Teachable Tidbit, Part 3:
Making a Content Element Active

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. Decide how to measure the outcome
Step 5. Develop activity for content/skill

Step 6. Practice

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In this session:

- Experience and review examples of active learning strategies
- Apply active learning strategies to your own teaching (tidbit)

"Tell me and I forget.
Show me and I may remember.
Involve me and I will learn."

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

Lesson – you are the student

“Working with forward and reverse reactions”

Purpose

Explain the equilibrium condition in terms of :

- Forward and reverse reaction rates
- Changes in reactant and product concentrations

(Data Page)

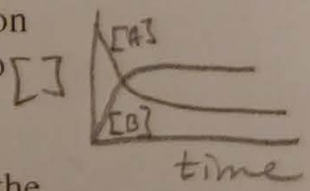
Table #1

	"[A]"	"[B]"	"Rate$_f$"	"Rate$_r$"
Round #	Starting A	Starting B	# A to move	# B to move
1	24	∅	$k_f[A] = \frac{1}{2}(24) = 12$	$k_r[B] = 1/4(0) = ∅$
2	12	12	6	3
3	9	15	5	4
→ 4	8	16	4	4
5	8	16	4	4
6	8	16	4	4

Critical Thinking:

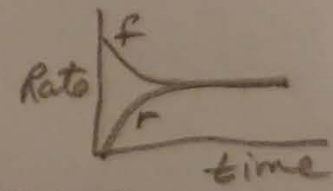
1. With a partner, describe in words what happened to the concentrations of A and B as the "reaction" progressed. [A] ↓ [B] ↑ until [ ]'s were constant

2. In the right-hand margin, using the same set of axes, make a sketch of concentration of reactant (or product) on the vertical axis as a function of time. What happens to the concentrations as we go to long times?



3. With a partner, describe in words what happened to the forward reaction rate and the reverse reaction rate as the "reaction" progressed. R_f ↓ Rate$_r$ ↑ until $R_f = R_r$

4. In the right-hand margin, make and label a set of axes as "reaction rate" on the vertical axis and "time" on the horizontal axis. Sketch the forward and reverse reaction rates on the same set of axes.



5. The condition you ended up with is called "equilibrium." What is "equal" at equilibrium?

$R_f = R_r$

Table #2

Equilibrium Assessment:

Consider the reversible reaction: $2\ NO_2(g) \rightleftarrows N_2O_4(g)$

(Initial) (Equilibrium)

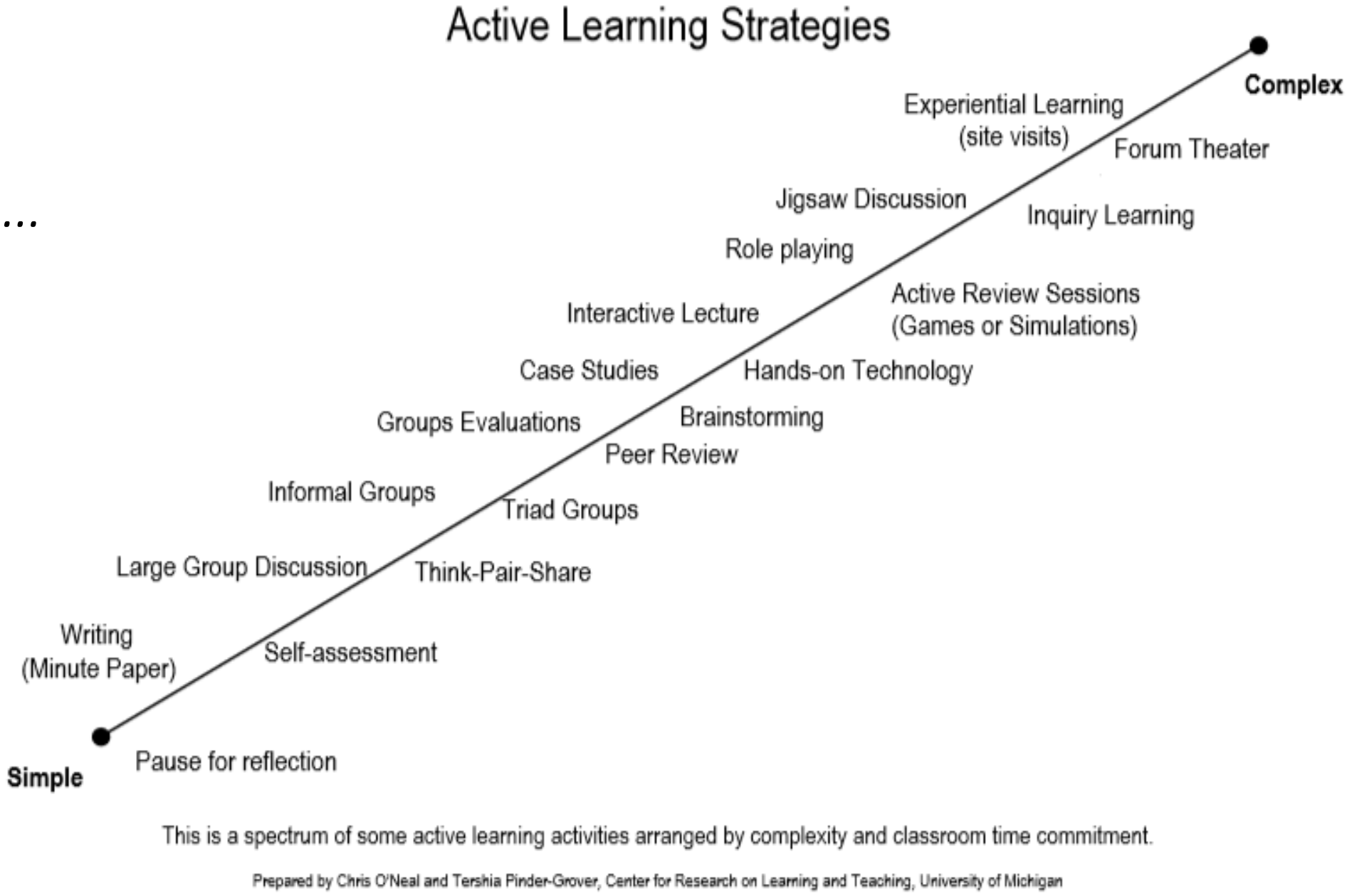
Information:
Nitrogen dioxide is a brown gas.
Dinitrogen tetroxide is a colorless gas.

