Teachable Tidbit, Part 2: Making a Content Element Active

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Tidbit = part of one class = content

Your goal: Turn that into a class experience

Step 1. Identify the content area
Step 2. Pick a key concept or skill
Step 3. Articulate learning goal for students (objective)

Step 4. Develop activity for content/skill

Step 5. Decide how to measure the outcome

Step 6. Practice

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In this session:

- Investigate and experience examples of active learning strategies
- Apply an active learning strategy to your own teaching

"Tell me and I forget.
Show me and I may remember.
Involve me and I understand."

Variously attributed to: Aristotle; Confucius; Benjamin Franklin; Native American proverb; Chinese proverb; Voltaire

Active Learning:

… is the lesson, not an “add on”

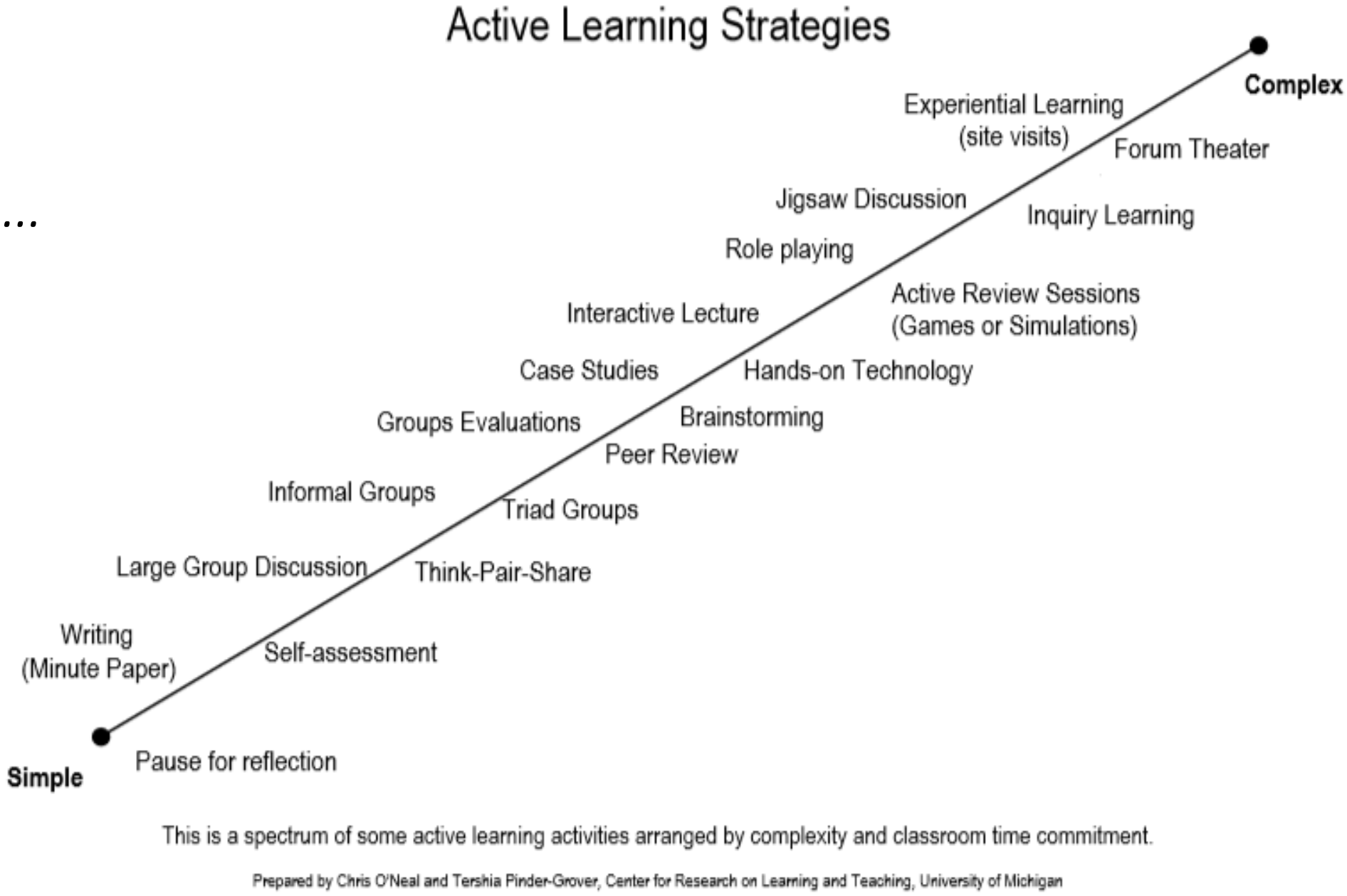
… requires the students’ presence and participation

