

## **SCoPE Site Lesson Plan**

**Title:** Lesson 5 – From Egg to Chicken (SC060105)

### **Abstract**

Students investigate levels of organization by observing a chicken egg, wing, and internal organs. The cell membrane is also explored using the chicken egg membrane as a model.

**Subject Area:** Science

**Grade Level and Course Title:** Sixth Grade/Biological Organization; Particles and Waves; Examining Water and Weather

**Unit of Study:** Cell Theory and Biological Organization

### **Benchmarks**

- Explain why and how selected specialized cells are needed by plants and animals (III.1.MS.2).
- Generate scientific questions about living organisms based on observation (I.1.MS.1).

### **Key Concept**

levels of organization

### **Instructional Resources**

Equipment/Manipulative

Biological Organization; Particles and Waves; Examining Water and Weather

Antibacterial soap

Bowls (1 per group)

Chicken organs (gizzards, livers, hearts, 1 of each per group)

Chicken wings (fresh; 1 per group)

Corn syrup

Disinfectant for desks and equipment

Eggs (1 per group plus 3; include a few extra for breakage)

Eye protection (for each student)

Glasses, clear plastic (3)

Meat trays or paper plates (1 per group)

Popsicle sticks (1 per group)

Protective gloves (for each student, non-latex)

Salt water solution (3%)

Scissors

Tape measure

Vinegar

### Student Resource

Sweeney, Bernice, and Juliana Texley. *Unit 1 Lesson 5 Student Pages*. Teacher-made material.  
Lansing, MI: Michigan Department of Treasury, 2003.

Biological Organization; Particles and Waves; Examining Water and Weather

### Teacher Resource

*Chicken Wing Dissection*. Access Excellence Activities Exchange. 27 January 2004  
<<http://www.accessexcellence.org/AE/newatg/Ekstrom.chickenwing/teacher.html>>.

*Incubation and Embryology Activities*. University of Illinois Extension. 27 January 2004  
<<http://www.urbanext.uiuc.edu/eggs/act00.html>>.

*Questions and Answers About Biology: Chicken Egg/Cell Question*. MillerandLevine.com. 27 January 2004 <<http://www.millerandlevine.com/ques/eggs.html>>.

Sweeney, Bernice, and Juliana Texley. *Grade 6 Unit 1 Teacher Background Information*.  
Teacher-made material. Lansing, MI: Michigan Department of Treasury, 2003.

### **Sequence of Activities**

Advanced Preparation: Download the coloring sheet for parts of the egg from University of Illinois Extension (cited above). In some areas you can obtain fertilized chicken eggs. If these eggs are allowed to sit at room temperature for a day or so, a tiny spot of blood will identify the development of the embryo. But even an unfertilized (grocery store) egg works for this exercise. Crack an egg into a bowl for each group making sure not to break the yolk. Retain part of the shell for each student group to examine. Prepare 3% salt water solution with 3 g salt to 100 ml of water. Place a chicken gizzard, liver, and, heart on a meat tray or paper plate for each group.

Safety Precautions: Raw chicken or eggs may be contaminated by *Salmonella* bacteria. Students must wear protective gloves to handle the chicken. The work area must be thoroughly cleaned with soap and water after the activity. Students must wear eye protection and wash their hands. Do not do this activity in an area where students might later eat.

1. Help students understand that living things must be organized to carry out all of the functions of life. Begin with the analogy from Lesson 4: “If you lived alone on a desert island, you would have to perform all of the functions of life. If you lived with others, you could share some of the functions. But when people share jobs, they must be very organized. They must

## Biological Organization; Particles and Waves; Examining Water and Weather

know who is responsible for each job, and coordinate.” (Give examples: If a group of people were building a house, the plumbers would have to know where to put the pipes, and the electricians where to put the plugs, or the house would not work when it was done.) “It is the same with cells. Groups of cells that are specialized for different jobs are called tissues. The tissues work together in organs, and organs cooperate to form systems. All those parts work together to make a healthy organism—a plant, an animal, or you.” Diagram on the board cell → tissue → organ → system → organism. Then add: “Organisms cooperate too, in communities and ecosystems.”