Observation: A sealed bottle initially contains pure nitrogen dioxide gas. The color of the gas in the bottle changes until, at equilibrium, the gas remains light brown in color.

Explain the observation:

a) in terms of changes in concentration of reactants and products
b) in terms of forward and reverse reaction rates

Active Learning might look like …



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

Example: Guided inquiry – Significant Figures

How are Significant Figures Used?

Outcomes:

- To review prior learning of significant figures in measurement-based numbers;
- To assign significant figures in a correctly written measurement-based number;
- To revise significant figures following calculations.

Model 1:

Look at the following examples of correctly written *measurement-based numbers*:

3	1 significant figure	0 decimal places
30	1 significant figure	0 decimal places
.003	1 significant figure	3 decimal places
.0030	2 significant figures	4 decimal places
.0034	2 significant figures	4 decimal places
34	2 significant figures	0 decimal places
340	2 significant figures	0 decimal places
341	3 significant figures	0 decimal places
.00301	3 significant figures	5 decimal places
.00340	3 significant figures	5 decimal places

Critical Thinking:

Use these examples above to create your own "rules" (be sure your group agrees):

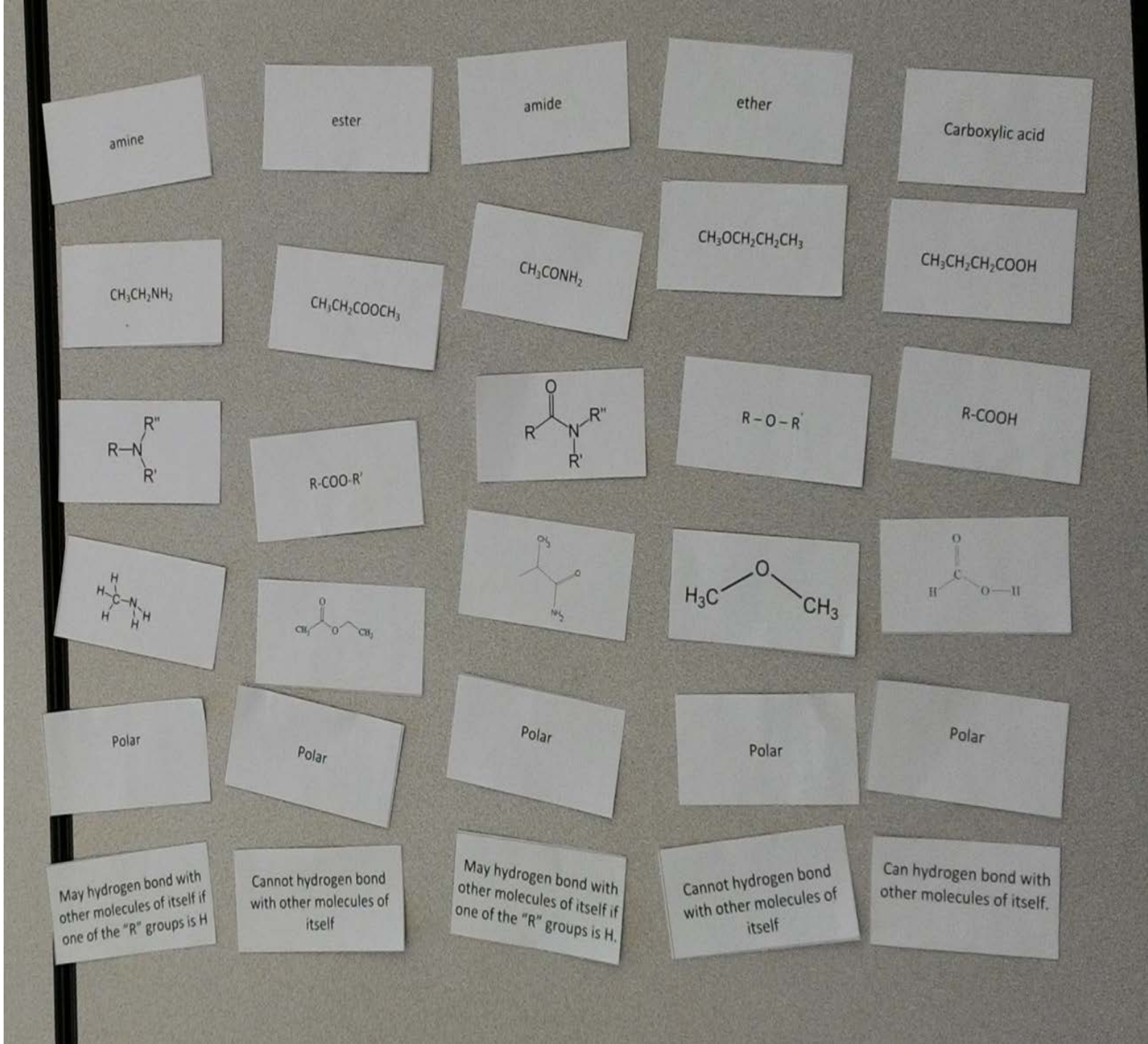
Students use patterns in data to determine sig figs;
Given more patterns, students arrive at sig fig rules for calculations

David Reichgott, Ph.D.
