Highlights from the 2015 WCSE Conference

Theme: Gather + Create + Improve
July 2015

Kirsten Poling, Tanya Noel, and Julie Smit
University of Windsor

What would **you** hope to get out of a science education conference?

- Take a minute or two to think about this on your own, and jot down some ideas.

If you haven't done so already, be sure to introduce yourself to your neighbours!

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- Talk to the person next to you – share your ideas.

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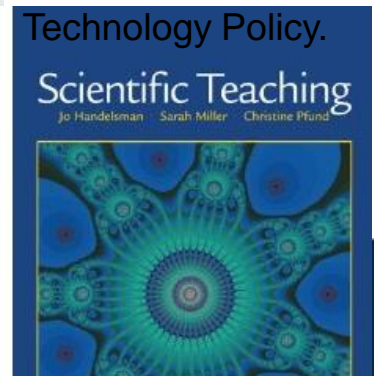
- Survey of ideas in the room.

Carl Wieman
Nobel prize winning Physicist, science education researcher/advocate. Served as White House's Office of Science & Technology Policy Associate Director of Science.

A Wakeup Call for Science Faculty

Bruce Alberts[1,*]
[1]Department of Biochemistry and Biophysics, University of California, San Francisco, CA 94143, USA
*Contact: balberts@ucsf.edu
DOI: 10.1016/j.cell.2005.11.014

By changing the way we teach the introductory science courses in our colleges and universities, we can attract many more talented students to science careers. At the same time, we will be fostering positive public attitudes about science that are critical for a successful modern society.

THE UNIVERSITY OF BRITISH COLUMBIA

CWSEI — Carl Wieman Science Education Initiative at the University of British Columbia

Bruce Alberts
Biochemist, advocate for science/math education, served as Editor-in-Chief of Science, one of the first three United States Science Envoys, and was president of NAS.

Jo Handelsman
Microbiologist, educational researcher, current Associate Director for Science at the White House Office of Science and Technology Policy.

Scientific Teaching
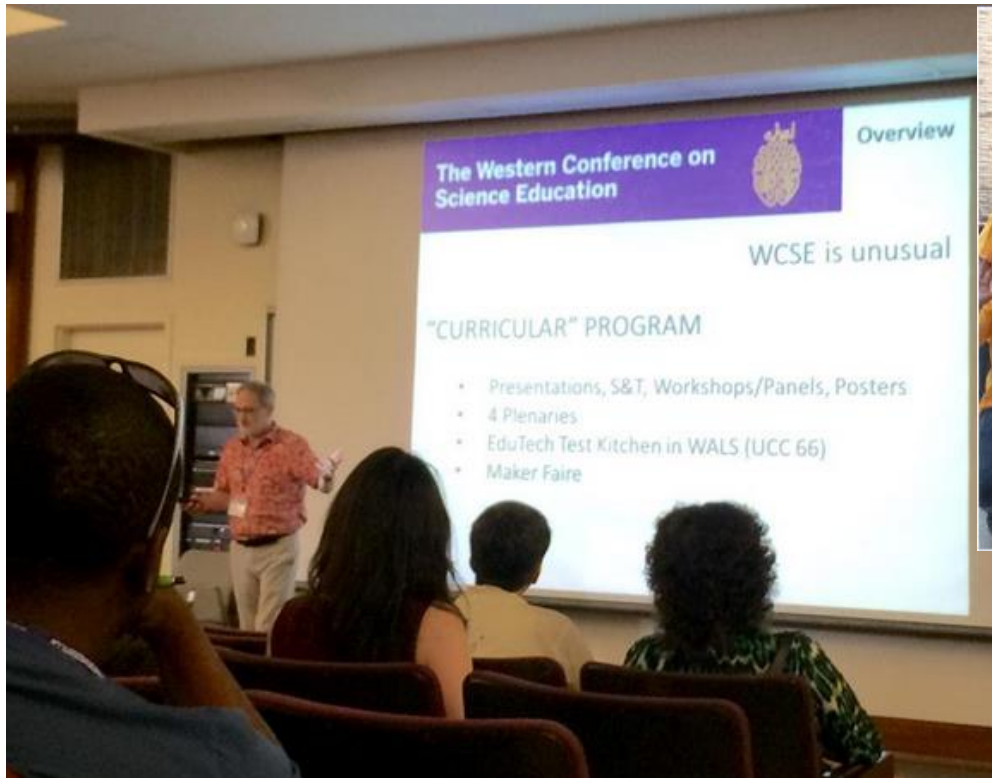Jo Handelsman · Sarah Miller · Christine Pfund

