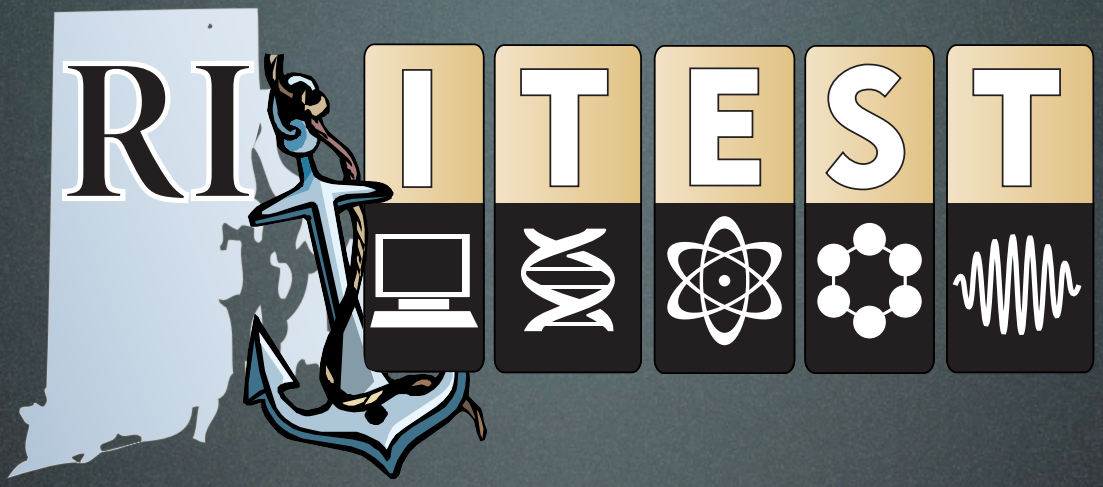


Rhode Island Information Technology Experiences for Students and Teachers

Using Embedded Assessment for Increasing Student Motivation and Teacher Engagement

February 25, 2010

The Concord Consortium

This project is supported by the National Science Foundation under Grant No. ESI-0737649.

TPD Goals

- Understand the science of atoms and molecules (SAM) and how it connects with current curriculum.
- Implement SAM learning activities in current curricula.
- Provide related IT career information.
- Utilize guided inquiry of SAM models in teaching.

Inquiry Is Key

- Going deeper can simplify science.
  - Most scientific phenomena can be explained by fundamental ideas of energy, force, the atomic nature of matter, and equilibrium.
  - Science through this lens is more connected - less individual facts to “memorize.”
- Conceptual understanding is the goal.
- Utilize interactive models, to allow inquiry at the atomic level.
- Teachers are essential for inquiry approach to work.