2. Introduce the first part of the “Investigating Organization” activity: “We are going to use a chicken and an egg to explore the levels of organization within an individual organism. The structure and function of chicken cells are similar to that of human cells.” Guide students through these steps:
  - You will be given a chicken egg that has been broken into a dish to examine.
  - First find the yolk. It is stored food for the new chick. Yolks are full of fat, which provides energy. What holds the yolk together? [A thin, plastic-like membrane called the vitelline membrane.]
  - Find the white spot on the surface of the yolk, or yellow part. (**Note:** This spot is called the germinal disc.) This is the egg cell, which is going to grow into a tiny chicken embryo. (Define embryo as a developing organism.)
  - From the yolk to the shell you may find a white, “rope-like” membrane called the chalaza. What might it be for? [Anchors the yolk inside the white.]
  - Find the albumen or “egg white.” How does it feel? [Viscous, jelly-like.] Why is it there? [It cushions the embryo.]
  - Carefully pick apart the remaining shell to find the membrane inside. Why is it there? [The embryo must breathe.]
3. Use the worksheet from University of Illinois extension to allow students to color the parts of the egg.
4. Tell students that together you are going to explore the purpose of shells and the membranes inside of them. Carefully, with student help, measure the widest circumference of three eggs.

## Biological Organization; Particles and Waves; Examining Water and Weather

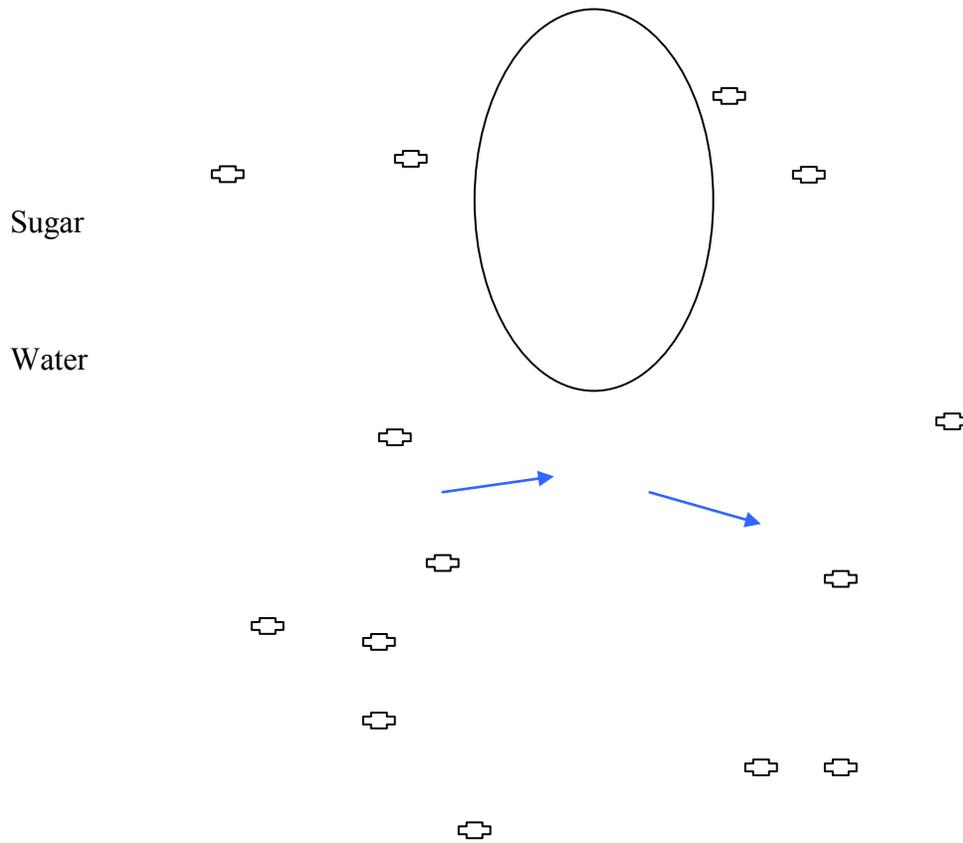
Then place two eggs in vinegar, and the other in water. (This is a good place to stop the lesson for a day or two.)

