



BLOOMING

Inclusion and Diversity in STEAM

Lesson Plan Title:

Rapid adulteration detection of cold pressed oils with their refined versions by UV-Vis spectroscopy

Objectives:

- Students will understand the concept of color and how it appears in different conditions.
- Students will learn how to measure the color parameters using a simple experiment.
- To increase students' interest in healthy food choices.

Materials:

- Project handout - communication documents;
- Laptop or computer with internet access;
- Projector for slides;
- Color monitoring device;
- Different colored materials dyed with organic dyes;
- Colored food products;
- Wastewater from dye industry;

Background Information:

The development of Romania's trade in a global market makes the diversity and rapid circulation of food products grow year by year. Under these conditions, checking the quality of these products to protect consumers from the interest of maximizing the profits of producers and sellers in any condition is an objective to which Dr. Simona POPA's research makes a direct contribution.



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Introduction (15 minutes): Color

1. Begin by discussing with students what they know about color. Ask questions such as:
 - a. How does the color appear?
 - b. What is the meaning of each color?
2. Introduce the concept of color and of different factors that influence color.
3. Which are the monitoring color devices.
4. How color influences our choices when it comes to buying food products.
 - a. Maybe the color demonstrates the alteration of a product?

Activity - Measuring Color of different products (30 minutes):

1. Divide the students into small groups.
2. Provide each group with a colored product.
3. Instruct each group how to use the color monitoring device.
4. Instruct each group how to prepare colored water using a well-known dye.
5. Next, instruct the students to use adsorption material to eliminate the dye from this water.
6. Measure the water and the adsorption material color parameters at the beginning and at the end of the adsorption process.
7. After completing the experiment, each group shares their findings with the class using a flipchart or whiteboard to create a visual map of different results.

Discussion (15 minutes):

1. Lead a class discussion on the results of the experiment. Discuss any variations in measurements between groups and reasons for those differences.
2. Emphasize that color is a property of different materials measured in different conditions.
3. Introduce the concept of *metamerism* – that the same object has different colors under different illuminants.





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Conclusion (10 minutes):

1. Summarize the key points of the lesson: the concept of color and how to measure it.
2. Discuss real-world applications of measuring color.
3. Assign a simple homework task related to color, such as paying attention to how the color-absorbing sheets used in laundry absorb and trap loose dyes in wash water, protecting clothes against damage from color bleeds.

Assessment:

- Evaluate group presentations and participation in the hands-on activity. Evaluate student understanding through group participation, the accuracy of measurements, and their ability to measure color parameters.
- Challenge students to explore how color varies under different illuminants, such as food products, by designing additional experiments.

Key terms:

- *Adulteration of oils* – it is the practice to add other oils to pure oils to increase the profit margin.
- *UV-VIS spectroscopy* – has application in analytical chemistry, especially in quantitative analysis. It deals with measuring the absorption of light by a substance or matter to obtain information regarding its structure and properties.
- *The physicochemical parameters* for oil monitoring are determined by characteristics such as: density, viscosity, refractive index, acidity index, etc.

