# **The Naked Egg Experiment Lesson Plan**

This lesson and experiment are best suited for students in grades 6-8. Students will read an article about the process of osmosis and connect it to their prior understanding of cells and organelles. Next, students will complete an experiment in which they will observe the process of osmosis through a chicken egg. Students will hypothesize about why the cell functions as it does and how the cell membrane and osmosis play a role in the experiment. Finally, students will reflect on their understanding. This lesson will take multiple days to complete because the egg must sit 24-48 hours multiple times during the course of the experiment. Please reference the Pacing Suggestions included in the Lesson Duration section of this plan as needed.

**Standards:**

**Next Generation Science Standards:**

* **MS-LS1-1** – Conduct an investigation to provide evidence that living things are made of cells; either one cell or many different numbers and types of cells.
* **MS-LS1-2** – Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.

**Objectives:**

* Students will be able to define and describe the process of osmosis and its importance in cell function.
* Students will be able to make and describe scientific observations as well as draw conclusions at the end of an experiment.

**Lesson Duration:** Approximately 115-145 total minutes, divided over multiple days

* Suggested Pacing:
  + Day 1 🡪 Complete Steps 1 and 2: read the article, take notes and begin the experiment
  + Day 2 🡪 No new steps today, revisit related topics instead
  + Day 3 🡪 Step 3: Exposing the Cell Membrane
  + Day 4 🡪 Step 4: Observing Osmosis
  + Day 5 🡪 Step 5: Colorful Conclusions
  + Note: Steps 4 and 5 can be completed on the same day

**Materials:**

* Building Blocks of Animals and Plants – specifically The Cell Cycle
* Osmosis Article
* Optional: Osmosis Article Detailed Version (written at a higher Lexile level)
* Optional: Osmosis Note-Taking Guide Student Version
* Optional: Osmosis Note-Taking Guide Teacher Version
* The Naked Egg Experiment Guide
* The Naked Egg Experiment Reflection Questions
* Pencils
* Optional: Colored pencils, markers, crayons
* For each experiment/group:
  + 1 chicken egg (brown or white, from the grocery store is more than fine!)
  + 1 jar with lid
  + Enough vinegar to cover each egg when placed in the jar
  + Food coloring (mix it up with fun colors!)
  + Scale that measures in ounces

**Requisite Prior Knowledge:**

Before engaging in this experiment, students should have general knowledge of cells and their organelles, specifically the cell membrane. They should also have prior experience making observations and taking notes during an experiment. If your students have not had many opportunities to practice these skills, consider modeling more than suggested in the lesson plan. If your students are more independent with these skills, consider using less modeling and giving students more responsibility in their experiment and learning.

**Assessment(s):**

* The Naked Egg Experiment Guide
* The Naked Egg Experiment Reflection Questions
* Optional: Note-Taking Guide

**Vocabulary:**

* Osmosis – a process by which liquid moves from one solution, through a membrane, and to another solution.
* Cell Membrane – a covering that separates the inside of a cell from the outside environment.
* Solution – a mixture of two or more substances in which one or more substances dissolves (breaks up) into another.
* Solute – The part of a mixture that dissolves in the liquid.
* Solvent – the part of a mixture that is mostly liquid and dissolves the solute.

**Differentiation Considerations:**

* Consider using the Osmosis Note-Taking Guide with your entire group of students or use it with students that need the extra note-taking support.
* Consider using the Osmosis Article Detailed Version for a more complex version of the text with a higher Lexile level.
* Consider extending students’ thinking by posing the following after concluding the experiment: We’ve seen what happens when the cell membrane does allow substances to pass through using the process of osmosis but what would happen if it didn’t allow for this? How could we set up an experiment to test this theory?