… needs to happen every day

Litmus Test:

- “Did the students actually need to be present for this lesson?”
- i.e. Were the students required/invited to take an active part

Active Learning might look like …

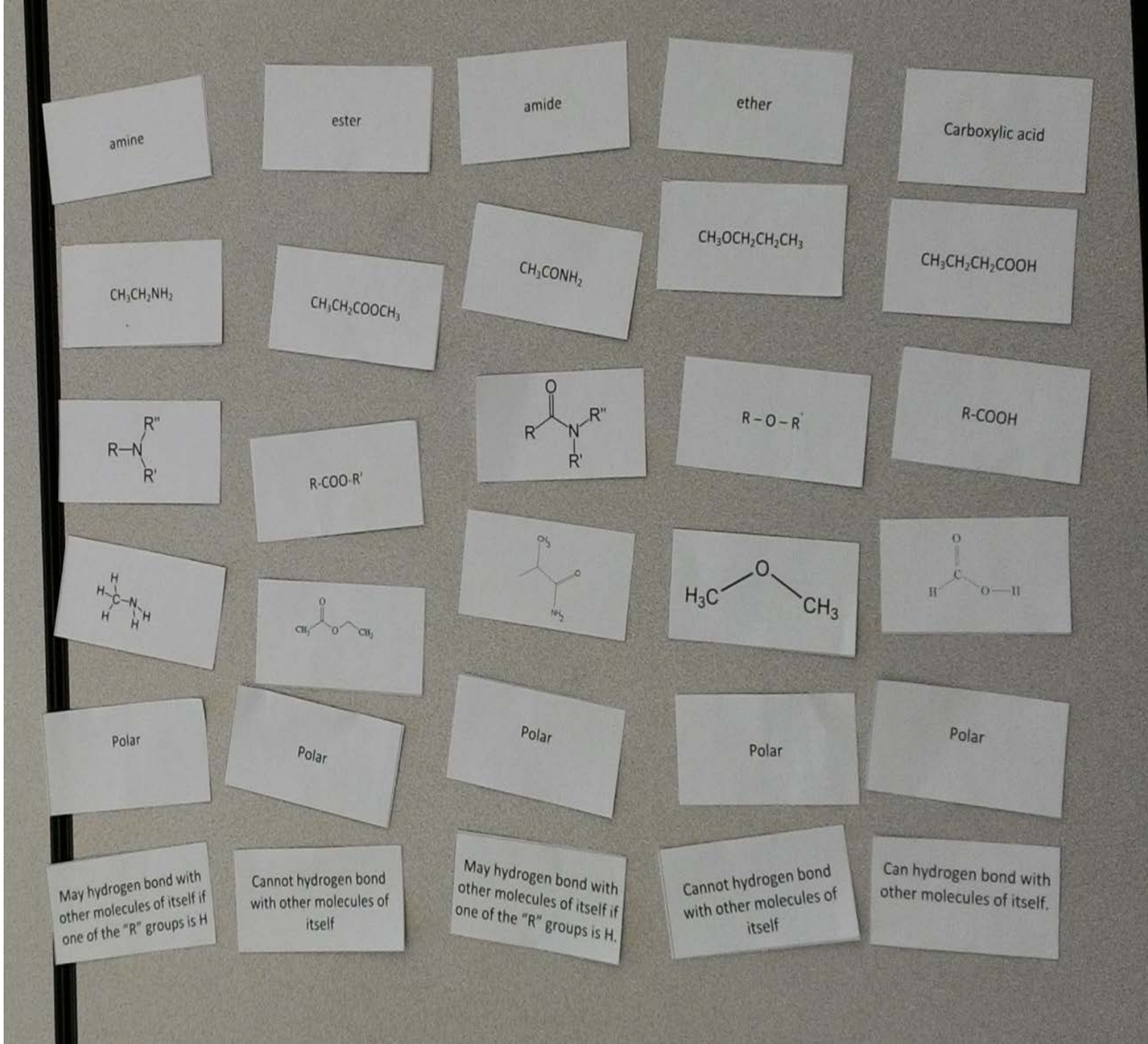


file:///E:/NFW/Active%20Learning%20Continuum_UofMichigan_Handout.pdf

Example: (Partial) Card Sort followed by guided inquiry worksheet

Organic Functional Groups

For 8 functional groups, students sort cards showing multiple representations; predict polarity and hydrogen bonding



Example- Jigsaw with Intermolecular Forces

Intermolecular Forces
Model 4

Compound	BP (°C)	Polar/ Non polar	Physical State
F_2	-188		
Cl_2	-34		
Br_2	59		
I_2	114		

Propose a hypothesis to explain the above data:

Compare your answer with your group, discuss.

