Choosing Classroom Resources: What Our Research Shows

A Guide for High School Science Teachers from Molecules & Minds at NYU’s CREATE Lab

Consortium for Research and Evaluation of Advanced Technologies in Education

NYU Steinhardt
Steinhardt School of Culture, Education, and Human Development
Some Key Questions

- Who are my learners?
- What is the learning context?
- What strategy will be most helpful?
• We grappled with these questions as we designed the *Molecules and Minds* simulations

• As you make your own judgments about what resources to use, here are some things we learned through our research
Levels of Representation
Simulations are more effective than pictures
But what should they look like?
We found that:
1. Big Ideas Need a Simple Design

- Why? Because bombarding the learner with unnecessary information inhibits learning.
- When you look for resources, think about clear and uncluttered!
How is the information represented?

• We found that:
2. Icons Work Better than Symbols

- Why?
- Because icons have culturally accepted meanings.
Symbolic

- Words are complex symbols that must be decoded
Iconic

• Icons are culturally understood representations

• When you look for resources, consider iconic representation!
What learning strategies work best?

We found that:
3. Freedom to Explore Supports Learning and Engagement

• Why? Because all learners value the opportunity to explore in a safe environment (even if they are not aware of it).
Worked-Out

• Learners follow step-by-step instructions
Exploratory

• Learners figure it out independently

• When you look for resources, consider exploratory learning!
What sequence of topics makes sense?

We found that:
Why? Because learning complex theories will be more effective if the learner understands the underpinning concepts.

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<td>Particles in gases and liquids move randomly and quickly</td>
<td>Temperature affects the motion of particles</td>
<td>The behavior of gases is affected by pressure, volume, and temperature</td>
<td>Intermolecular forces</td>
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<tr>
<td>Motion is affected by particle size and temperature</td>
<td>The number of particles affects the motion of particles</td>
<td>If you want to make an argument for the relation between variables, one must be held constant in order to explore the effect of one upon the other</td>
<td>When particles exist as solids and liquids, there are forces of attraction between the particles that must be broken by heat.</td>
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• When you look for resources, does the order of topics make sense?
How is the material contextualized?

We found that:
5. A Problematizing narrative leads to better outcomes

Why? Problematizing narratives create a motivation to learn and help expand science learning from the classroom/lab into the outside world.

When you look for resources, consider a Problematizing narrative that connects science concepts with students’ real-life experience.
References

Big Ideas/Simple Designs:

Icons/Symbols:
Exploration/Worked-Out

Order of Topics/Problematizing Narrative

Simulations Produce Better Learning: