Four Ancient Elements in the Lab:

Natural Science Principles in Simple Experiments with Substances of Daily Consumption

School subjects
Chemistry
Age of students
12-16
Aim of the Activity
STEM subject knowledge: girls have opportunities to recognize, develop and apply STEM knowledge on examples of simple science principles (properties of substances, measures, proportions, forces, everyday life phenomena). **Knowledge of inspiring role models and their meaning:** girls get in touch with inspiring role models: a female researcher of substances and their properties, a female lecturer explaining science principles, a female PR worker. **Knowledge about the STEM world of work: g**irls know about the STEM world of work through an immersion experience playing the role of a female researcher and lecturer.

Co-funded by the European Union

Entrepreneurial mind-sets: girls develop entrepreneurial mind-sets by thinking how they can present own ideas about science principles, how to be flexible in discussion, reaction to criticism and to be open for new ideas and proposals.
Transversal skills: girls acquire transversal skills such as the capacity to observe and critically analyse the world around, creativity to design own presentation, problem solving to overcome barriers and improve accessibility and wellbeing and personal initiative.

Background

This activity was part of a summer school that focused on personal consumption items in the everyday life that are connected to chemistry. Participants used labs and appropriate technologies i.e., sensors for measuring and for recognizing principles and processes connected with food, cosmetics, washing means, connection science and art, connection ethics and biology etc. They used different lab approaches, technologies, devices, and analytical means.

They discovered content of "healthy" and "unhealthy" food products by actively working in the laboratory. Natural science principles were discovered in simple experiments with substances of daily consumption, active parts of washing means, how to replace traditional products by more nature-friendly means and procedures, and many other interesting things, phenomena, and procedures.

The activity works best if it is not compulsory but serves as an inspiration for inquisitive people of any age or professional orientation. For the learning unit, several experiments were selected that include one or more of the mentioned elements and are feasible even in home conditions, i.e. they are not demanding in terms of material security or the safety of their implementation.

Activity

Input: an overview of the following activity is provided. Science experiments on the four ancient elements Water, Air, Fire and Earth, can form our view of the world around us, its laws and "mysteries". The knowledge about these elements enables us to have a new look at various phenomena of everyday life, they are not distant and difficult to understand anymore.

Task: Girls are working in pairs for this task. They are invited to study a description of elected science phenomena, a simple experiment is showed and explained. The girls are analysing phenomena description, thinking about a possible realisation of experiments and create own experiment for presentation to the whole group. When they have presented the experiment and explain themselves what happened, a discussion can start. Proposed phenomena:

Air: Little Balloon in Bottle, How much space does air need?, Vitamin Rocket,

Water: Lava Lamp, Water as glue, Water is not like water,

Fire: Who turns off first?, Fire extinguisher, Does the iron burn?

Earth: Acids are dangerous, On the trail of markers, Dry feet to the treasure.

Co-funded by the European Union

Time necessary
2 hours (one for preparation and one for presentation)
Learning outcomes
Through this activity, girls will gain the following skills knowledge: 1. develop a sense of identity in the STEM field by having a real experience as a female researcher, that is also shared with a role model and small group of girls (sense of belonging). 2. acquire and apply knowledge in the STEM field (properties of substances, observations, measures, proportions, forces, etc.). 3. know about some options related to the STEM world of work (everyday life phenomena, mainly food and their properties). 4. acquire entrepreneurial skills (development of a creative presentation, analysing, planning, comparing, presenting to an audience, etc.) 5. develop transversal skills such as collaboration, communication and creativity.
Costs
Lab equipment necessary
Materials necessary
Materials and substances of everyday life by proposed phenomena. Materials and equipment: glasses of different size, bottles of differ size, paper, pencils, markers for drawing, scissors, knife, candles, filter paper, heater etc. Substances: water, ice, oil, vinegar, detergent etc. (by elected phenomena and experiments).

Co-funded by the European Union