

Thermo Virtual Community of Practice (VCP)



Session 4: Instructional activities – Part 1: Interactive learning techniques

April 24, 2013

John Chen
California Polytechnic State University
jchen24@calpoly.edu

Milo Koretsky
Oregon State University
milo.koretsky@oregonstate.edu

Tentative Agenda



- Introductions, Objectives ~ 10 min
- Active Learning ~ 5 min
- Peer Instruction ~ 5 min
- Evidence for active learning ~ 15 min (group)
- Types of Active Learning ~ 5 min (group)
- Group polling and discussion ~ 10 min
- Wrap-up and next week ~ 10 min

Team Flow



Ganesh
Balasubramanian
Iowa State



Jeff LaMack
Milwaukee School
of Engineering



Melissa Pasquinelli
North Carolina State



Georg Pinggen
Union



Nastaran Hashemi
Iowa State

Team Energy



Nihad Dukhan
Detroit Mercy



Calvin Li
Villanova



Krishna Pakala
Boise State

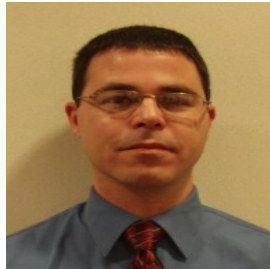


Hessam Taherian
Alabama at Birmingham



Robert F Richards
Washington State

Killer Watts



Jamie Canino
Trine



Heather Dillon
Portland



Edwin Wiggins
Webb Institute



Joseph Tipton
Evansville

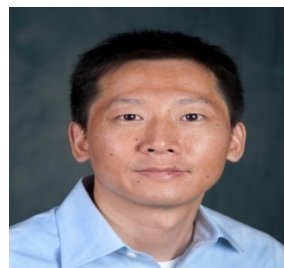
Team Green Engineering



Margot Vigeant
Bucknell



John O'Connell
Virginia



Zihua Xu
Minnesota Duluth



Sapna Sarupina
Clemson

TdS



Sooby Bhattacharjee
San Diego State



Ashland Brown
Pacific



Betta Fisher
Cornell



H. S. Udaykumar
Iowa

Team Cycle



John Chen
California Polytechnic



Milo Koretsky
Oregon State



Sadi Carnot
École Polytechnique

Objectives



- Define active learning and identify different active learning techniques
- Understand the scientific evidence for the use of active engagement pedagogies

Please individually ...

- in your own words, define “active learning”.

ACTIVE Learning includes

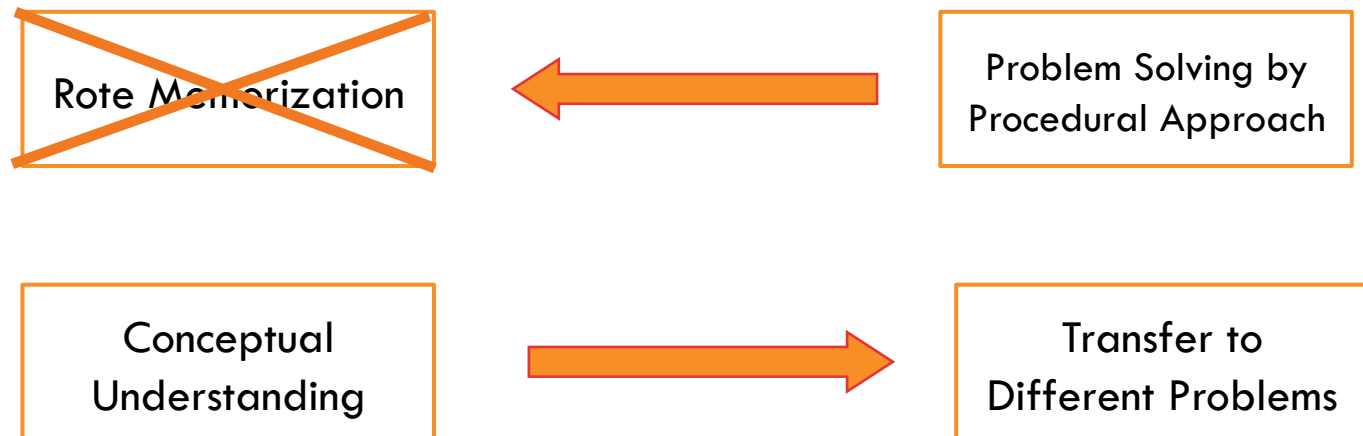
- all class activities where students do something and think about what they are doing.