Key messages:
- Use of evidence-supported practises in teaching and learning.
- Helping students to learn to think like scientists.
- Discovering/publishing/sharing what works.

The Western Conference on Science Education
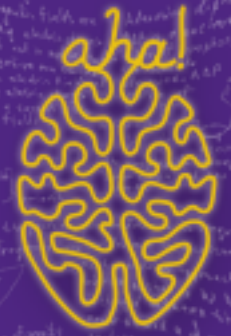
Collaboration on post-secondary issues. Across disciplines. Across Canada.

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2015 program:
http://ir.lib.uwo.ca/wcse/WCSEFifteen

In this session we will:

- Provide examples/activities for incorporating into your course:
    - "Making" & gamification
    - Card sorting
    - 2-stage exam
    - Other possibilities

Maker fair: Original "Maker Faire" event created by "Make" magazine to "**celebrate arts, crafts, engineering, science projects & the Do-It-Yourself (DIY) mindset**".

Keynote: Kylie Peppler "Make-to-Learn: Broadening Participation and Deepening Learning Through Making"

- Increasing youth (particularly female) STEM participation by using e-textiles (new, cross-disciplinary technology involving embedded computers/electronics in fabrics – fusion of computing/engineering and fabric/needle arts).

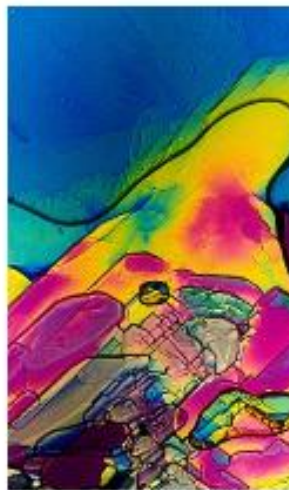- Hands-on approach improves learning outcomes for all students.

BevShots
art. distilled.

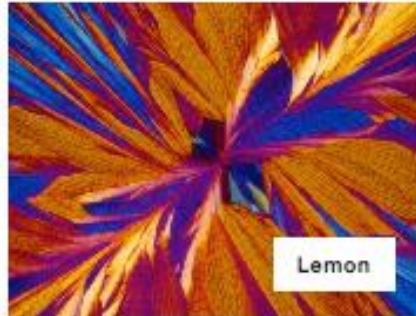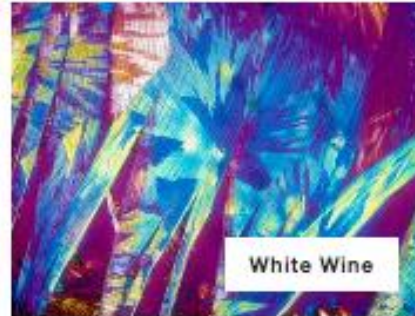ALL   BEER   COCKTAIL   LIQUOR   MIXER   NEW   POPULAR   WINE
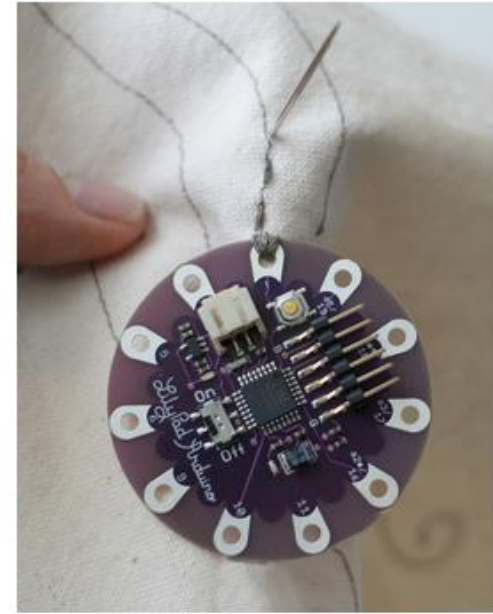
Belgian Lambic