**Lesson and Instruction:**

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| **Lesson Components and Time Guidelines** | **Teacher Actions** | **Notes** |
| **Introduction/Hook**  Approximately 5-8 minutes | Activate background knowledge by reviewing the term “organelle” and by reviewing organelles and their basic functions.  Set the scene for today’s lesson by posing the following to students: *Cells need nutrients to survive. How do they get those nutrients if they are surrounded by a cell wall?*  Provide time for students to share their predictions and understandings with peers or in a whole-group discussion before transitioning to the next phase of the lesson. |  |
| **Direct Instruction and Modeling**  **STEP 1:** **Read and take notes:** approximately  20-30 minutes depending on choice of notes  **STEP 2: Beginning the Experiment** approximately 15-20 minutes  **STEP 3: Exposing the Cell Membrane** approximately 20-25 minutes  **STEP 4: Observing Osmosis**  approximately 20-25 minutes  **STEP 5: Colorful Conclusions** approximately 20-25 minutes | **STEP 1: Read and take notes:**  Begin by reading the Osmosis Article with students. Consider using your favorite note-taking strategy or the Osmosis Note-Taking Guide during or after reading.  Hook students into the experiment: *We learned that cell membranes use osmosis to let certain substances (like nutrients!) into and out of cells. How can we show this so we can see the process of osmosis?*  Explain that we will conduct an experiment over the next few days in which we will observe the process of osmosis without needing a microscope! We will use a chicken egg just like the ones you can get at the grocery store. Once we remove the shell, the chicken egg is just one large cell! It will be easier to observe osmosis when the egg is “naked.”  It is suggested that you explain AND model each of these steps for students. After listening to an explanation and/or model, students should be able to complete these steps in small groups with minimal support.  **Step 2: Beginning the Experiment:**  Use page 1 of the Experiment Guide:  -Explain and model how to carefully weigh your egg in ounces using a scale. Record this data in the Experiment Guide. Then gently place the egg into a jar and completely cover it with vinegar. Close the lid tightly and set sit for 48 hours in a cool, dark place.  -Return to the Experiment Guide and draw a picture as well as list other observations and notes. Use colors to make your sketch more detailed. Be thorough and encourage students to do so as well.  **STEP 3: Exposing the Cell Membrane**  Use page 2 of the Experiment Guide:  - Explain and model how to carefully remove the egg from the vinegar and rinse it with cold water in the sink. Be careful!  - Draw students’ attention to the lack of shell. Explain that the thing holding the cell (the egg) together is the cell membrane. Review what students know about this organelle.  - Repeat the weighing, observing, and recording process in your Guide. Discuss what changes students noticed and what observations they made. Prompt students to hypothesize about changes they observed. Draw students’ attention to the question in the guide, reminding them to use evidence and reasoning to support their answers.  -After completing observations, carefully place the egg back into the jar and fill with water. Close the lid and store overnight.  **STEP 4: Observing Osmosis**  Use page 3 of the Experiment Guide  - Depending on your students’ levels of independence, consider just explaining the directions here instead of modeling.  - After waiting overnight, explain and/or model how to carefully remove the egg from the jar of water and repeat the weighing, observing, and recording process in your Experiment Guide.  - Discuss what might have caused the weight to fluctuate and change over just one night. Begin guiding the class discussion toward the idea that water is passing through the cell membrane using the process of osmosis. This shows that some materials with nutrients the cell needs can pass through the cell membrane.  - Remind students to add detailed drawings, labels, and descriptions to their Experiment Guide. Remind them, too, to complete the hypothesis question using evidence and reasoning to support their thinking.  - Place the egg back into the jar of water but this time add 3-5 drops of food coloring (let your students pick their colors for some added choice and fun!). Predict and discuss what might happen to the “naked” egg with the food coloring, using scientific vocabulary appropriately.  **STEP 4: Colorful Conclusions**  Use with page 4 of the Experiment Guide  - Observe the egg and what happened with the food coloring. Repeat the process of weighing, observing, and recording ideas in the Guide. Draw students’ attention to the hypothesis question included in the guide. |  |
| **Closure**  Approximately 15-17 minutes | Explain to students that they were able to observe osmosis in real time using a chicken egg cell. Review vocabulary terms such as cell membrane, osmosis, and nutrients.  Next, use the Naked Egg Experiment Reflection Questions. Choose to have students complete these independently, in their experiment teams, as a whole group discussion, or in another way! These three reflection questions review major concepts addressed in this experiment and encourage higher order thinking skills.  Finally, revisit the objectives to close out the lesson. *Throughout this experiment you were able to observe the process of osmosis. You were able to describe this process in detail. Osmosis allows certain substances cells need like nutrients through the cell membrane and into the cell so it can survive.* |  |

**Next Steps and Reflection:**

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| What went well? |  |
| What changes might be beneficial? |  |
| Reteaching needs |  |
| Extension needs |  |