Active **LEARNING** is useful since ...

- “learning is not a spectator sport. Students do not learn much just by sitting in class listening to teachers, memorizing prepackaged assignments, and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, apply it to their daily lives. They must make what they learn part of themselves.”

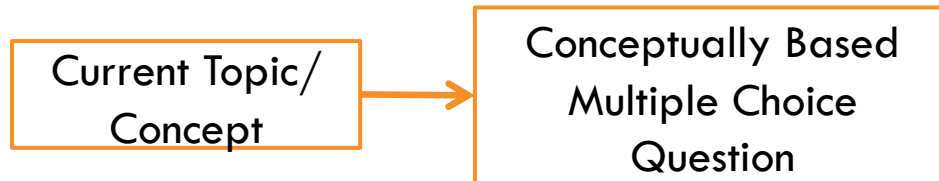
Chickering & Gamson., 1987, Seven principles for Good practice.

Why Concept Based Learning?



Students are more likely to develop conceptual understanding when learning through **Active Learning**

An example: Peer Instruction



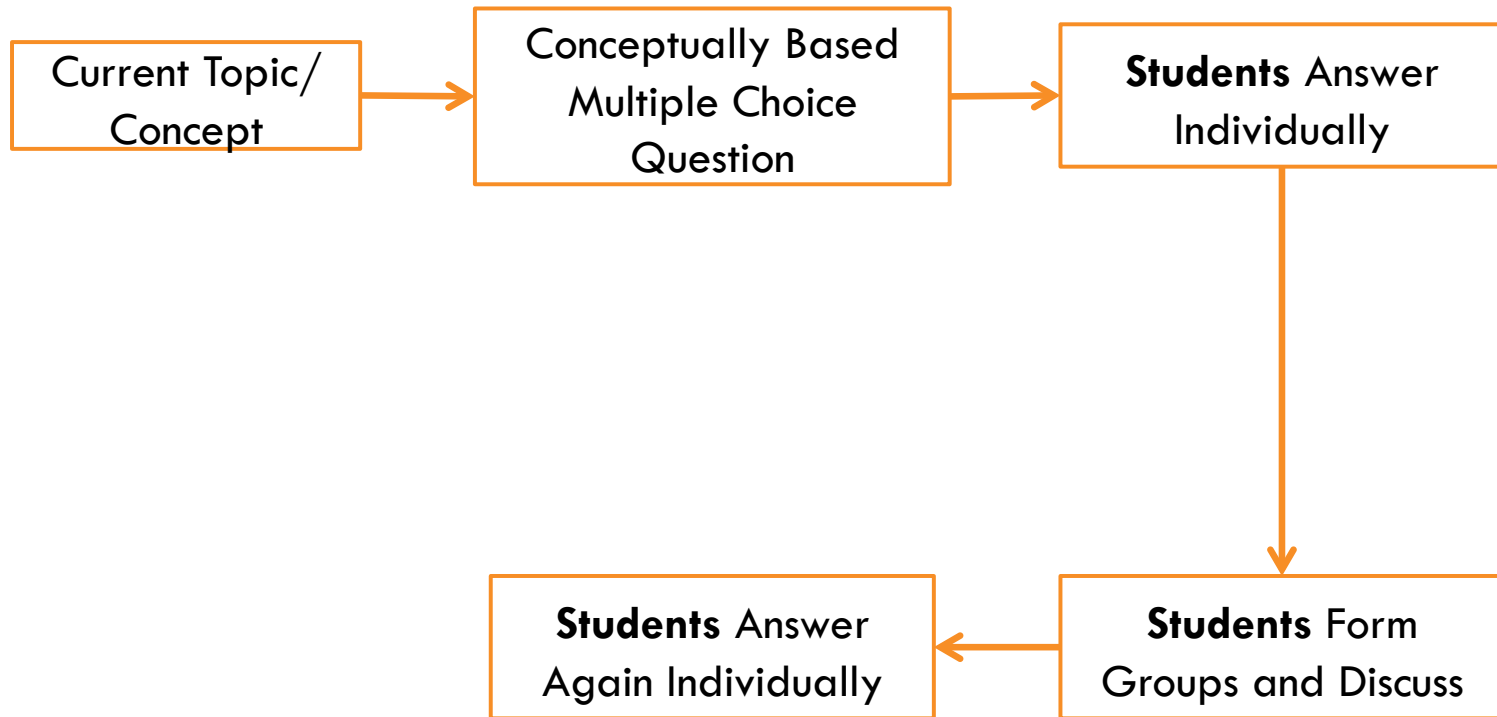
Example – as suggested last week

Entropy of freezing water

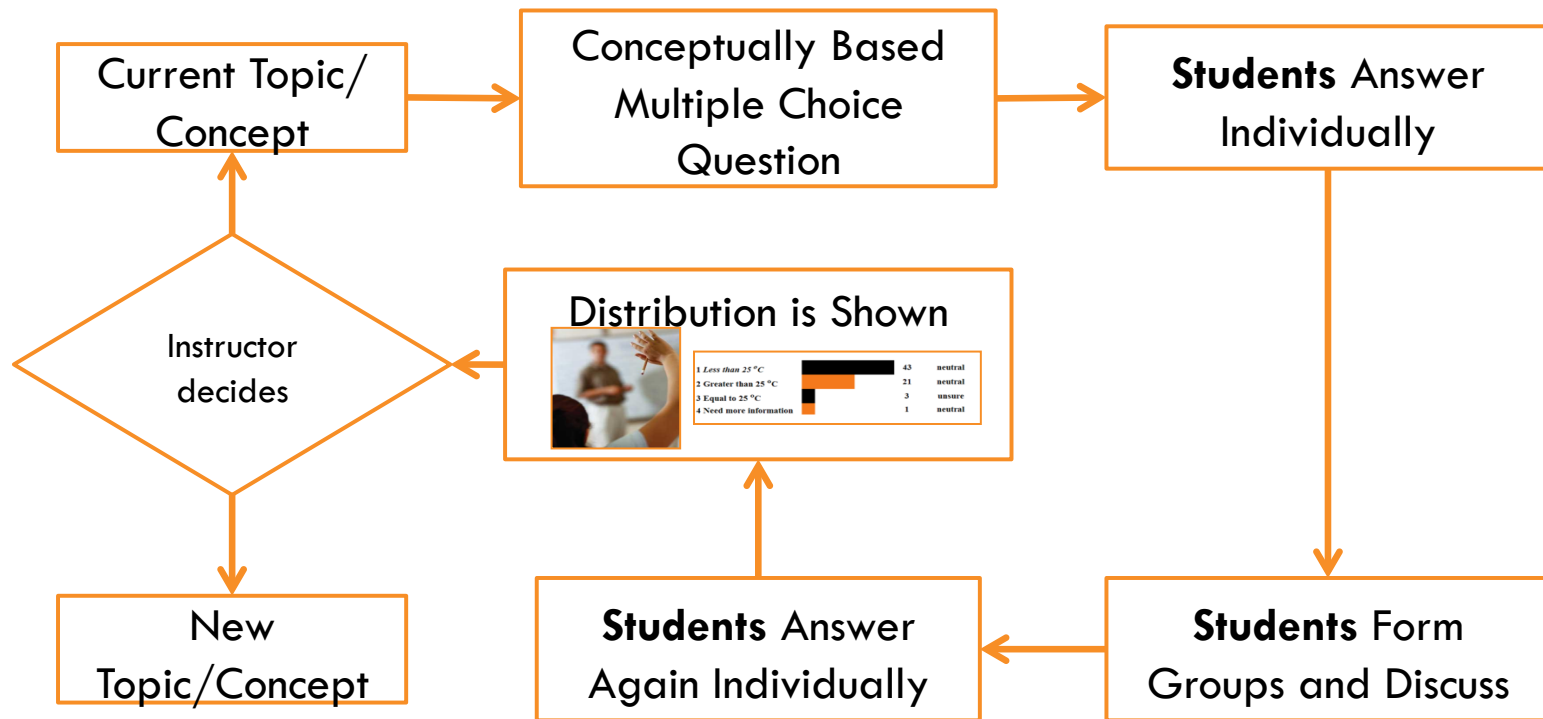
Consider a process where liquid water undergoes a reversible, isothermal process where it freezes to form ice. For this process, how does the entropy of the system change?

- The entropy of the system increases
- The entropy of the system stays the same
- The entropy of the system decreases
- You cannot tell

Peer Instruction



Peer Instruction



Why not try a Scientific Approach to Science Education?

