

Research Experiences for Teachers (RET)
Center for Pre-College Programs
New Jersey Institute of Technology

LESSON #1
EGGS-EXPERIMENT

LESSON TOPIC:

- Homeostasis
- Solubility
- Particle Size
- Responding To Environmental Conditions

RATIONALE:

How the size of particle will effect whether it crosses a membrane in response to changes occurring to its external environment.

STANDARD(S) & INDICATOR(S):

- 5.1.8.B2.** Design and conduct investigations incorporating the use of a control.
- 5.1.8.B3.** Collect, organize, and interpret the data that result from experiments.
- 5.5.6.A2.** Identify and describe the structure and function of cells and cell parts.

OBJECTIVE(S): Students will be able to:

- Create a testable question, design an experiment, and carry out the experiment
- Dissolve the shell of an egg and then place the egg in an environmental condition in which they are to predict what will happen to the egg. Predictions should be backed with rationale and reevaluated once data is collected.
- Maintain a journal with predictions, protocol, data, and analyze experimental findings.

MATERIALS:

- Eggs
- Vinegar
- Beakers
- Scales
- Water
- Corn syrup
- Various drinks (cola, mountain dew, gatorade, etc)
- Paper towels
- Journals
- Gloves, goggles, aprons

BACKGROUND INFORMATION:

Students will be incorporating the concepts of homeostasis, controlled experiment, variables, to cells responding to their environment, qualitative and quantitative data.

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CLASSROOM ACTIVITY DESCRIPTION (LABORATORY/EXERCISES/PROBLEMS)

including detailed procedures:

1. Observe eggs & document what you see.
2. Label beakers with names & period using glassware pencil.
3. Place each egg into a beaker and pour vinegar over each egg until it is covered.
4. Document anything you notice happening to the egg shell.
5. It will take a few days for the egg shell to dissolve.
6. Observe & document what happened to the eggs.
7. One at a time, take an egg out of the vinegar, blot it dry and weigh it. Record the weight.
8. Rinse out beakers.
9. Place eggs back into beakers.
10. Add chosen drinks to the beakers.
11. Wait 15 minutes.
12. Take eggs out. Blot dry. Reweigh the eggs.
13. Document the weight.
14. Clean work area and equipment.

TABLES

PREDICTIONS TABLE

ENVIRONMENT	PREDICTION	RATIONALE
WATER		
CORN SYRUP		
DRINK OF CHOICE		

WEIGHT TABLE

ENVIRONMENT	PRE-WEIGHT	POST-WEIGHT	DIFFERENCE
WATER			
CORN SYRUP			
DRINK OF CHOICE			

Lesson Plan Template

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SAMPLE QUESTIONS TO ELICIT CLASS DISCUSSION:

- What happened to the eggshell?
- Why do you think the weights of the eggs changed?
- Why was water allowed to pass and not the protein of the egg?

PARAMETERS TO EVALUATE STUDENT WORK PRODUCTS:

Students will be evaluated via experimental design, tables, experimental analysis and tests.

REFERENCES:

Experiment was modified from an activity in “BSCS Biology: A Human Approach”, Kendall/Hunt Publishing Company.

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LESSON #2
DIALYSIS

LESSON TOPIC:

- Homeostasis,
- Particle size and movement, responding to environmental conditions

RATIONALE:

How the size of a particle will effect whether it crosses a membrane in response to changes in its environmental conditions

STANDARD(S) & INDICATOR(S):

5.1.8.B1. Identify questions and make predictions that can be addressed by conducting investigations.

5.1.8.B2. Design and conduct investigations incorporating the use of a control.

5.1.8.B3. Collect, organize, and interpret the data that result from experiments.

5.5.6.A2. Identify and describe the structure and function of cells and cell parts.

OBJECTIVE(S): Students will be able to:

- Create a model of a cell and manipulate its environment in order to provoke particle movement with the materials provided.
- Write a hypothesis predicting particle movement.
- Appraise their experimental design and synthesize lab results through measurements and observations.
- Draw conclusions about particle size, molecular movement and cell responses to environmental disturbances and articulate them in a narrative.

MATERIALS:

- Dialysis tubing
- Salt
- Water
- Starch solution
- Iodine
- Rubber bands
- Pipets
- Graduated cylinders
- Beakers
- Scales
- Paper towels
- Journals
- Aprons, goggles, gloves

BACKGROUND INFORMATION:

Students will be applying the concepts of experimental design, homeostasis, isotonic, hypertonic, hypotonic, solution and solute.

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**CLASSROOM ACTIVITY DESCRIPTION (LABORATORY/EXERCISES/PROBLEMS)
including detailed procedures:**

- Students will obtain 3 pieces of dialysis tubing and create the internal environment of a cell by adding to it a saline solution and starch.
- Students will secure both ends of the tubing and weigh each model of a cell prior to placing the cell into its environment.
 - Isotonic/hypertonic/hypotonic environments
- Students will make predictions as to what will occur in each environment and give rationale as to why.
- After sitting in the respective environments, the cells will be removed from their environment and weighed.
- The weight will be documented in their journals.
- Students will then compare their predictions to what actually happened in the experiment. They will critique the experiment and comment on any modifications they thought would benefit the experiment.

TABLE

PREDICTIONS TABLE

CELL INTERNAL ENVIRONMENT	CELL EXTERNAL ENVIRONMENT	PREDICTED CHANGE	RATIONALE FOR CHANGE
	(ISOTONIC)		
	(HYPERTONIC)		
	(HYPOTONIC)		

SAMPLE QUESTIONS TO ELICIT CLASS DISCUSSION:

- What will determine what will travel across the cell membrane?
- How does taking medicine work?

PARAMETERS TO EVALUATE STUDENT WORK PRODUCTS:

Students will be evaluated on how well they were able to create a model of a cell, their predictions table, lab narrative and tests.

REFERENCES:

Experiment was modified from an activity in “BSCS Biology: A Human Approach”, Kendall/Hunt Publishing Company.

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