Complete the table in Model 4

According to the physical state data, what compound has the strongest intermolecular forces? _____

Based on polarity, is there a relationship between polarity and BP here? _____

Model Strategy:
"Think-Pair-Share"

Complete the statement:

As the (property your group identified) _____ increases, the strength of intermolecular forces _____ (increases/decreases)

Analyze the data below:

Selected boiling points

Compound	BP (°C)	Polar/Nonpolar	Compound	BP (°C)	Polar/Nonpolar
He	-269		CH_4	-161	
Ne	-246		C_2H_6	-88	
Ar	-186		C_3H_8	-42	
Kr	-152		C_4H_{10}	0	

What is changing in the previous table? _____

Does the trend observed in the previous table agree with the last statement your group established? Explain

From the original table of type of intermolecular forces, which one would you say describes what you observed in the last two tables? Complete the statement:

_____ (type of force) is observed in _____ (polar/nonpolar) compounds inducing an

_____ (increase/decrease) boiling point as _____ (property) increases.

Groups become experts on type of intermolecular force - then share their knowledge with new group.

Example- Inquiry-based exploration of VSEPR theory

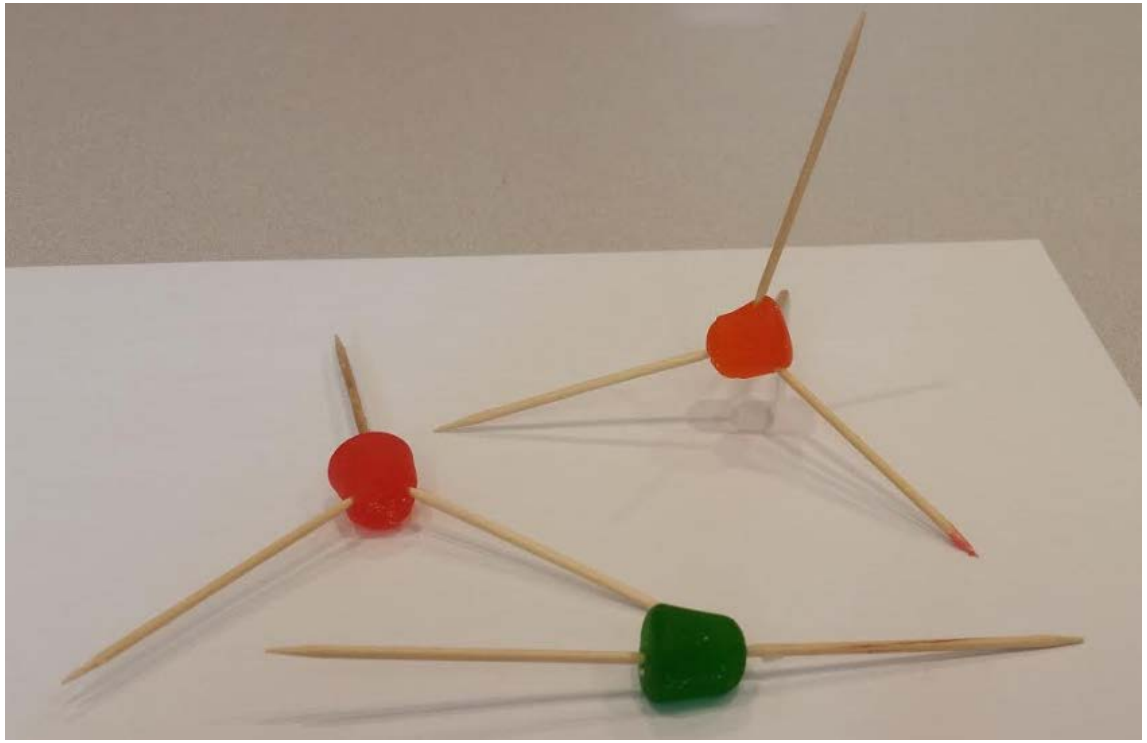
Students work in small groups with their own “molecular modeling kits” to explore VSEPR theory

Chapter 5: Bonding theories
Worksheet 1: Exploring VSEPR theory

Use the “molecular modeling” kit (candy = atom, toothpick = electron pair) to complete the VSEPR table. For each molecular geometry, sketch the 3-D representation with the approximate bond angles. In VSEPR theory, valence electron pairs (bonding or non-bonding) want to keep as far apart as possible, so space your toothpicks accordingly.

