

Thermo Virtual Community of Practice (VCP)



Session 5: Instructional activities – Part 2: Interactive learning techniques

May 1, 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
- Peer instruction mock run ~ 10 min
- Participants' reflections vs. lecture ~ 5 min
- Concept Warehouse tour ~ 15 min (group)
- Bucknell Inquiry based activities ~ 5 min (group)
- Silverthorn tips for active learning ~ 5 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

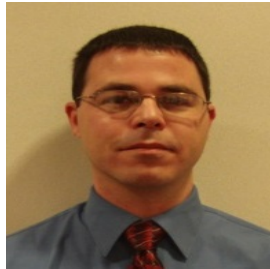


Hessam Taherian
Alabama at Birmingham



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



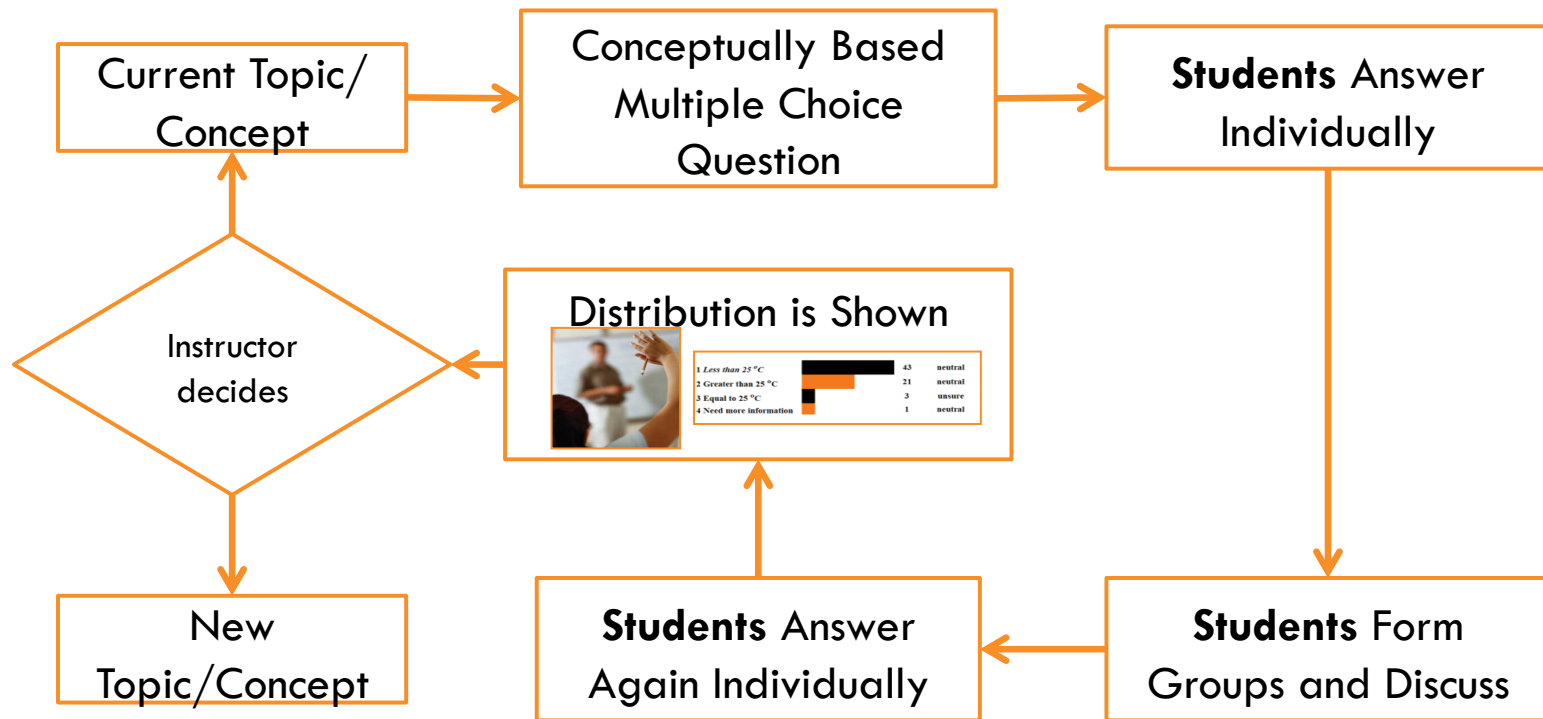
Sadi Carnot
École Polytechnique

Objectives



- Experience one active learning technique “as a student” and reflect on this experience
- Identify resources for ConcepTests, concept inventories, and inquiry-based activities

Peer Instruction – Mock Run



Peer Instruction Discussion

- You just experienced Peer Instruction as a student. What are your thoughts about how this type of learning experience compares with “traditional” lecture

Constructive Alignment (CA)



1. All assessments should address one or more pre-formulated learning objectives;
2. Summative assessment of a skill should be done only after adequate practice and feedback in the skill has been provided in class activities and assignments;
3. If a learning objective is important, be it analytical, critical or creative thinking, writing or speaking, or anything else, it should be assessed. The assessment drives the learning.

Richard Felder (*Technical Teaching*)

Concept Tests and Concept Inventories

Type	Assessment	Question Grouping	Quality
Concept Tests	Formative	Single question or set of single questions	Various
Concept Inventories	Summative	An instrument with many linked questions	Valid & Reliable

Concept Warehouse – quick tour

HOME CONCEPTS CONCEPT INVENTORIES CLASSES PROFILE

ABOUT SEARCH MANAGE TESTS STATISTICS

Fugacity	✓ 76.9 %	70-10,8,3	Confident	91 Ans/92 Stu
Melting temperature of a mixture	✓ 72.5 %	66-13,8,4	Neutral	91 Ans/92 Stu
Melting temperature of a mixture	✓ 53.3 %	49-21,13,9	Unsure	92 Ans/93 Stu
Original Throttling Valve	✓ 20.6 %	20-70,7	Neutral	97 Ans/97 Stu

An ideal gas flows steadily through the piping system and valve shown below. The inlet pressure and temperature are P_1 and T_1 and the pressure drops through the valve to a lower value, P_2 .

