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Lesson Plan

by Durão, Ganhão, Marques and Silva from Portugal

mcrganhao@gmail.com

Title:

Sustainability of the Urban Water Cycle

Grade Level: 5th Grade

STEAM Areas: Science, Technology, Engineering

Materials Needed:

- Digital kit with internet connection;
- Interactive whiteboard;
- Smartphone;
- Canva;
- Mentimeter;
- Plastic bags with zippers;
- Permanent ink markers;
- Adhesive tape;
- Clear plastic bottles;
- Absorbent cotton, gauze and debris to filter (charcoal, sand and stones);
- Water, soil, leaves and other plant debris;
- Gobelé.

Objectives:

- Raise awareness of the scarcity of water suitable for consumption;
- Understand the importance of water as one of the essential resources for life on the planet;
- Understand the water cycle and the percentage of fresh water available on the planet;
- Discuss ways of saving and reusing water suitable for consumption.

Procedure:

We propose tackling the issue of the **Sustainability of the Urban Water Cycle** with a focus on the scarcity of water suitable for consumption, which is one of the real problems and challenges for the 21st century. We need to be aware that water is a finite resource, that the continued existence of life on the planet depends on it and that each human being has an individual and collective responsibility to be part of the solution to this problem. **Inquiry-Based-Learning and Modeling** are the educational approaches used to help students develop the project's objectives.

Learning environments: the proposed tasks should be carried out in the classroom, WTP (Water treatment process) and WWTP (Wastewater treatment process).

Engage | 45'

1. Watch the video "Where does water come from?" (https://www.youtube.com/watch?v=bQNFAKyOobk).
   a. Discuss questions, in a large group, related to the video and record the ideas generated in Mentimeter.

Explore | 2x 45'

1. Watch the video "Water cycle in a Bag" (https://www.youtube.com/watch?v=VZB44_X0pFw).
   a. Create a model of the water cycle;
   b. Record the observations in a table (phases and states of water);
   c. Draw conclusions from the experiment, based on the observations.

Procedure:

Explain | 30'

1. Watch the video "The Urban Water Cycle" (https://www.youtube.com/watch?v=tWvcWQ26nG0&t=5s).
   a. Order (from 1 to 7) the following stages of the urban water cycle:
      A - Obtaining water suitable for consumption
      B - Forwarding the water to a WTP
      C - Collecting water from nature
      D - Disinfecting the water
      E - Removal of coarse materials
      F - Filtering the water
      G - Removal of other particles by chemical and physical processes

Explore | 2 outings + 3x 45'

1. Visit a WTP and a WWTP.
   a. Indicate 3 advantages of having a WTP and a WWTP.
2. Build a model that explains the urban water cycle, reusing materials.
3. Build a model of a water filter, with clear plastic bottles, absorbent cotton, gauze and debris to filter (charcoal, sand and stones). Pour water with soil, leaves and other plant debris. Search for a tutorial in YouTube to help you.
   a. Record the differences observed in the water before and after passing through the filter (color and amount of organic matter);
   b. Briefly explain the function of the filter layers;
   c. Calculate the effectiveness of the filter, in percentage, taking into account the amount of water unfit for consumption placed in the filter (500ml) and the amount of water collected after filtration;
   d. Compare the results of the filter's efficiency with those of the other groups and discuss the conditions that may have made the difference.

Exchange | 45'

1. Reflect on ways to make the most of and reuse water and define 3 effective strategies for doing so.
   a. Make an attractive poster (with the 3 strategies) to share with the school community.

Evaluate | 30'

1. Check the knowledge acquired by playing the Aquaquizz Game (https://www.aquaquiz.pt/).

The links have been provided as examples. Some have no translation. We suggest that you select similar resources in your communities.

Assessment:

- Formative assessment of the students, on recording grids with a qualitative scale (group work and model construction);
- Evaluation of the activity, using Google Form, with a quantitative scale and open questions.

References:

- https://sdgs.un.org/2030agenda
- https://www.youtube.com/watch?v=bQNFAKyOobk
- https://www.youtube.com/watch?v=VZB44_X0pFw
- https://www.youtube.com/watch?v=tWvcWQ26nG0&t=5s
- https://www.aquaquiz.pt/

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