Science in the KitchenLab & in the LanguageLab

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Subject: Chemistry.
Country of creation: Poland.
Countries of testing: Portugal, Lithuania and the Czech Republic.

Aims of the GP

- To help students to investigate on their own the colour changes involved when adding cabbage water indicator to a variety of solutions.
- To enable students to understand that there are substances in water which they can find using their senses and there are others which they can identify using tools.
- To identify the solutions and give scientific explanations of a chemical reaction in the LanguageLab, in English.

Teaching material

Solutions**:** Ethanol (common alcohol) in water, sodium chloride (table salt) in water, baking soda (a base) in water, pure water, vinegar (acid) in water.

Use of two senses: Smell and sight. Use of taste and touch is forbidden.

Red cabbage indicator solution.

Materials needed for a group of 4-5 students:

- Pipette.
- Five Erlenmeyer flasks.
- Ten test-tubes.
- Stand.
- Burner.
- Nichrome wire.
- Permanent marker.
- White piece of paper.
- Camera to photograph the experiment.
- Reference books.
- Access to Internet.

Age of the students

12 - 14

Preparation and teaching time

2 x 45 min lessons.

Lesson plan

I. Preparation (15 min)

Red cabbage indicator solution – prepared at home by students one day before the experiment. They bring it to school.

II. Provide a work station called The KitchenLab (15 min)

Some students (e.g. two students plus a teacher) prepare five types of water samples with small amounts of each mystery substance for every group and copy the worksheet for each team.

III. Do the experiment (60 min)

1. Divide the class into teams of 4 or 5 students and introduce the subject (5 min).
2. Show the students the materials and tools they can use during the experiment.
3. Tell students the plan: *These are five water samples with mystery substances. We will try to identify substances in water using two senses: smell and sight. Use of taste and touch is forbidden* (5 min).
4. Have students look at and smell each water solution. Ask them to take notes (5 min).
5. Ask students to pour small amounts of each sample into five test tubes.
6. Have students dip a few drops of red cabbage indicator into each tube, observe the colour change and take notes (10 min).

Image 1: picture by authors of GP

Questionnaire

During the experiment we identified different substances dissolved in water. Use of two senses was forbidden. Which ones?

Smell and sight / Taste and touch / Smell and taste

Acids and bases are two groups of chemicals that have something in common when they are dissolved in a liquid such as water.

Acids turn cabbage water indicator red.

Yes / No

Bases turn cabbage water indicator blue.

Yes / No

A flame is the visible gaseous part of a fire. It is true that

- Both colour and temperature of a flame are dependent on the type of fuel involved in the combustion.
- Only the temperature of a flame is dependent on the type of fuel involved in the combustion.
- Only the colour of a flame is dependent on the type of fuel involved in the combustion.

Acids donate hydrogen ions and have

A high pH (pH > 7) / A low pH (pH < 7)

What did you see when the baking soda was dropped into the vinegar?

Nothing / Bubbles

A solution is composed of a solute and the solvent. Is tap water a solution?

Yes. Tap water contains dissolved minerals and gases.

No. Tap water doesn't contain dissolved minerals and gases.

How can we describe the appearance and smell of C_2H_5OH.

Colourless acidic liquid.

Colourless liquid that has a strong characteristic odour.

Colourless, no odour.

80% of all illnesses in the world are caused by drinking dirty water. A lot of attention has to be paid to what kind of water we use because of dirty things dissolved in it. These:

Are always visible / Can be invisible

Teacher reviews

Each one of the teachers who implemented this GP said that the fact that it asked the students to work with materials that are so closely related to everyday life increased the students' motivation incredibly. Students were familiar with most of the substances and even use them in their daily lives, but

they were surprised to see that these substances and materials could be used in chemical experiments and could not only serve as food or drink. The Czech teacher said that "*the students had a lot of fun during the lessons.*"

Concerning the fact that the GP was meant to be taught in English, all the teachers agreed that it was a good exercise for the students to prepare the final presentations in English. This was not easy for the students, but during the whole process they learned many scientific terms.

The Portuguese teacher summed up the effect and success of this GP by saying: *"The students showed great interest in the activities proposed, executed them with enthusiasm, and repeated them at home with their family and friends. The materials used were easy to find and so I think this is an activity that easily adapts to the curricula of different countries and educational realities. It has an excellent hands-on nature, and is perfectly framed in the spirit of inquiry based learning.*

The SPICE project

SPICE was a two-year project (December 2009 – November 2011) carried out by **European Schoolnet** (http://europeanschoonet.org) together with **Direção Geral de Inovação e Desenvolvimento Curricular** (http://sitio.dgidc.min-edu.pt/Paginas/default.aspx) from Portugal and **Dum Zahranicnich Sluzeb MSMT** (http://www.dzs.cz/) from the Czech Republic.

The primary objective of the SPICE project was to collect, analyse, validate and share innovative pedagogical practices, particularly those using inquiry-based learning, whilst enhancing pupils' interest in the sciences. SPICE supported this objective by singling out, analysing and validating good practice pedagogies and practices in maths, science and technology (mostly ICT-based) and disseminating them across Europe. SPICE involved 24 teachers from 16 different educational systems (from 15 different countries). This teachers' panel helped the SPICE partners in defining good practices that were then tested in classes by 41 teachers during the school year 2010-2011.

For more information see: **http://spice.eun.org**

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