Assuming the valve is well insulated and inlet and outlet pipes connected to the valve are the same diameter, what is the relationship of the outlet temperature T_2 to the inlet temperature T_1 ?

$T_2 > T_1$ because work is done on the gas as it is compressed through the valve opening

$T_2 < T_1$ because temperature must decrease if pressure decreases since the volume and number of moles both stay the same

$T_2 = T_1$ because rapid expansion of an ideal gas does not affect temperature

Can't answer unless the type of gas flowing is specified

Original Throttling Valve

An ideal gas flows steadily through the piping system and valve shown below. The inlet pressure and temperature are P_1 and T_1 and the pressure drops through the valve to a lower value, P_2 .

Assuming the valve is well insulated and inlet and outlet pipes connected to the valve are the same diameter, what is the relationship of the outlet temperature T_2 to the inlet temperature T_1 ?

$T_2 > T_1$ because work is done on the gas as it is compressed through the valve opening

$T_2 < T_1$ because temperature must decrease if pressure decreases since the volume and number of moles both stay the same

$T_2 = T_1$ because rapid expansion of an ideal gas does not affect temperature

Can't answer unless the type of gas flowing is specified

✓	Answer(s)	Explanation	Confidence
✓	$T_2 = T_1$	The explanation given is sufficient	5
✗	$T_2 < T_1$ because temperature must decrease if pressure decreases since the volume and number of moles both stay the same	T_2 must be lower than T_1 , using the ideal gas law, if Pressure drops then so must the temperature since the number of moles and volume stays the same.	5
✗	$T_2 < T_1$ because temperature must decrease if pressure decreases since the volume and number of moles both stay the same	since this is an ideal gas, the reasoning is correct in that since the moles stay the same, and T is directly proportional to P in the ideal gas law, T must also decrease.	4
✓	$T_2 = T_1$ because rapid expansion of an ideal gas does not affect temperature	$\Delta H = q + w = 0$. Since $\Delta H = C_v \Delta T = q + w$ and q is zero and I think w is zero, ΔT is zero.	4



Concept Warehouse: in-class or homework

- ▣ Online with cell phones, laptops, and clickers



- ▣ Download in Microsoft PowerPoint and Word



AIChE
Education Division
**CONCEPT
WAREHOUSE**



Inquiry Based Activities

- Carnot Engine Cycle:
http://www.facstaff.bucknell.edu/mvigeant/Thermo_JS/Carnot/Carnot-Engine.html
- Piston Cylinder Model:
http://www.facstaff.bucknell.edu/mvigeant/Thermo_JS/Piston/cycle-modeler.html
- Reversibility of Mixing:
http://www.facstaff.bucknell.edu/mvigeant/Thermo_JS/Mixing/Mixing.html
- Pump Reversibility:
http://www.facstaff.bucknell.edu/mvigeant/Thermo_JS/Pump_Reversibility_edit/pump-reversibility.html
- Cough Drop Dissolution (Steady State vs. Equilibrium):
http://www.facstaff.bucknell.edu/mvigeant/Thermo_JS/Steady_State/steadyState.html

Blog Review

milo.koretsky@oregonstate.edu [Home](#) > [Groups](#) > [Thermodynamics VCP](#)

Blog

[+ Create content](#)

[View](#) [Edit](#) [Track](#) [Subscriptions](#)

Active Learning Activities

Please add a comment to this thread where you identify ONE active learning pedagogy that you plan to implement next time you teach thermo (or if you are completely satisfied identify the active learning pedagogies that you use)

milo.koretsky@o...
9:33am Mon Apr 22

[Print](#) [Print entire section](#)

[Close comment thread](#)

#1

Jamie Canino
6:21am Yesterday

Last time I taught thermodynamics I tried the “flipped classroom” model, where I recorded lectures using screencasts from my computer and then had the students do worksheets in class. I can say that I had mixed results due to many different factors. One of which might be that the class was not truly active learning. If you are interested you can read about my experiences in an ASEE regional conference paper (http://ilin.asee.org/2013/index_files/canino2.pdf) .

Recent comments

The in-class activity that I have used in several courses is similar to the one described by Sapna. I pose a problem related [Active Learning Activities](#)

I also use the fill-in-the-black notes idea. I had a few professors over the years who did that so once I became a professor I wanted [Active Learning Activities](#)

I have used this technique with undergraduates in teaching Fluid and Heat Transfer. I plan to use this every time I am tea

Dee Silverthorn tips for active learning

- ❑ Define your goals and objectives
- ❑ Start small and don't change too many things at once.
- ❑ Tell your students what you're doing and why, and **KEEP TELLING THEM**
- ❑ Provide students with tools to help them change
- ❑ Match the assessment to your teaching style, goals, and objectives.
- ❑ Have the right attitude.



Thoughts about Fall

- The intent is to continue in some form this fall
 - ▣ Is this time good (poll)
 - ▣ Ideas for what we should do and the frequency that we should meet

For Session 6: May 8, 2013

- Read the cooperative learning handout developed by Karl Smith available in the week 6 folder
<https://aseevcp.asee.org/?q=thermovcp/node/383>
- Review the Myers Briggs type Indicator
<http://web.cortland.edu/andersmd/learning/mbti.htm>
<http://www.myevt.com/teamdev/building-your-teams-type-table>
- Identify ONE hint for using teams in class or ONE thing you struggle with and post it on 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.