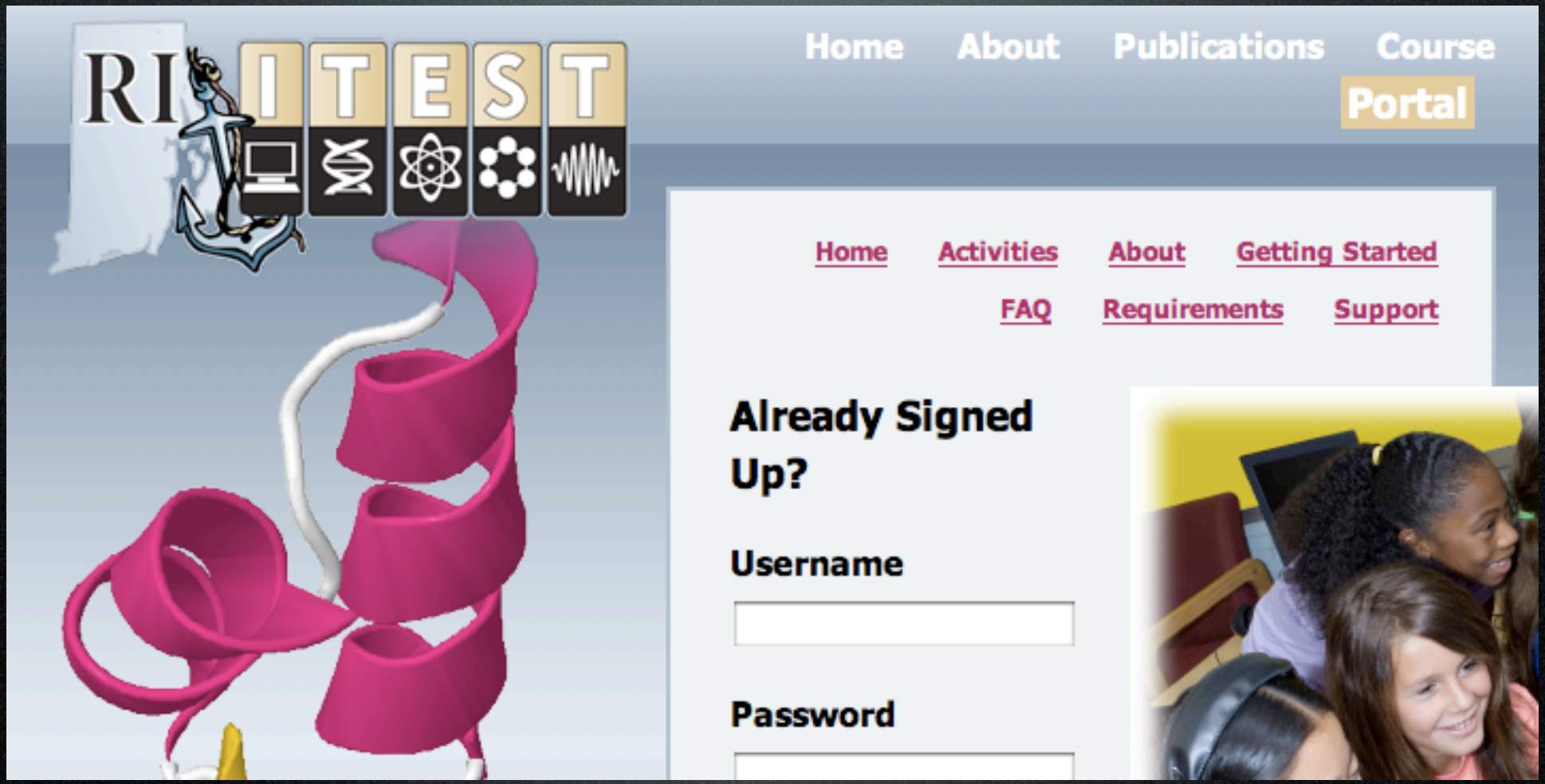
SAM Actvities

	Physics	Chemistry	Biology
Motion and Energy	Atoms and Energy	Phase Change	Diffusion, Osmosis, and Active Transport
	Heat and Temperature	Gas Laws	Cellular Respiration
Charge	Electrostatics	Intermolecular Attractions	Four Levels of Protein Structure
	Electric Current	Molecular Geometry	Molecular Recognition
		Solubility	
Atoms and Molecules	Atomic Structure	Chemical Bonds	Lipids and Carbohydrates
	Newton's Laws at the Atomic Scale	Chemical Reactions and Stoichiometry	Proteins and Nucleic Acids
			DNA to Proteins
Light	Atoms, Excited States, and Photons	Chemical Reactions and Energy	Harvesting Light for Photosynthesis
	Spectroscopy		

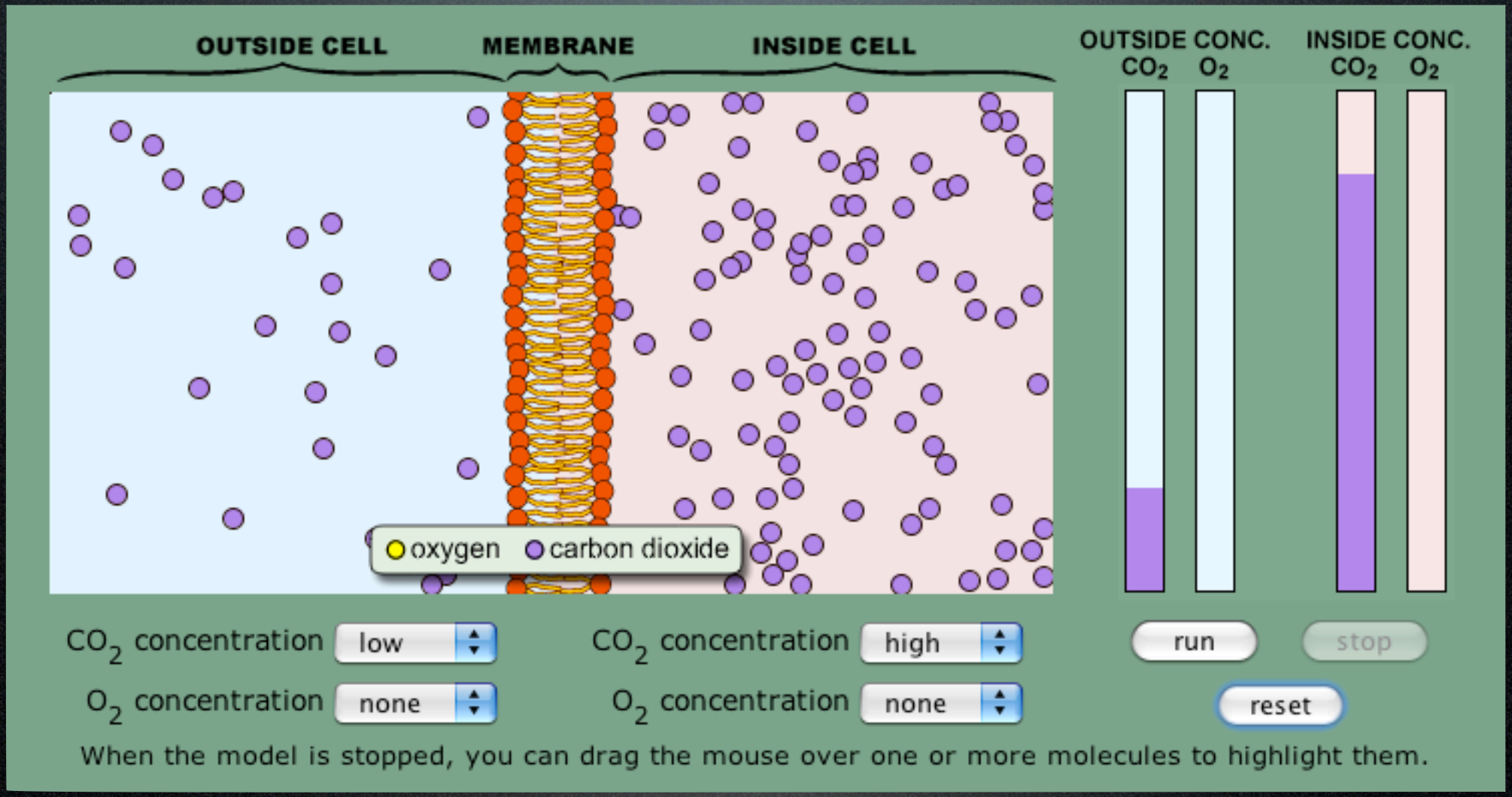
Materials Development

Teacher/student portal and reporting.

http://ri-itest.concord.org



Interactive Models



Embedded Assessments

What is true of the rate at which molecules move into and out of the cell at equilibrium?