5. When students return to their egg demonstration, they should see that the eggs in vinegar have lost their shells. (Egg shells are primarily calcium carbonate  $\text{CaCO}_3$ . In an acid, that lime breaks down to a soluble calcium salt and carbon dioxide.) Ask students to carefully examine the shell-less egg. They should be able to see the membranes clearly.
6. Soak one of the eggs with no shell in a 50% of 3% salt water and 50% corn syrup solution. Soak the other egg with no shell in a 3% salt solution (3 g salt to 100 ml water). **Note:** This is the approximate salinity of the ocean, and the approximate salinity inside all cells. It is the normal or “isotonic” level of salt so that the cells maintain their normal osmotic pressure or “plumpness. Let the eggs soak overnight again.
7. Measure the eggs after 24 hours and record the measurements in the chart.

Egg Treatment	Circumference
No shell in corn syrup solution	
No shell in salt water solution	

8. Discuss the results with the students. Question #1: “Why did the chicken shell dissolve?” [Without any specific chemistry, students should be able to see that vinegar dissolves the hard calcium.] Question #2: “How would you describe the membrane inside the shell?” [It is very thin; the chicken embryo can breathe through it.] Then let students know that the membrane inside the egg is very much like a cell membrane. We can see how a cell might act by using this shell-less egg as a *model* for the cell. “The inside of all cells is about 3% salt. That is the same as the ocean. Water can move inside or outside of a cell membrane. So can salt. But sugar is a big molecule that cannot pass through. If there is a lot of sugar outside the cell, the water inside the cell will want to leave to re-balance the water on each side of the membrane. This makes our model “cell” shrink up.” Add a diagram to help students understand the process called *osmosis*.

## Biological Organization; Particles and Waves; Examining Water and Weather



9. Students will understand the process of osmosis better with examples: “When we put foods in salt water, they shrink. If we put foods in pure water, they sometimes swell. But soft contact lenses are a lot like shells; to be just the right shape for our eyes, we need to keep them in just the right solution.”
  
10. Remind students: “The parts of an egg can be models for a cell. But they are really made of many cells. Each part is a tissue. An egg is an organ.” Invite them to look at the other organs of a chicken with you, using very careful technique to keep clean. (Remind them to wear gloves and eye protection and wash their hands when finished.) Students should continue with the “Chicken Wing” section of the “Investigating Organization Activity” following these directions:
  - Put on your gloves and carefully observe the chicken wing provided for your group. The skin of the chicken is made up of *epithelial* tissue. Its function is to cover the surfaces of the body, inside and out. The cells are tightly packed to

## Biological Organization; Particles and Waves; Examining Water and Weather

provide protection from the environment. What properties of skin make it good for protection? [It is tough, water-repellant, and flexible.]

- Carefully cut the skin from the wing by putting the tip of the scissors between the skin and the connective and muscle tissue underneath, starting at the end of the wing that had been attached to the chicken. Use a popsicle stick to help lift the skin from the connective tissue underneath. Look closely at the skin that has been removed.
- Notice the semi-transparent connective tissue covering the muscles. The part of the chicken we eat is muscle tissue. Pull on a few different muscles and observe the movement that occurs. Muscle tissue is made of cells that contract. All body movement is in response to muscles contracting and relaxing. But to move, the muscle must pull on a bone. Find a bone and the muscle that connects to it.
- A chicken wing has a humerus, radius, and ulna. These are the three bones in a human arm also. Pull away the muscle and connective tissue to reveal the bones. Bones are also a connective tissue. Connective tissues (bones, tendons, ligaments, cartilage) provide protection, support, and connect body parts. Blood and fat are connective tissues that transport or store materials. Can you find the bones on your arm that are like the chicken's bones? Nerve tissue is not easily seen in a chicken wing. Nerve cells are very long and thin.

