Simulations as Asynchronous Guided Inquiry

AKA POGIL-izing a Simulation
Context

- College prep chemistry (as opposed to AP)
- Was not allowed to require any synchronous learning.
- In person schooling ended right after empirical and molecular formulas.
- Wanted to try out as much as possible in preparation for distance in the fall.
What’s the goal?

Guide the inquiry! (Less process-orientation.)

I’m big on POGIL and POGIL-izing. I wanted students to build their own understanding and feel successful using simulations. This means writing many short questions that bring students to an awareness of the concept.
POGIL-izing

Students are given a model.

First they explore the model.

Then they conceptualize the ideas underpinning the model.

Finally, they apply their understanding to a new situation or idea.

Picture and More Information on the POGIL Learning Cycle Found [Here](#)
Example: Energy of Phase Changes Simulation

Let’s make the simulation the model!

CK12 Phases of Matter Simulation  Energy of Phase Changes Simulation POGIL
What are the big concerns?

1. Students learning HOW to use the simulation.
2. Students getting feedback as they go.
3. Collecting answers in an efficient way.
How to Use the Model Example: Kinetic Molecular Theory

PhET States of Matter: Basics Simulation

Kinetic Molecular Theory Activity
Checkboxes to the rescue!

Play with the controls and mark the check box when you have done each task.

- Pick a substance to work with.
- Make that substance a gas.
- Heat up the substance.
- Cool down the substance.
- Pause and restart the motion of the substance.
- Change the temperature from °C to K and leave it that way.
Feedback Example: Limiting Reactant Simulation

PhET Reactants, Products, & Leftovers Simulation  Limiting Reactant Virtual Lab Activity
Embedding video keys to the rescue!

2 B + 1 M + 1 C → 1 B₂MC

<table>
<thead>
<tr>
<th>Before</th>
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<tbody>
<tr>
<td>Change</td>
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<tr>
<td>After</td>
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d. Which line of the BCA table has the same ratios at the coefficients in the balanced chemical equation? (i.e. your ratio was 1:1 or 2:2 or 3:3, etc.)

e. Use the simulation to determine how many sandwiches you can make. Do this by arrowing up on the reactant side. How many can you make? Were you right?

f. Which reactants are in excess and how much of each is leftover? How can you see this in the particle diagrams? How can you see this in the BCA table?

Want to check your work? Use this video key!

PhET Reactants, Products, & Leftovers Simulation  Limiting Reactant Virtual Lab Activity
Collecting Answers Example: U of O/Pearson Calorimetry Lab

Pearson Calorimetry Lab
Energy of Dissolving Lab Activity
Only collecting key answers to the rescue!

**WEDNESDAY:** The simulation for the activity is found [here](#). It should work fine on phones or tablets.

**Part 2: Dissolve some stuff!** Make sure to answer questions 1-8 in your notebook. Then type your answers to question 4 & 8 into the form on Google Classroom.

- On the main page, click the blue “Experiment” tab then click “Run Experiment” when prompted.
- On the left-most set of controls click the solids tab and choose NaOH (sodium hydroxide), move the mass bar to 25.0 g. Click next on at the left to continue.
- On the middle set of controls click the liquids tab and choose water, move the mass bar to 100.0 g. Click next on at the left to continue.
- In the right-most set of controls click both “Show graph view” and “Show microscopic view.” Then click start.
  1. Describe what happened in the microscopic view.
  2. What happened to the temperature of the solution?
  3. Is the process of dissolving NaOH (sodium hydroxide) in water endothermic or exothermic?
  4. Does it take more energy to pull apart the water molecules and the sodium hydroxide than you get back from the water molecules and ions attracting one another and moving together? Support your answer with evidence from the lab. *(This answer goes in the form in Google Classroom.)*
What did students say?

Many worked with friends as they missed the social aspect.

Appreciated video keys and responses.

Many commented on how this was one of the few ways they “actually learned something” during distance schooling.
If time:

Balancing Chemical Equations [PhET - POGIL Activity](#)

Energy Profiles of Reactions [AACT - POGIL Activity](#)

Collision Theory [Gizmo - POGIL Activity](#)
Questions?

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If you would like to view all of my distance learning materials just shoot me an email! :)