- A. More move into the cell than out of it.
- B. More move out of the cell than into it.
- C. Equal amounts move into and out of the cell.
- D. They move randomly, so it is not predictable.

Check Answer

Embedded Assessments

"I like the Check Your Answer thing – it gives me reinforcement of my understanding of the concepts."

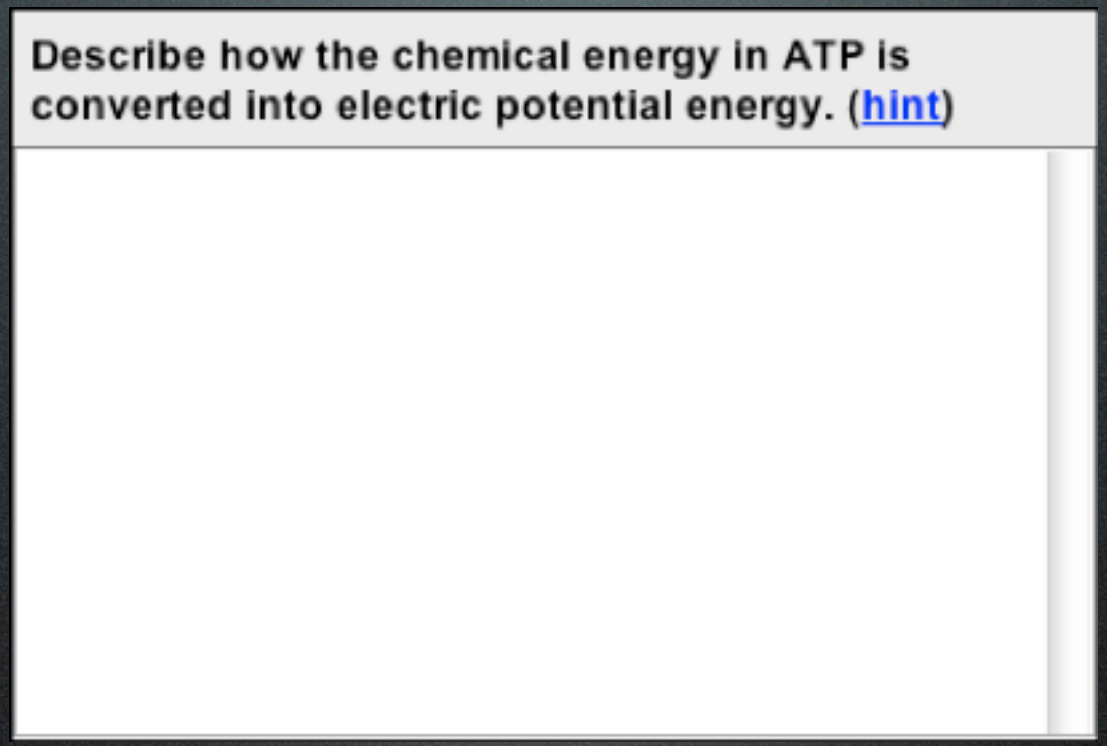
Embedded Assessments

Cells generally stay in equilibrium with their surroundings. What are two ways you know the cell has reached equilibrium?

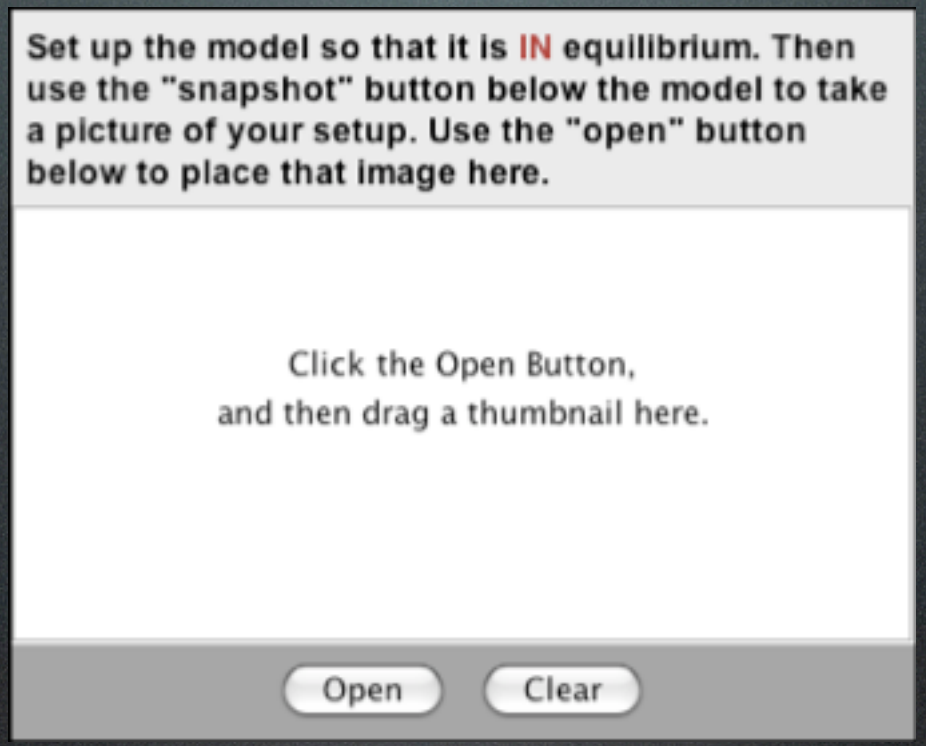
- [ ] A. Water stops flowing into and out of the cell.
- [ ] B. The concentrations inside and outside of the cell are the same.
- [ ] C. The osmotic pressure inside and outside of the cell is the same.
- [ ] D. The cell gets as small as it possibly can.