Rosé

Long Island Iced Tea

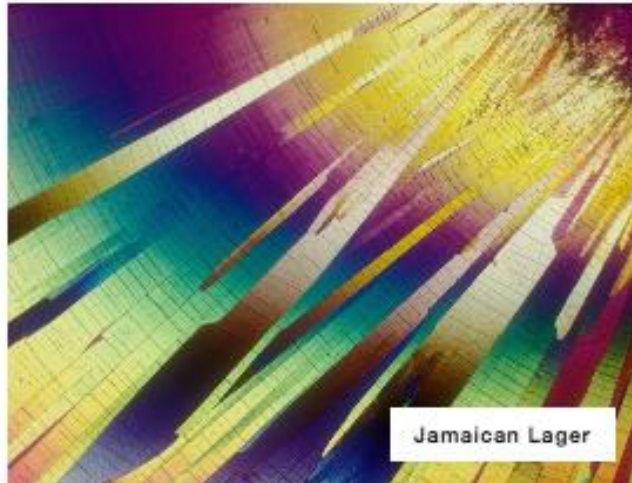Lemon

White Wine
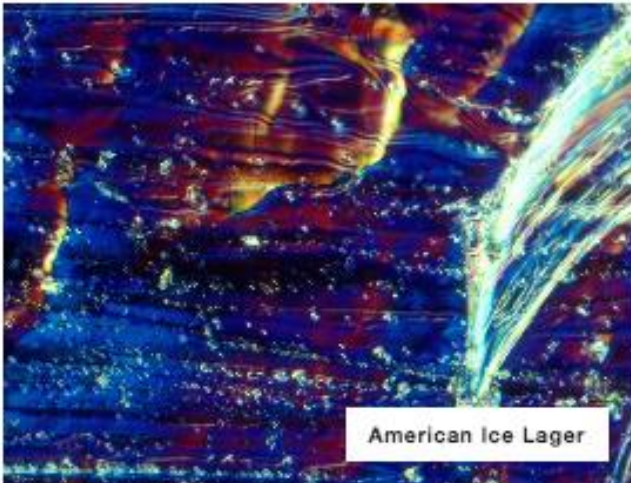
American Ice Lager

Jamaican Lager

http://www.bevshots.com/gallery/

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Gamification & "The Game" at WCSE2015

- Gamification – bringing in game elements to course activities to increase engagement, motivation.

At WCSE, our game involved:

- Teams
- Clues (accessed in different ways).
- Scavenger hunt.
- Augmented reality
- Finding & talking to gatekeepers (experts).
- Visiting buildings (including finding specific book in library), rooms.

References for some recent literature on gamification in higher ed STEM courses in handout.

Layar – Augmented Reality

By Layar B.V.

Open iTunes to buy and downl...

Close   WCSE Test

Tanya Noel @TCNoel · Jul 10
Success! @_petewhite_ & I made it! #WCSE2015

Fiona Rawle @FRawle · Jul 9
@WestConf #WCSE2015 yay next clue!

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Understanding the structure of students' knowledge:
Kimberly Tanner plenary session

- "Normal" assessments tell you how well students remember pieces of information

- Research has shown that linking concepts is more difficult (Smith et al. 2013, Smith and Good 1984, Chi et al. 1981)

- "Thinking like a scientist" involves linking together a lot of different concepts and fields

How do your students think?

- We know that students struggle with connections, so how can we see if our students are linking things together?

- We can look at where they are on a continuum

Novice—surface learning   Expert—deep learning

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Your chance to test your knowledge

- In your team, open your envelope and sort your pieces of paper

- The only guidelines are that…

  - each statement must belong to only one group

  - your team must have at least 2 & less than 9 groups

  - you must decide on a name for each group that reflects why you put them together



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How did you sort?

