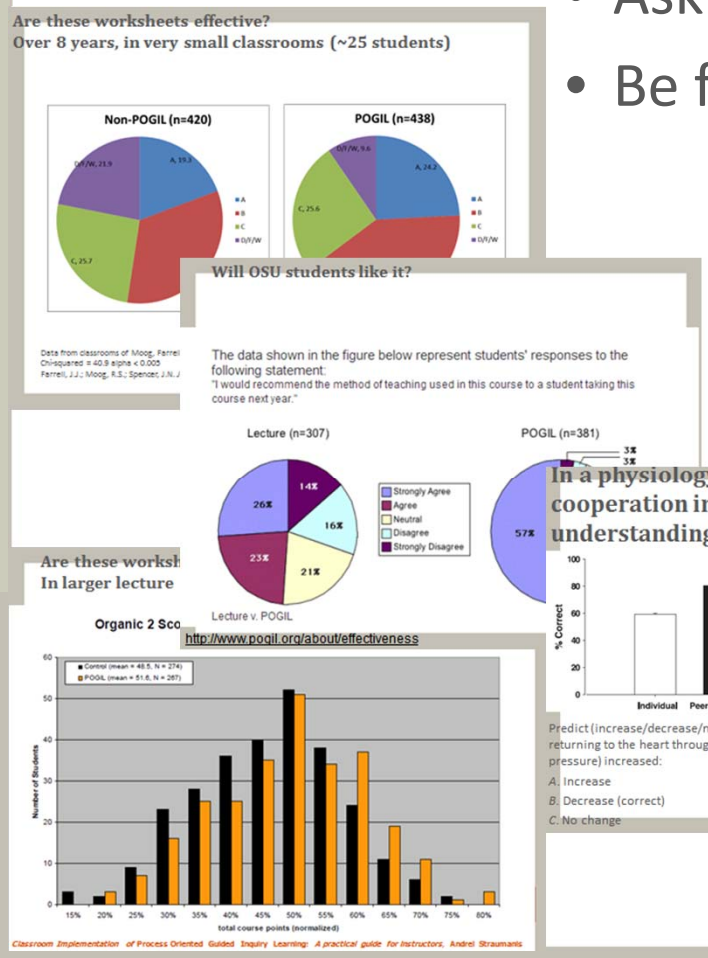
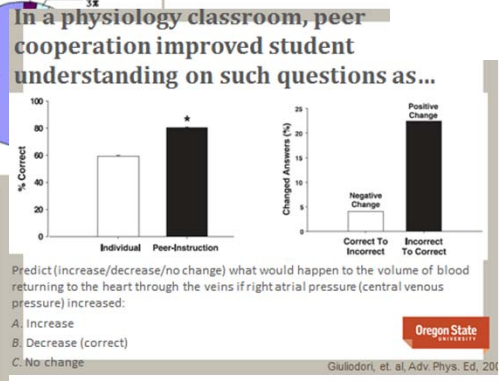
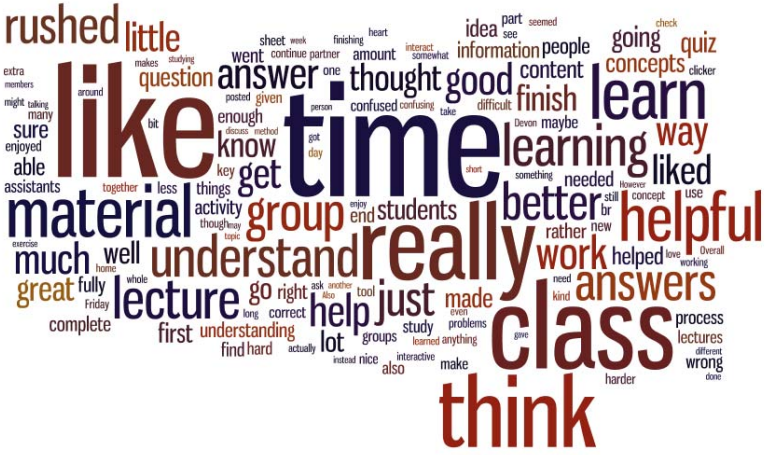
Our Implementation Tips

- Show students the data to get their buy-in
- Ask for their feedback
- Be flexible







Our Implementation Tips

- Start small
- Start with resources as available
- Hold students accountable
- Watch other people
- Reflect on what worked
- Peer evaluations
- Find like minded colleagues
- Discuss with administration to get buy-in and support

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How to prepare students

- Show them the data
- Give them support
- Connect session (What is the large lecture experience)

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How to be Successful in a Large Lecture

Thursday, September 25, 2014

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Goals of the session

- Introduce unique characteristics of large lectures
- Discuss strategies for success

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I am used to my teacher knowing me, or at least knowing my name

MORE OR LESS

NOT REALLY

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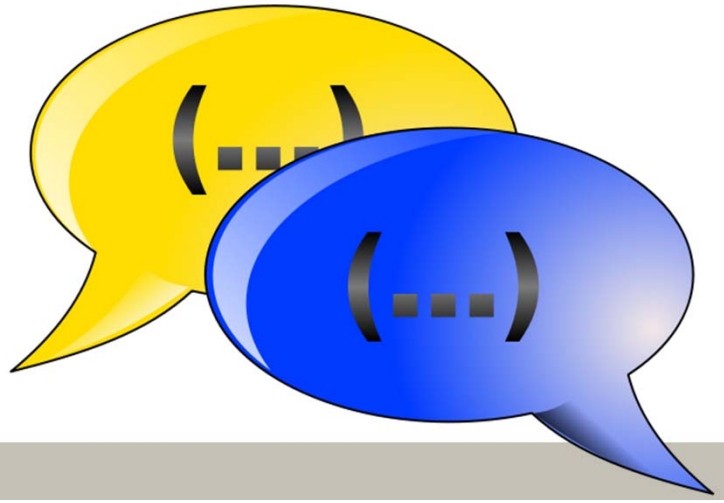
I am used to my teacher knowing me, or at least knowing my name

1. Compare your response with someone nearby
2. Identify ways you think you can be "known" by your instructors



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Strategy #2 - Interact with instructors and GTAs

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Conclusion

- Identify and discuss challenges and opportunities associated with teaching in the large lecture and for engaging students in this context
- Provide examples of strategies for promoting engagement in the large lecture classroom and evidence of success of different strategies for promoting engagement.
- Explain implementation tips utilizing strategies across a variety of classroom sizes.
- Describe ways to prepare students for success in the large lecture classroom

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Resources for Active Learning Activities

General Resources

- Merlot (http://www.merlot.org/merlot/index.htm)
- National Center for Case Study Teaching in Science (http://sciencecases.lib.buffalo.edu/cs/)
- POGIL (https://pogil.org/)
- Learning Assistant Resource Site (https://sites.google.com/a/colorado.edu/la-resources/)

Biology specific

- Pulse Community (http://www.pulsecommunity.org/page/active-learning)
- TIEE (Teaching Issues and Experiments in Ecology; www.esa.org/tiee/)
- EcoEd Digitial Library (http://ecoed.esa.org/index.php?P=Home)
- http://iclimate.org/ccc/index.asp
- Summer Institute Teachable Tidbits (http://cst.yale.edu/teachable-tidbit-general-categories)
- Thinking like a biologist (http://www.biodqc.org/dqcs)

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Thank you!!

Questions?

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