Check Answer

Embedded Assessments



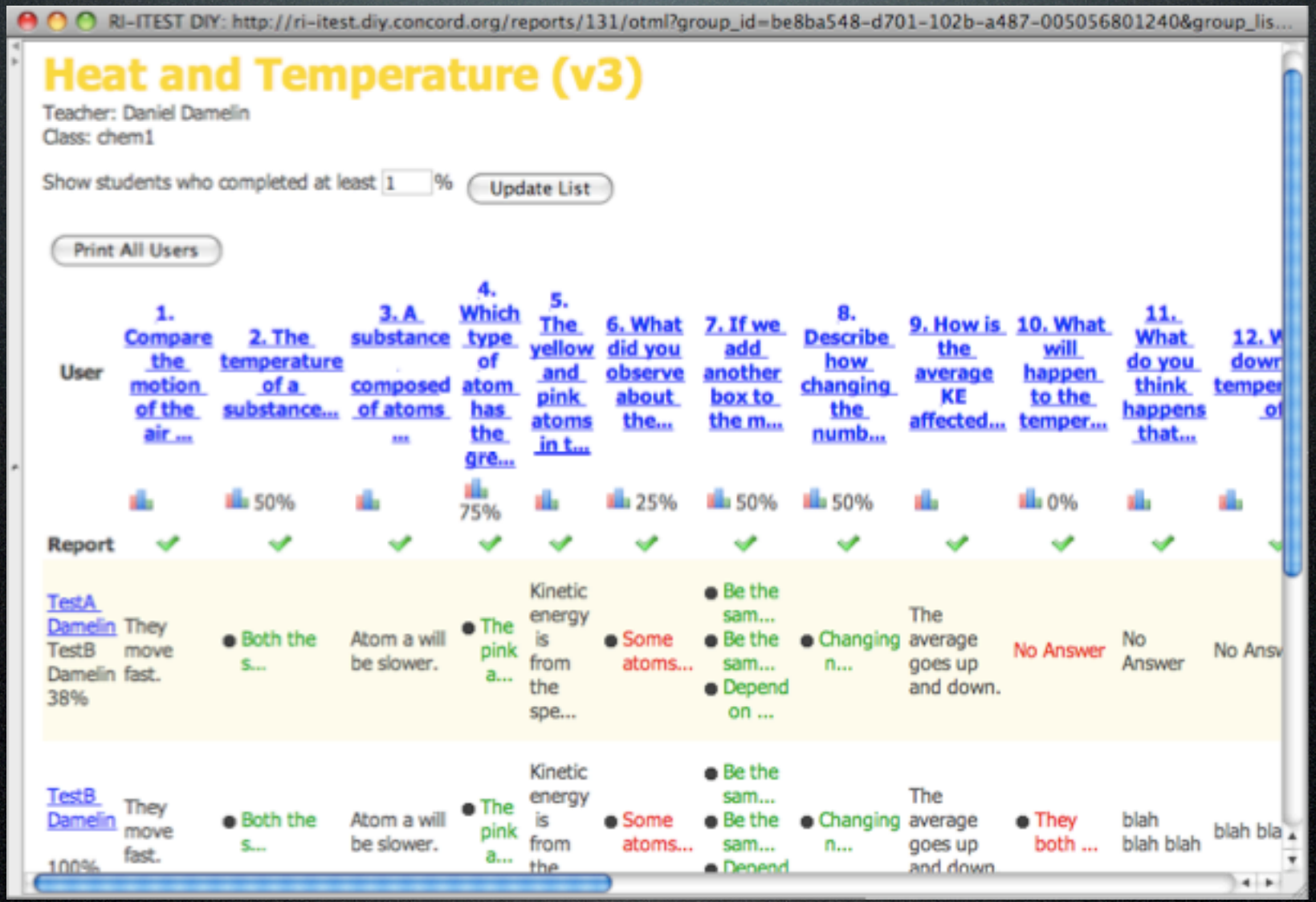
Embedded Assessments



Embedded Assessments

“Students begging to do more units on the computer ... [and] ... writing more than they usually do in response to something they did only moments before.

Teacher Reports



Teacher Reports

RI-ITEST DIY: http://ri-itest.diy.concord.org/reports/131/otml?group_id=be8ba548-d701-102b-a487-0...

Heat and Temperature (v3)

TestC Damelin

Teacher: Daniel Damelin
Class: chem1
Other Group Members:

Print

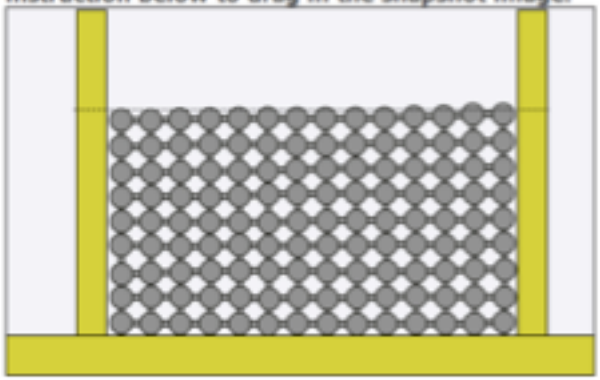
1. Compare the motion of the air molecules at high and low temperatures.