Expert

Novice

How to apply this to your courses

- Consider the difference between how novices and experts think in your field

- Give students a sorting task based on some key principles and connections

- This will give you an idea of how they think and where connections may be missing

- Then explicitly model what the expert thinking really is to help them make those connections

My adaptation for Animal Cells + Tissues
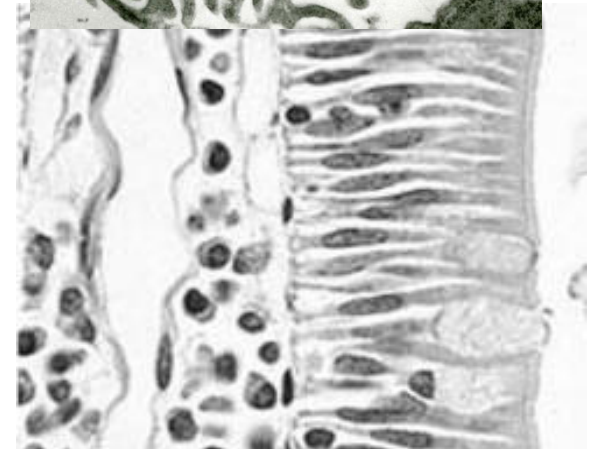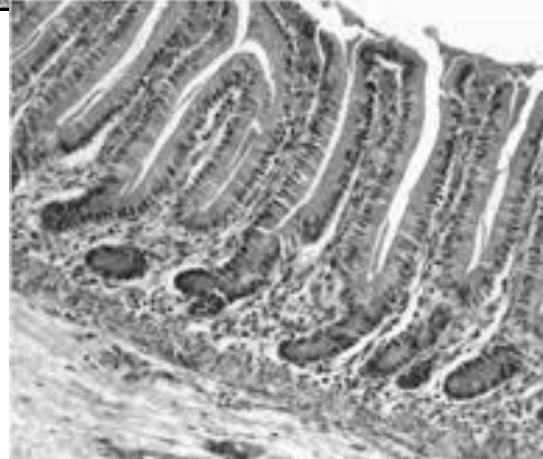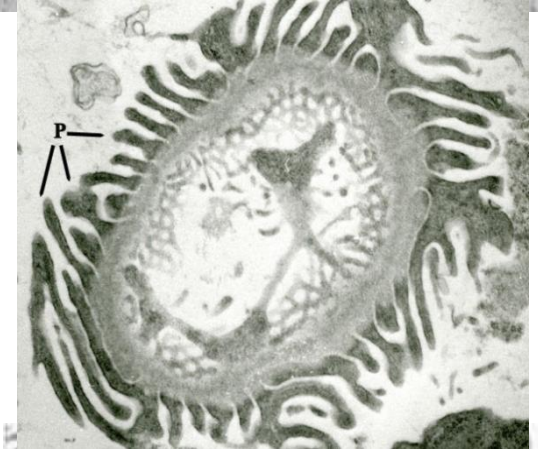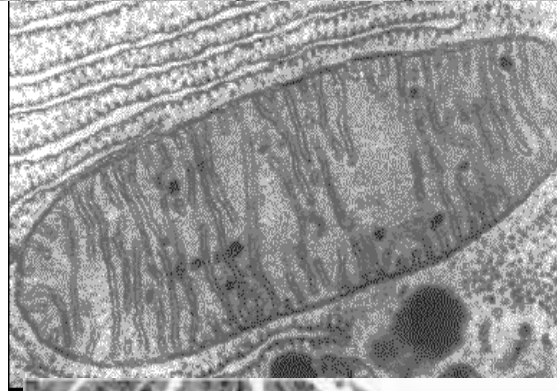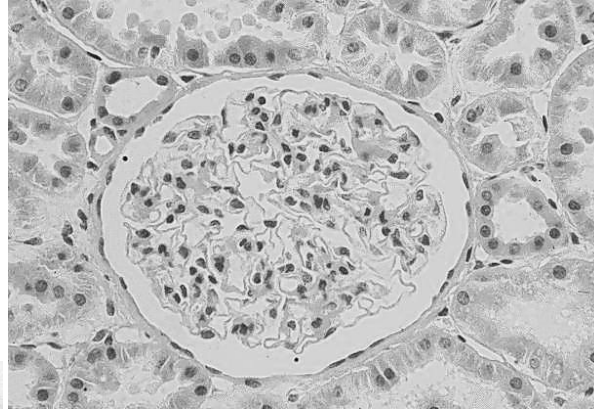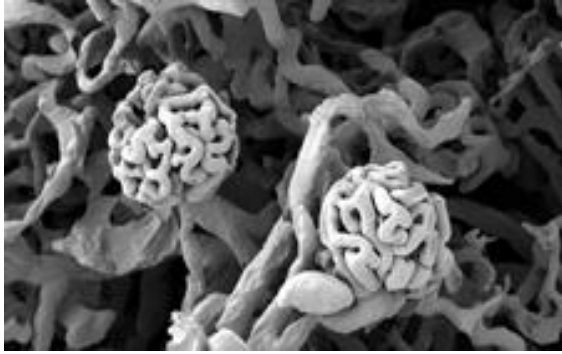
Two-stage exam