Cascadia College

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 – Gas Laws worksheet

Model 3: *(Charles's Law)*
In the following data set, volume was measured as a function of temperature while pressure and moles of gas were held constant.

Temp. (°C)	Volume (L)
-73	16.4
0	22.4
100	30.6

Hypothesis:
As temperature increases, volume _____, if pressure and moles of gas are constant

Critical Thinking Questions:

a) What kind of relationship do the data above show when temperature has units of °(
   i. an inverse proportion,
   ii. a direct proportion (with a zero intercept),
   iii. or a linear relationship (with a non-zero intercept)?

b) What kind of relationship is there between T and V if the temperatures are convert
   Kelvin? (Linear? Proportional? Other?)

c) Write a general equation to show Charles's Law (at constant n and P):

Skill Development: (Refer to Model 3)

3. A 0.47 mole sample of gas at 37°C occupies 3.20 L. What volume would the same gas occupy at 0°C?

Groups become experts on individual gas laws - then share their knowledge with new group.

Some active learning strategies…(Handout)

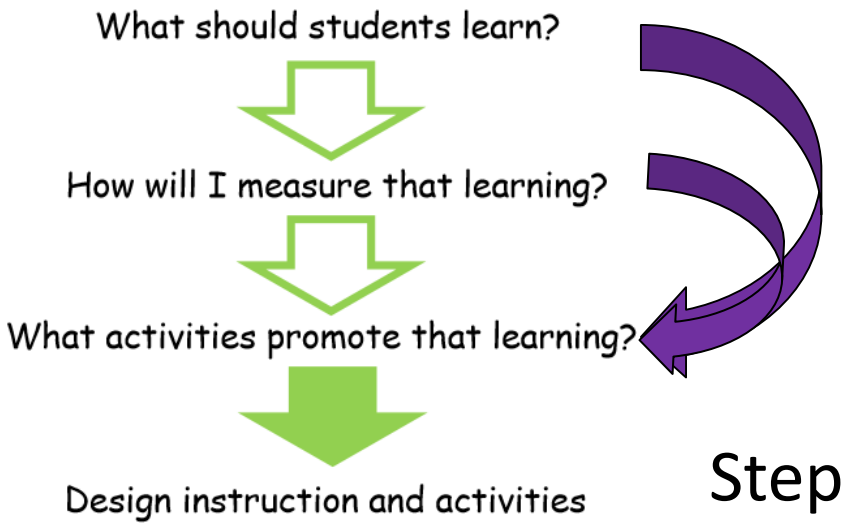
Reflect on your own teaching …

- 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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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
  - What content can students use independent learning skills
  - “What’s the sticking point of this lesson?”

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

Now you try it ….