They look the same to me.

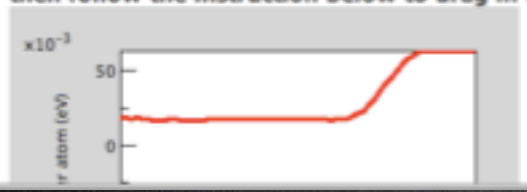
4. Which type of atom has the greater mass?

● The pink atoms.

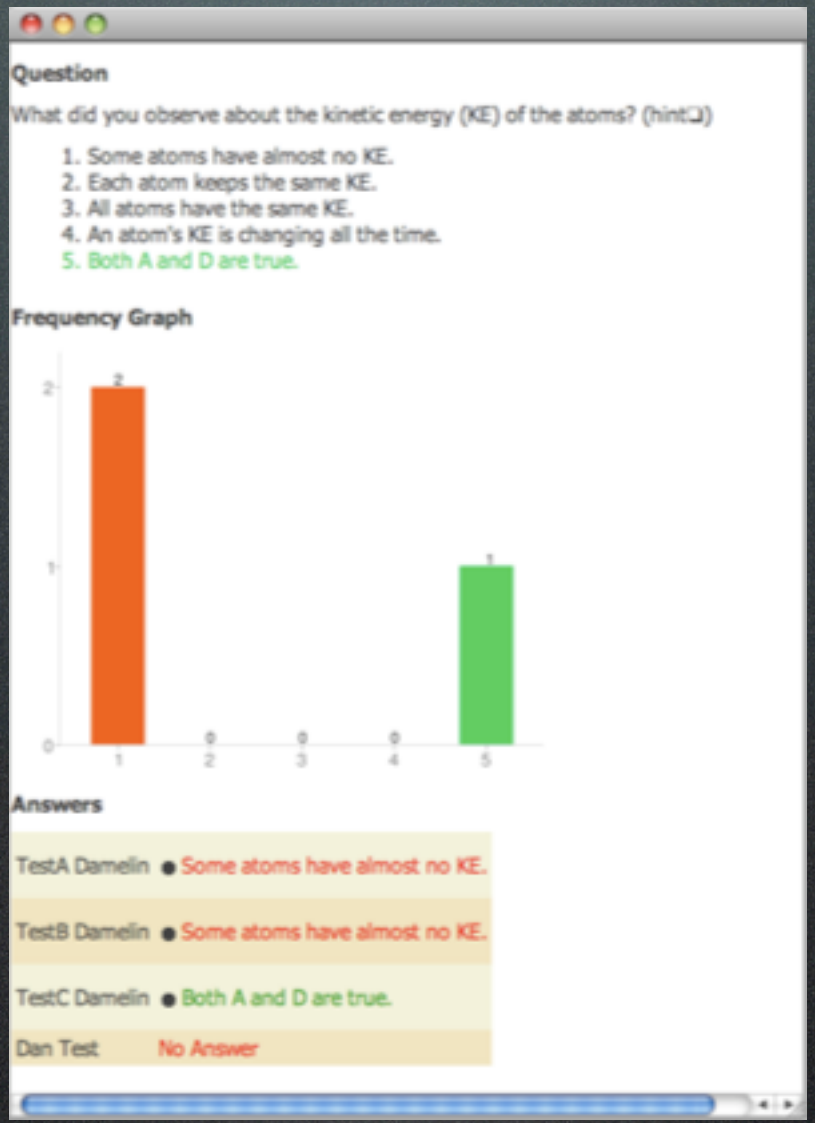
17. Take a snapshot of the model that shows thermal expansion, and then follow the instruction below to drag in the snapshot image.



18. Take a snapshot of the graph that shows the increasing of energy when heated, and then follow the instruction below to drag in the snapshot image.



Teacher Reports



Question

What did you observe about the kinetic energy (KE) of the atoms? (hint)

1. Some atoms have almost no KE.
2. Each atom keeps the same KE.
3. All atoms have the same KE.
4. An atom's KE is changing all the time.
5. Both A and D are true.

Frequency Graph

Answers

TestA Damelin	Some atoms have almost no KE.
TestB Damelin	Some atoms have almost no KE.
TestC Damelin	Both A and D are true.
Dan Test	No Answer

RI-ITEST Participants

Total of 95 teachers involved this upcoming year in Cohorts 1 & 2.

28 Participating Schools	
Burrillville High School	Lincoln High School
Central Falls High School	Mount Pleasant High School
Classical High School	Narragansett High School
Community College of Rhode Island	North Smithfield High School
Cooley High School	Ocean Tides High School
Coventry High School	Pilgrim High School
Cranston West High School	Portsmouth High School
Cumberland High School	Rogers High School
Dighton-Rehoboth High School	Shea High School
Dr. Jorge Alvarez High School	South Kingstown High School
E-Cubed Academy	Textron Academy
East Providence High School	Tiverton High School
Exeter-West Greenwich High School	Toll Gate High School
LaSalle Academy	Woonsocket High School

Molecular Concept Inventory (MCI)

