

# Trout in the Classroom Lesson/Presentation Plan

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Eco-Cruises  
Floating Classroom  
Trout in the Classroom

## Title/Topic: Red Cabbage pH Chemistry Test

**Audience/Grade:** Elementary/MS

**Overview:** Ahh, the sweet smell of science! This next activity is super smelly, but really cool activity. Students can prepare their own classroom or at home acidity testing process, and explore the range of acidity of water and other substances.

### **Skills/Understandings/Learning Objective(s): Reading comprehension...**

- Reading comprehension
- Use of information resource to interpret observations

**Relevance:** Water testing. This is a home version of the pH test during aquarium maintenance in class.

**Timeframe:** 30 minutes

**Group Size:** Independent or group study

**Location(s):** Flexible home/classroom or outdoors.

### **Materials:**

- Blender or stove (see below),
- three or more jars, glasses or clear containers. Different sizes are OK.
- A sieve or filter.
- A teaspoon or pipette.

### **Preparation:**

1. Create the test solution. First, you'll need some raw red cabbage. Once you've got that, there are two options for preparing the test solution; each one requires adult supervision.

- **Blender and strainer:** Put three or four big cabbage leaves in a blender filled one-half full with water. Blend the mixture on high until you have purple cabbage juice. Pour the purplish cabbage liquid through a strainer to filter the chunks of cabbage. Save the clear liquid for your experiments.
- **Boiling:** Have an adult boil 2 cups of water. Remove from heat when boiling. Add three or four cabbage leaves and let sit for a few minutes. Once the water has cooled, remove the leaves and save the colored liquid for your experiment.



2. Set up your pH Indicators:

- a. For home experiments: Set out three glasses, side by side. Fill each glass three-fourths full with cabbage juice. (Hint, make one glass larger than the other two.)

- b. For Classroom/Lab Experiments: Use a set of 20ml test tubes and a stand. Put about 10 ml of purple cabbage water in each test tube.
- c. Add a little vinegar to one of the smaller glasses of cabbage juice. Stir with a spoon and notice the color change to red, which indicates that vinegar is classified as an acid. All acids will turn red when mixed with cabbage juice.
- d. In the second small glass, add a teaspoon of washing soda or laundry detergent. Notice how the liquid turns green, indicating that this chemical is a base.
- e. You should have three glasses (or test tubes) that look about like this. (The glass with purple, neutral cabbage water may be larger.)



## What Just Happened?

Substances are classified as either an acid or a base. Think of acids and bases as opposites—acids have a low pH and bases have a high pH. Distilled water (a “neutral”) has a pH of 7 on a scale of 0–14. Around Ithaca, our water often is slightly basic, with a pH close to 8. (That’s because of our rocks and soil!)

Scientists can tell if a substance is an acid or a base by means of an **indicator**. An indicator is typically a chemical that changes color if it comes in contact with an acid or a base. (Your trout aquarium test used an indicator!) The purple cabbage juice turns red when it mixes with something acidic and turns green when it mixes with something basic. Red cabbage juice is an indicator because it shows us something about the chemical composition of other substances.



Red cabbage contains a water-soluble pigment called **anthocyanin** that changes color when it is mixed with an acid or a base. The pigment turns red in acidic environments with a pH less than 7 and the pigment turns bluish-green in alkaline (basic) environments with a pH greater than 7.



## Exploration Procedure

Now that you've got the basics, let's test a few more substances!

- Think of other household chemicals or foods that you use daily (shampoo, glass cleaner, dish soap, salt, orange juice, etc.) Try mixing a small amount of each household chemical with a small amount of cabbage juice. Note the color change to determine if the chemical is an acid (red) or a base (green).
- Head outdoors and collect a few water samples to test. Stream water, groundwater, even water you squeeze out of decaying logs or mulch!
- Record your results.

### WRAP UP:

- Share your data with classmates! Did they get similar results?
- Your trout (and most creatures that depend on water, like you, prefer water that is nearly neutral, with a pH about 7, or slightly basic with a pH up to 8. If you tested stream water, would the pH be OK for your trout?

### Assessment Criteria/Rubric:

|                                                  | Needs work | OK | Good |
|--------------------------------------------------|------------|----|------|
| Engagement/Participation                         |            |    |      |
| Students showed understanding of key concepts... |            |    |      |
| Creative projects ...                            |            |    |      |

**You can even make your own pH indicator strips, for the road!** To do this, soak some coffee filter paper in concentrated cabbage juice. Remove the paper from the cabbage juice and hang somewhere to dry. Cut the dried paper into thin strips. Dip the strips into various liquids to test their pH. The redder the strip turns, the more acidic the liquid is. The greener the strip turns, the more basic the liquid is. If it stays purple, you guessed it, the substance you're testing is probably neutral.