Steric Number	No. of Bonded Atoms	No. of Lone Pairs	Molecular Geometry
2	2	0	
3	3	0	
	2	1	
4	4	0	
	3	1	
	2	2	

Cost effective approach for general chemistry students



Example- Cooperative groups in an upper level course

1. Consider a box filled with *n* moles of dilute gas A at some T and P. Given the assumptions described in class, complete the following table:

Molecular picture	Macroscopic picture	Explanation
As the molecules move slower,	the temperature will _____	
As the molecules move _____	the pressure will increase	
Suppose we replace A with *n* moles of gas B. If B has the same distribution of velocities as A but has a larger mass than A,	the pressure will _____	

2. Early researchers observed the following gas relations for dilute gases. Explain the laws using a molecular or microscopic argument:

   Boyle's law: $P \propto \frac{1}{V}$ at constant *n* and constant *T* (isothermal)

   (other laws….)

3. Describe at least one way in which our assumptions could fail.

4. How do you think the physical movement of molecules relate to the rate of chemical reactions?

Model Strategies:
"Cooperative group"

First day of class:
Groups are introduced to classical vs. statistical thermodynamics through exploration of a familiar expression: PV = nRT

Planning a lesson activity

Consider:

- Your classroom environment (set up of chairs/tables)
- Your style (stretch your comfort zone??)
- Your content/competency/skill/etc.
- Available technology (high tech/ low tech)

- Need Inspiration?

    Peers; workshops; Journals (Chem Ed); literature resources

Select content carefully:

- Active learning takes time
- May need to make choices of what content to support in-class:
  - What content requires most support for student understanding (i.e. What's the sticking point of this lesson?)
  - What content can students use independent learning skills

Some active learning strategies…(Handout)

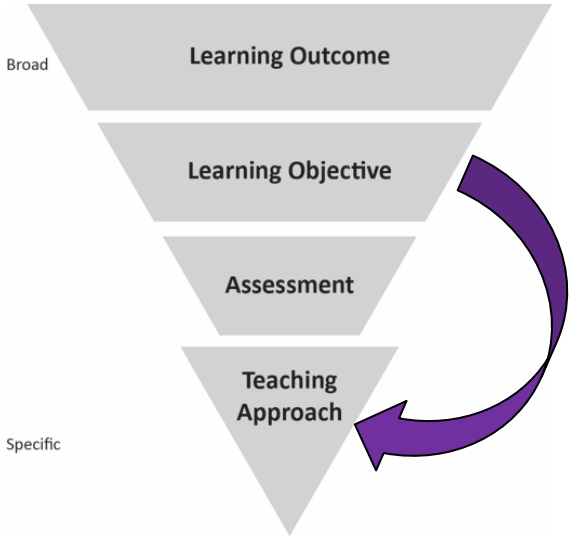
Reflect on your own teaching …

- Which strategies do you employ? – underline
- Which strategy(s) can you reasonably try this quarter/semester?

Share with a partner …

- What did you try? What went well? How can it be improved?
- What would you like to try?

Model Strategy:
"Think-Pair-Share"



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Now you try it ….

A few resources:

http://www.calstatela.edu/dept/chem/chem2/Active/index.htm Cal StateLA - Department of Chemistry and Biochemistry “Active and Cooperative Learning”

http://edtech.mst.edu/media/extendedlearning/edtech/documents/instructorresources/activelearning/Active%20Learning%20Continuum.pdf How can you incorporate active learning into the classroom

https://blendedtoolkit.wisc.edu/pharmacy/pharmacy-how-to-build/examples-of-active-learning-strategies/ Examples of Active Learning Strategies, University of Wisconsin-Madison

https:y//teaching.berkeley.edu/active-learning-strategies Berkeley Center for Teaching & Learning