- Molecular concept tests covering Physics, Chemistry, and Biology

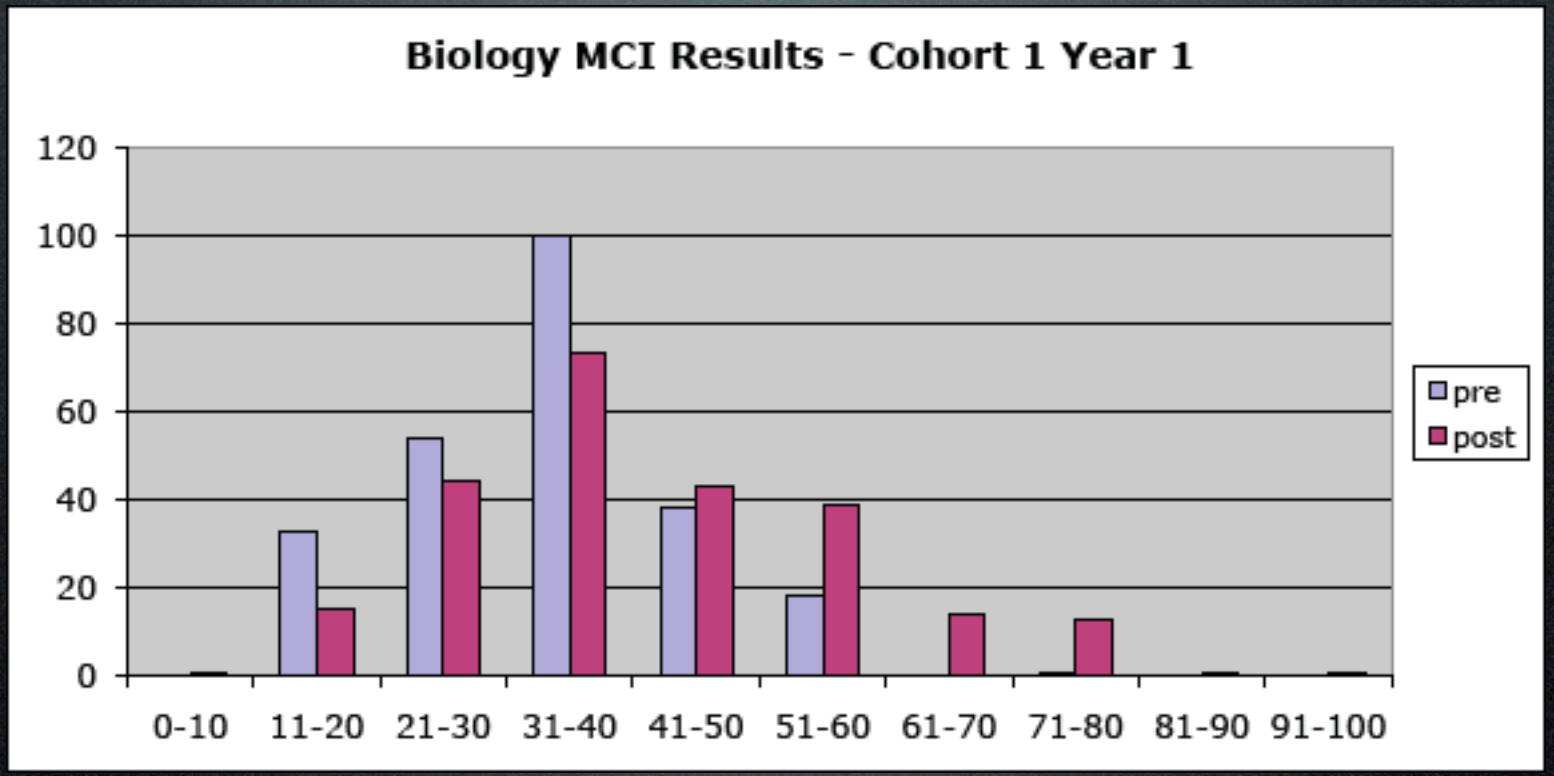
33. Imagine a cell that has a membrane through which potassium ions freely enter and leave. Suppose this cell contains a high concentration of potassium and is put in distilled water that has no potassium. Which is the BEST description of what will happen?

a) All of the potassium ions will leave the cell.
b) Potassium ions will move only from high concentration to low concentration.
c) Potassium ions will leave the cell until there is the same concentration of salt inside and outside the cell.
d) (correct answer) Potassium ions will reach a point when they will continuously enter and leave the cell at equal rates.

Molecular Concept Inventory (MCI)