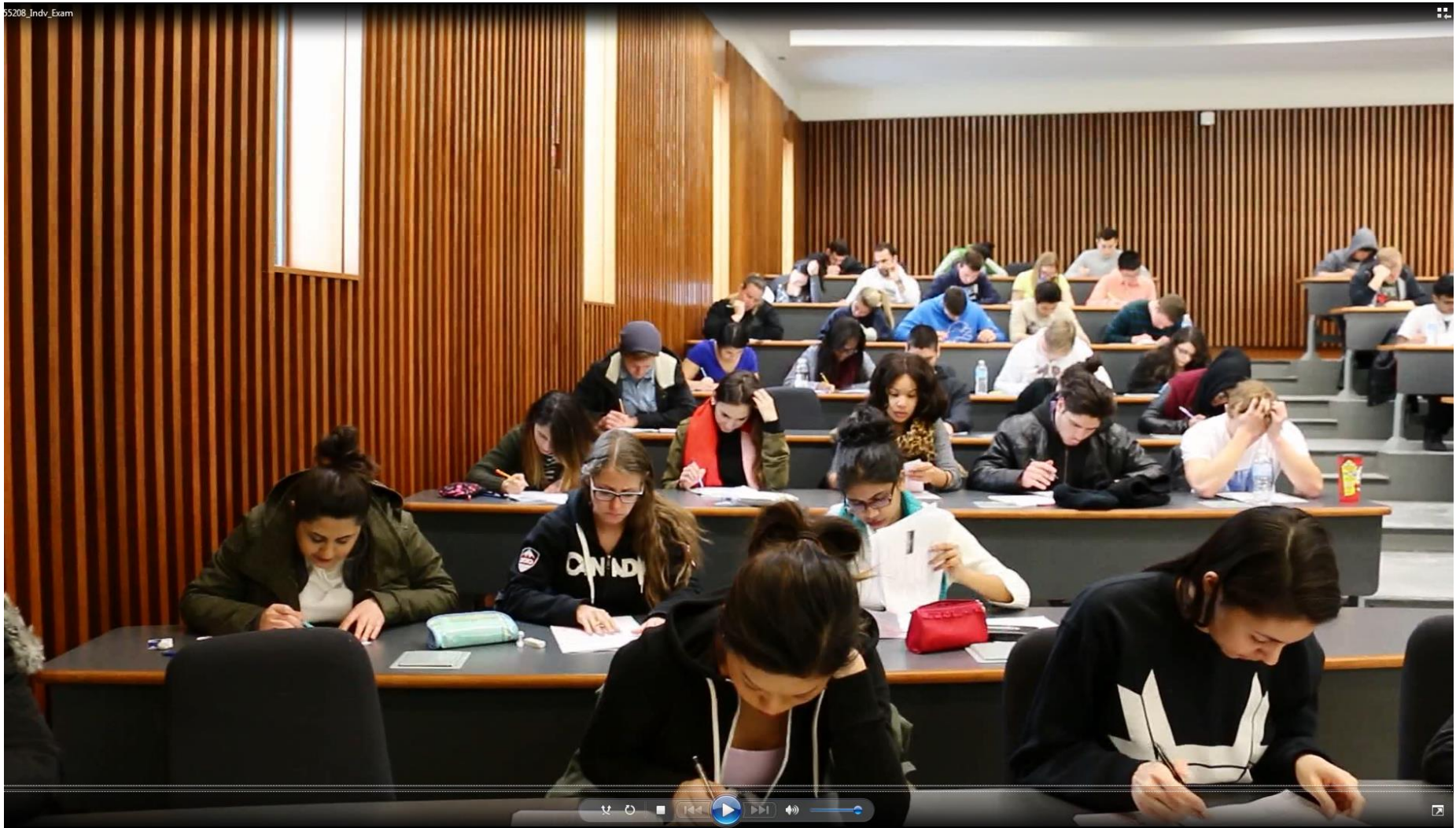- What is it?