“We really need to approach teaching science and engineering like astronomy not like astrology”

- ▣ Looking at what research tells us
- ▣ Carefully measuring things
- ▣ Not just relying on tradition

Carl Wieman

(Former Associate Director for Science, Office of Science and Technology Policy for Barack Obama & Nobel Laureate in Physics)



Evidence for impact of active learning

- Each VCP team summarize your assigned paper
 - Green Engineering Improved Learning in Large-Enrollment Physics Class, Deslariers, et al. *Science* (2011)
 - Tds Why Peer Discussion Improves Student Performance on In-Class Concept Questions, Smith et al. *Science* (2009)
 - Team Flow Increased Structure and Active Learning Reduce the Achievement Gap in Introductory Biology, Haak et al. *Science* (2011)
 - Killer Watts Interactive-Engagement vs. Traditional Methods: A 6000 Student Survey of Mechanics Test Data ... Hake, *Am. J. Phys.* (1998)
 - Team Energy Physics Learning with Audience Paced Feedback, *Am. J. Phys.* (1998)

Active Learning Pedagogies

- Peer Instruction
- Jigsaw Activity
- Think-Pair-Share
- Thinking-Aloud Pair Problem Solving (TAPPS)
- Minute Paper
- Muddiest Point

Group Questions and Discussion

- Short answer question - what active learning pedagogies do you presently use?
- Short answer question - Identify any active learning pedagogies that you would like to learn
- Group discussion what barriers there might be to active learning

For Session 5: May 1, 2013

- Activate your “Student Account” in the Concept Warehouse. You can follow instructions in an email titled “[Thermo_VCP] Concept Warehouse Registration Information” Check your junk mail if you don’t see it! Answer the question that is assigned for “homework.” (Instructions in the Week 5 folder)
- Read Idea Paper #53 Active Learning Strategies in Face-to-Face Courses (Available in the Week 5 folder)
- Identify ONE active learning pedagogy that you plan to implement next time you teach thermo or ONE of the active learning pedagogies that you currently use that you really like) Describe it in the Blog:
<https://aseevcp.asee.org/?q=thermovcp/blog>
- Update your syllabus based on VCP this far with track changes – incorporate an active learning strategy or two.

More Resources on Active Learning

- *Supplemental Reading in week 5 folder:*

Teaching and learning in the interactive classroom (D.U. Silverthorn);

Using Active Learning in the Classroom

Planning active learning (this is a worksheet)

Does Active Learning Work? A Review of the Research (Prince)

- Website References:

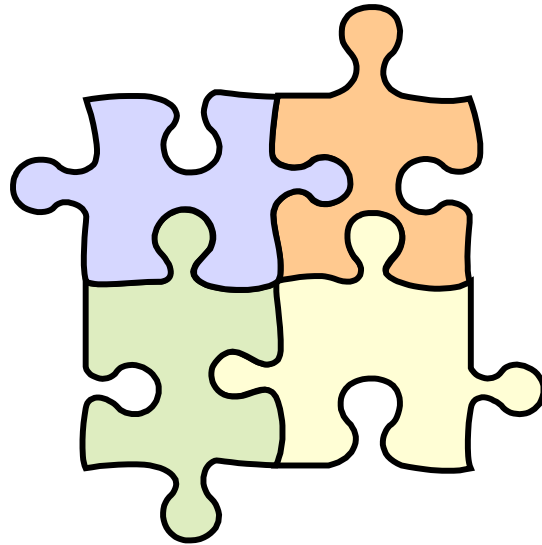
www1.umn.edu/ohr/teachlearn/tutorials/active/recommendations/index.html

[http://derekbruff.org/?](http://derekbruff.org/?p=2570&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+tomprofblog+%28Tomorrow%27s+Professor+Blog%29)

[p=2570&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+tomprofblog+%28Tomorrow%27s+Professor+Blog%29](http://derekbruff.org/?p=2570&utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+tomprofblog+%28Tomorrow%27s+Professor+Blog%29)

Jigsaw Activity

- What we just did



Active Learning Pedagogies

- Jigsaw Activity
- Minute Paper where students write a short paragraph that summarizes their understanding of a key concept
- Think-Pair-Share, a problem or question is presented; students then discuss solutions or answers in small groups, and lastly, selected groups report-out to the whole class followed by discussion, elaboration, or clarification by the instructor.
- Muddiest Point