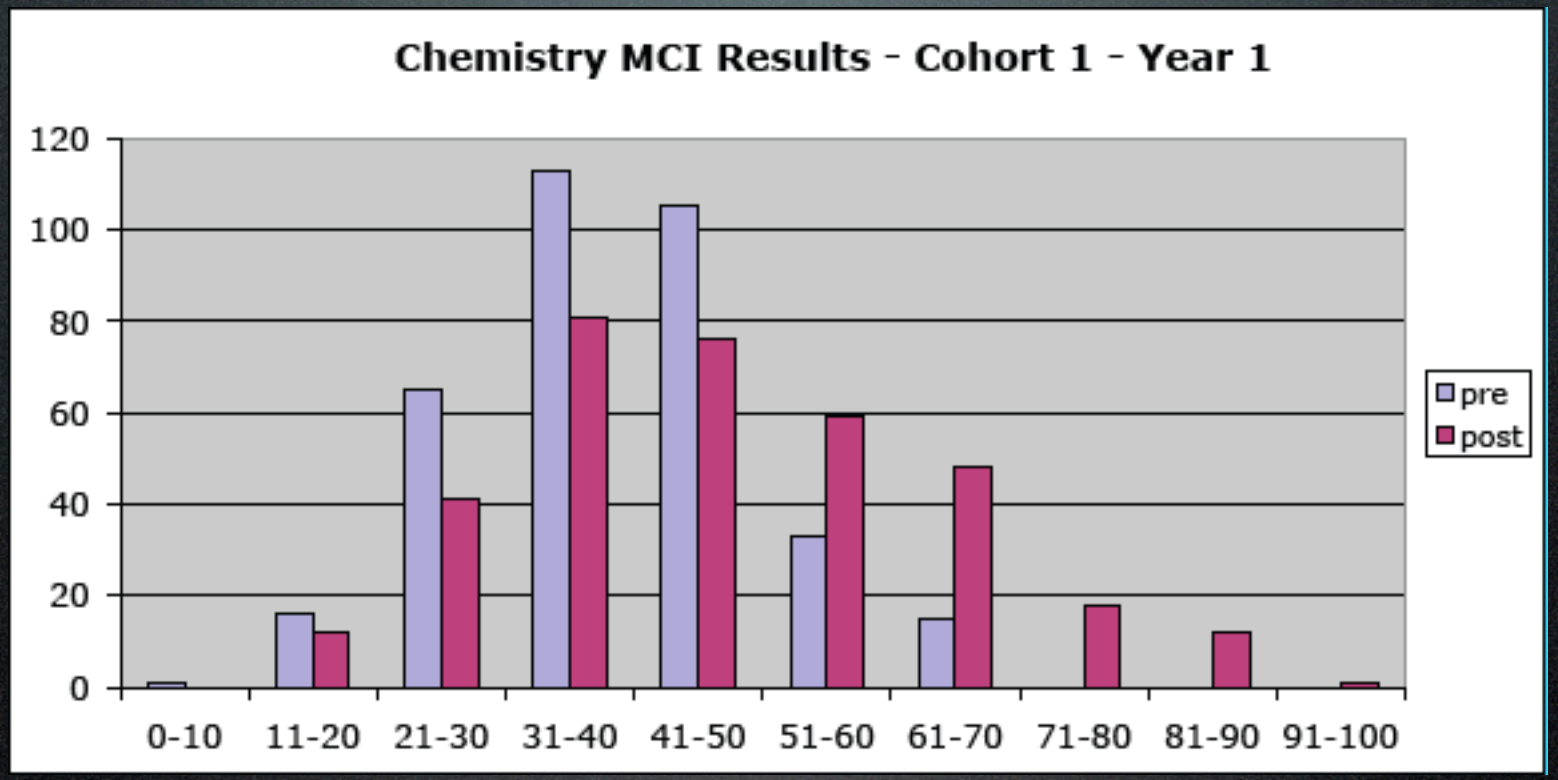
- Pre-post test of student and teacher knowledge.
- Students took subject specific test.
- Teachers took combination of student MCI tests.

Biology Student Results



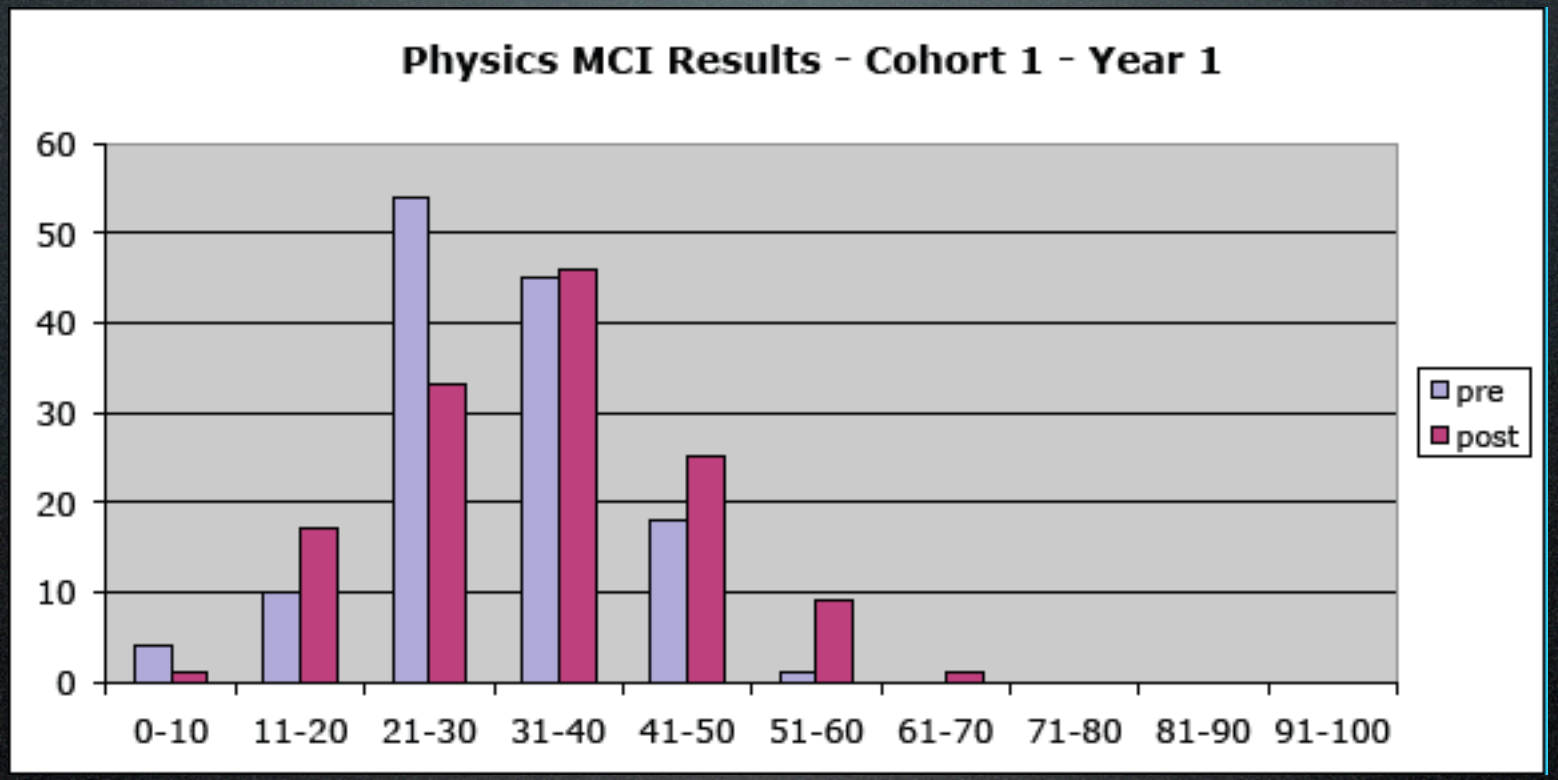
Group	Pre-test mean	Post-test mean	DF	T-value	p-value	Cohen's d	Effect size
Biology	34%	42%	243	-8.4	1.90E-15	0.6	Moderate

