

INTELLECTUAL OUTPUT 03

SCIENTIFIC CREATIVITY

4 Creativities Project
№2019-1-BG01-KA201-062354





INTRODUCTION

The aim of FCREATIVITIES project is to improve the teachers' abilities to generate a creative education, leading to the creation of students who are able to think, analyze and solve daily problems. We **will develop new scientific skills** and competencies through the incorporation of new proposals, spaces, methodologies, and resources that will increase the students' ability, creativity and the skills for innovation. These activities will be used **with 10 to 12 years old students**, promoting their motivation and creativity. The activities will be composed for **six working activities** which will contain the different activities that we will elaborate with our students.

With the **scientific creativity** promotion we will improve the thinking capacity of our students and the ability to go from basic notions to more complex ones; they will learn to resolve problems in a real situation; they will practice the construction of their own learning; they will train their **deductive capacity** and this will take them to create strategies and solutions of their own and they will get better with their physical environment and their appreciation from different spaces, shapes, parts and the group in general. Scientific creativity will take place inside the classroom through scientific experiments workshops.

All the **experiments** will be presented in an experiment manual. The format will be a paper card, it will contain all the material that we will need to accomplish the experiment, how you do it, **how it is related to everyday life** and other relevant details.

The experiments that will conform the manual will be the following ones: **bacteria everywhere. Cells. Let's make a periscope. Light and air. Prehistoric illumination. Can we imitate a heart? Global warming.**

Scientific activity will be **boosted through observation, manipulation and research**. That will lead students to discover their immediate environment. Experimental and research activities will offer students the opportunity for learning in an independent and significant way.



Title of the experiment

Indicators in Science



Description and application in everyday life

*Describe the experiment and its **practical application** in everyday life...*

In this lesson students are encouraged to share their knowledge and understanding of what an indicator is. Most students will talk about indicators on a car. This is an ideal opportunity to speak about why indicators are used – they are used to signal or as indication of change. This then leads on nicely to talk about acids and bases and how indicators undergo observable changes when placed in acids or bases. You can then introduce the idea of homemade indicators such as red cabbage. Red cabbage contains a pigment molecule called flavin (an anthocyanin). This water-soluble pigment is also found in apple skins, plums, poppies, cornflowers, and grapes. Very acidic solutions will turn anthocyanin into a red colour. Neutral solutions result in a purplish colour. Basic solutions appear in greenish-yellow. Therefore, you can determine the pH of a solution based on the colour that it turns the anthocyanin pigments in red cabbage juice.



Aims

Please list the objectives you want to achieve...

- Students will make their own pH indicator solution
- Students will make predictions on whether the various household substances are acids or bases
- Students will get to test this indicator on household substances such as vinegar and baking soda
- Students will then complete the worksheet and determine which household substances are acids and bases



Steps we must follow

Detailed description of the different steps to carry out the experiment...

1. Chop the cabbage into small pieces until you have about 2 cups of chopped cabbage. Place the cabbage in a large beaker or other glass container and add boiling water to cover the cabbage. Allow at least 10 minutes for the colour to leach out of the cabbage. Alternatively, you can place about 2 cups of cabbage in a blender, cover it with boiling water, and blend it.
2. Filter out the plant material to obtain a red-purple-bluish coloured liquid. This liquid is at about pH 7. The exact colour you get depends on the pH of the water.
3. Pour about 50–100 mL of your red cabbage indicator into each 250 mL beaker.
4. Add the various household solutions to your indicator until it changes colour. Use separate containers for each household solution—you don't want to mix chemicals that don't go well together.

Red Cabbage pH Indicator Colours

pH	2	4	6	8	10	12
Colour	Red	Purple	Violet	Blue	Blue-Green	Greenish Yellow



Materials needed

In order the teacher to be prepared for the proper implementation make a list of all needed materials and resources needed.

- *Red cabbage*
- *Blender or knife*
- *Boiling water*
- *Filter paper (coffee filters work well)*
- *One large glass beaker or another glass container*
- *Five 250 mL beakers or other small glass containers*
- *Baking soda (sodium bicarbonate, NaHCO_3)*
- *Washing soda (sodium carbonate, Na_2CO_3)*
- *Lemon juice (citric acid, $\text{C}_6\text{H}_8\text{O}_7$)*
- *Vinegar (acetic acid, CH_3COOH)*
- *Bleach (NaClO)*



Tips

If you have any recommendations for the teachers, please share them here. Please include any measures that must be taken to carry out the experiment safely!

This demo uses acids and bases, so use safety goggles and gloves.

You can conduct a neutralization experiment using a cabbage juice indicator. First, add an acidic solution such as vinegar or lemon, then juice until a reddish colour is obtained. Add baking soda to return the pH to a neutral 7.

You can add in other household substances to test, the students enjoy making predictions on the various household substances.

You can make your own pH paper strips using a red cabbage indicator. Take filter paper (or coffee filter) and soak it in a concentrated red cabbage juice solution. After a few hours, remove the paper and allow it to dry (hang it by a clothespin or string). Cut the



filter into strips and use them to test the pH of various solutions. To test a sample, place a drop of liquid on the test strip. Don't dip the strip in the liquid because you'll get cabbage juice in it. An example of a basic solution is laundry soap. Examples of common acids include lemon juice and vinegar.

Discussion points could include any or all of the following:

- *Many plant colouring materials in berries, leaves and petals act as indicators.*
- *Some of these will not dissolve in water easily. A solvent other than water (eg ethanol) could be used, but it may be flammable. Discuss how the risk of fire can be reduced by using a beaker of hot water to heat the mixture.*
- *Possible variations on this experiment might include using beetroot, blackberries, raspberries, copper beech leaves, or onion skins in place of the red cabbage.*

Acids & Bases

Learning Intention: To be able to identify common acids and bases using natural indicators

Predict whether each item will be an acid or a base.

YOU MUST PREDICT FOR ALL SUBSTANCES BEFORE STARTING.

Substance	Prediction: Acid, Base or Neutral?	Colour with pH indicator	pH range according to scale	Results: Acid, Base or Neutral?

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