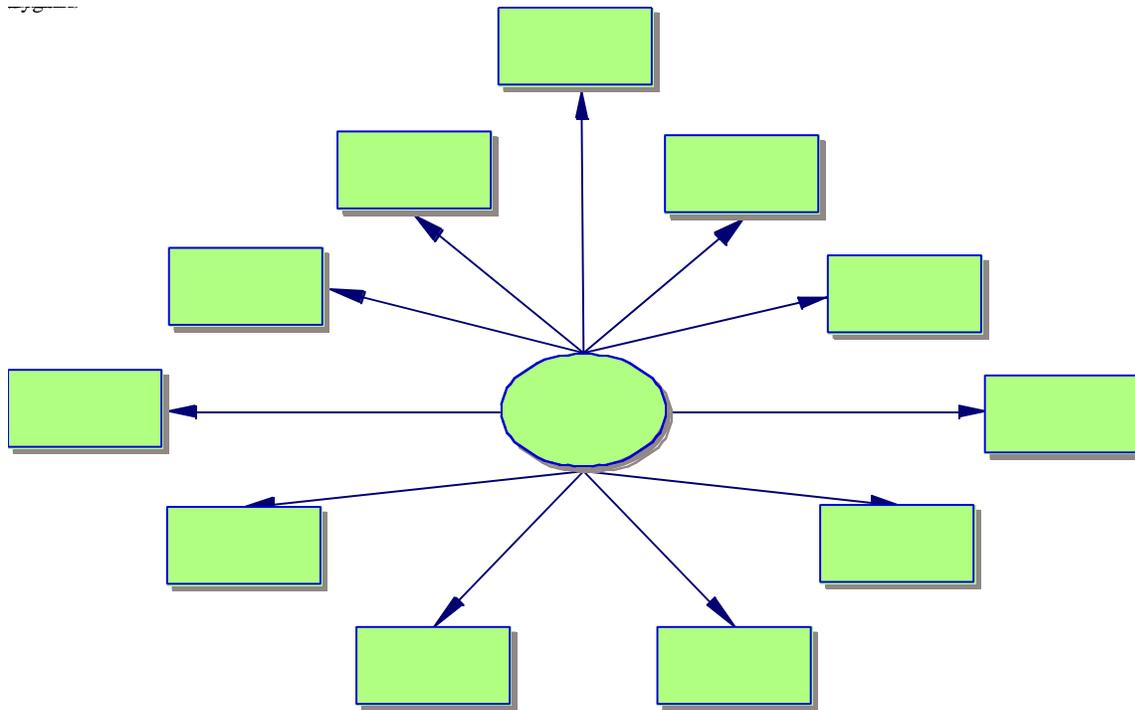
11. Remind students that a wing is an organ. An organ is a group of tissues that work together to perform a specific and more complex function. Organs are often made up of all of the kinds of tissues. Provide each group with a heart, a gizzard, and a liver to examine. Explain: "In the heart, each tissue type contributes to the overall job of pumping blood throughout the body. Ask students to compare a heart, liver, and gizzard in the "Chicken Organ" section of the Investigating Organization Activity.

Organ	Function	Describe How It Looks
Heart	Pumps blood throughout the body.	

## Biological Organization; Particles and Waves; Examining Water and Weather

Liver	Processes nutrients into substances needed by the body to help digestion.	
Gizzard	Grinds and digests tough food that the chicken has eaten.	

12. Ask students to complete and discuss the final questions: Question #3: “ Muscle tissues are denser than gland tissues, and make an organ feel hard. Which of these organs are harder?” [Gizzard and Heart.] Question #4: “Which organ contracts over and over again?” [Heart.] Question #5: “One of these organs has very strong muscles. In a live chicken, it holds a little sand or gravel, and helps the chicken grind its food. Which organ is that?” [Gizzard.] Question #6: “Gland cells make chemicals that a body needs. They are very tiny cells, and a gland has a structure that you cannot see with your eyes. Which organ is a gland?” [Liver.]
13. Organ systems are the next level of organization. There are eleven organ systems that work together to maintain a stable internal environment in an animal. Use this graphic organizer to review the idea of systems with students:



**Assessment**

Students should be able to draw a graphic describing the levels of organization from a cell to an individual organism.

**Application Beyond School**

There is a similarity in the organization of living things. Studying the relationship between organ systems in laboratory animals provides insights into how human organ systems may work.

**Connections**

Social Studies

Students should diagram the levels of organization within their school.