Chemistry Student Results



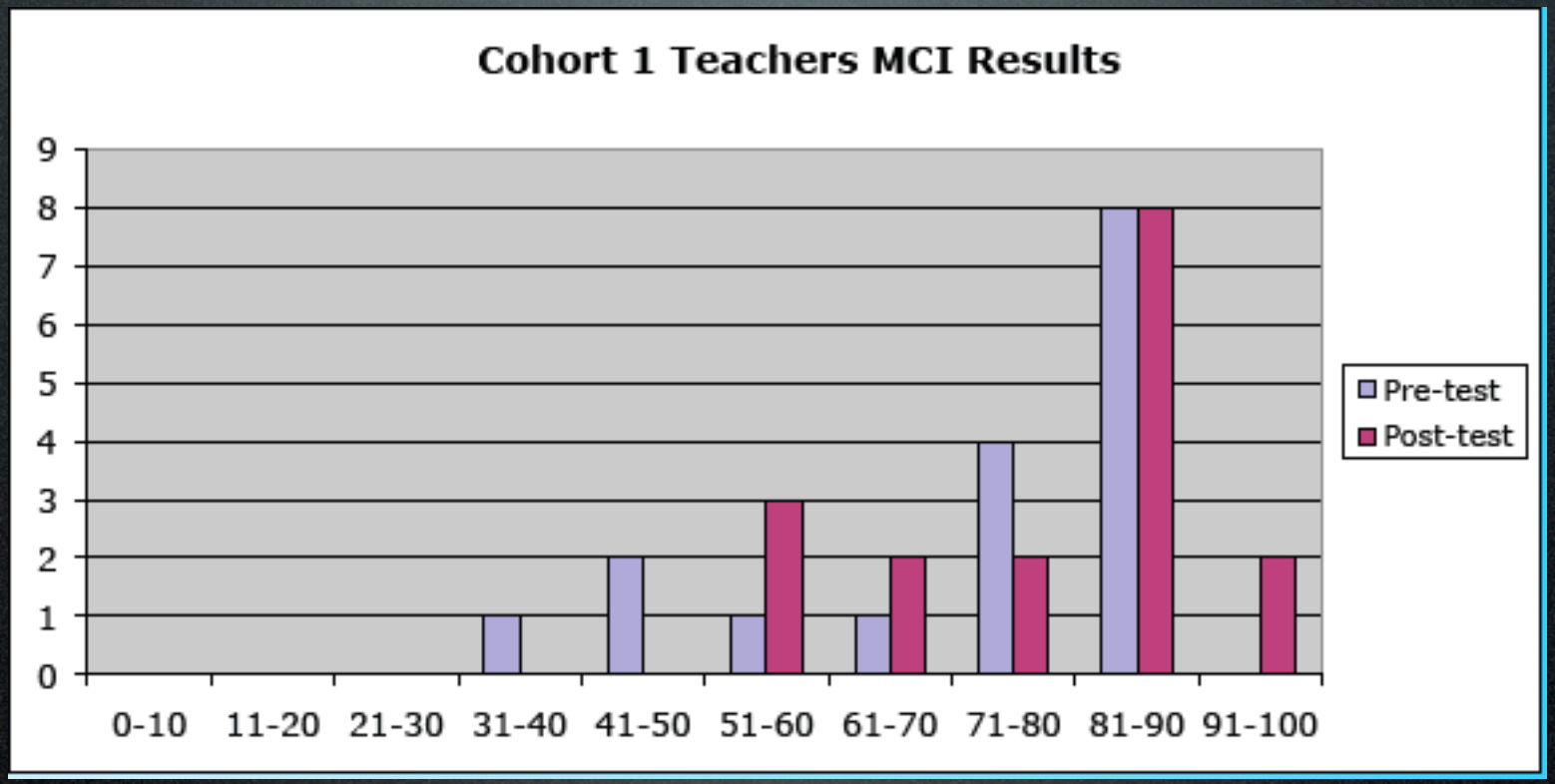
Group	Pre-test mean	Post-test mean	DF	T-value	p-value	Cohen's d	Effect size
Chemistry	39%	47%	347	-12.9	7.80E-32	0.6	Moderate

Physics Student Results



Group	Pre-test mean	Post-test mean	DF	T-value	p-value	Cohen's d	Effect size
Physics	32%	35%	139	-3.0	0.0015	0.3	Small

Cohort 1 Teacher Results



Group	Pre-test mean	Post-test mean	DF	T-value	p-value	Cohen's d	Effect size
Teachers	73%	76%	16	-2.1	0.030	0.2	Small

More Accurate Measures

- Disaggregate student MCI results based on actual activities completed.

- Better match teacher results with their fields of expertise and the courses they teach.

Contact Info

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