- Evidence for using it?

McCurdy, T.R., P.B. Helli, and K. Volterman. Creating and solidifying knowledge by incorporating feedback into group-based, two-stage collaborative exams.

- What do students think of it?

- Would you want to use it?

- Taking it one step further ….

Stage 1 – Individual Test

Two-Stage Exam

1 - Students write an individual exam

… then …

2 – Students write the same (or similar) exam in a group

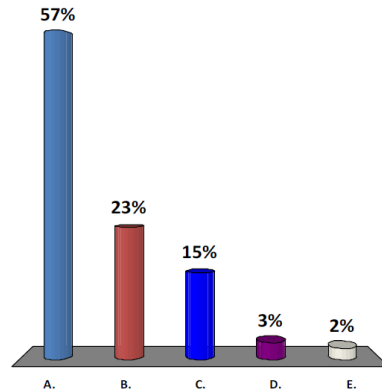# Changeover: Stage 1 to Stage 2

Stage 2 – Group Exam

# What did students think of the 2-stage Exam?

Clicker Feedback

After Midterm 1:

I prefer completing a two-step test over the usual individual exam.

A. Strongly agree
B. Agree (prefer two-step testing)
C. Neutral (feel same about both types of testing)
D. Disagree (prefer individual testing)
E. Strongly disagree

57% 23% 15% 3% 2%
A. B. C. D. E.

I felt I better understood course material after completing the **group** test.

A. Strongly agree
B. Agree
C. Neutral
D. Disagree
E. Strongly disagree

48% 25% 14% 5% 7%
A. B. C. D. E.
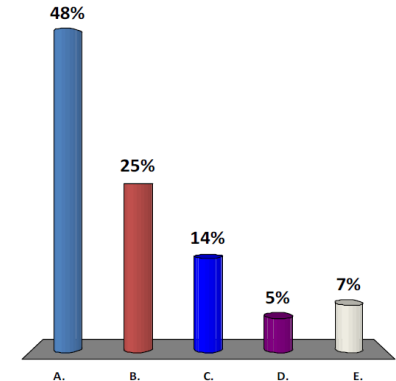
After midterm 2: (similar results)

81%	Agree or Strongly Agree	75%
11%	Neutral,	14%
8%	Disagree or Strongly Disagree	10%

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Other options (additions)?

Use in tutorials and review sessions:

Kelly, T. and F. Rawle. A tale of two classes: Student and instructor perceptions of two-stage tutorials in introductory genetics classes.

Maxwell, E.J., L. McDonnell, and C. Wieman. An improved design for in-class review based on collaborative two-stage testing.

Other materials:

- mini-whiteboards
- IF-AT cards

IF AT Cards

Summary of great things about WCSE

- Welcoming environment for discussing stumbling blocks and attempts

- You can always bring home great ideas to incorporate into your courses

- You can learn from internationally scholars as well as from connections with more local colleagues

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Questions

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