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Pollution of aquatic ecosystems - causes, effects and solutions

SUBJECT AREAS:

Nature Sciences

ACTIVITY DESCRIPTION:

Pollutant; pH value/neutral, acidic, basic water, wastewater management, researching skills.

OBJECTIVES:

Understands and uses the terms pollutant and pH value; research and differentiate between neutral, acidic, and basic water; connects water pollution and the effect; explains ways to solve water pollution problems.

MATERIALS:

Distilled water; water from springs/rivers/lakes or tap water with different substances; laboratory/plastic cups; graduated cylinder; pH paper; worksheets; computer/TV/ interactive table; internet connection.

GRADE/LEVEL:

Upper Elementary School (12-14)

DURATION:

Preparation time: depends on the possibility of collecting water from springs/river/lake; If using tap water and adding different substances, the process will take approximately 5 to 10 min.
Activity time: 40 min.

PLACE:

Classroom/Laboratory

AUTOR:

Civil Society Organization Eco Logic - Republic of North Macedonia

INTRODUCTION:

Students follow the video about the importance of water. https://education.nationalgeographic.org/resource/why-care-about-water/
The teacher initiates a class discussion on different examples of water pollution that the students may have observed in their daily lives. This can help students identify sources of pollution and think critically about ways to prevent or reduce pollution in their own communities.

BACKGROUND:

The teacher starts by presenting a lesson on environmental pollution and its impact on aquatic ecosystems. This encourages students to think more deeply about the human impact on the environment.

https://view.genial.ly/645f8bcbeecdc80018f49b0f/presentation-environmental-pollution-1

Different water samples, including those from a spring, river, or lake, are considered, with some of the samples being from polluted water sources. Another option is to utilize tap water and mix it with different substances such as detergent, oil, tartaric acid, different beverages, as well as both soluble and insoluble substances. The students are asked to describe the differences they notice between the samples with the naked eye. A sample of distilled water is also shown. Students are asked to describe the taste of water and to describe the difference in the tastes of different foods based on their previous experience. The teacher introduces the concepts of acid, base, and neutral compounds and explains the planned activities.

The students are then divided into groups and given three cups, each marked with a label. Each group is given distilled water, one sample of water from the sources mentioned earlier, vinegar, baking soda, pH paper, and a worksheet to record their results. The first cup is filled with distilled water to act as a control sample, and the other two cups are filled with an equal amount of water from the samples from spring/river/lake.

The students determine the pH of each sample and record the values in their worksheets. Then, they add vinegar to the second cup and baking soda to the third cup and determine the pH again, recording the new values. Each group presents their findings, and the results are discussed as a class. The students conclude that adding different substances to water changes its quality.

Finally, the students are encouraged to think about the various pollutants that are released into aquatic ecosystems and their impact on the living world. Possible solutions for protecting these ecosystems are discussed (wastewater management, water purification stations, recycling, stormwater treatment, green agriculture, etc.)

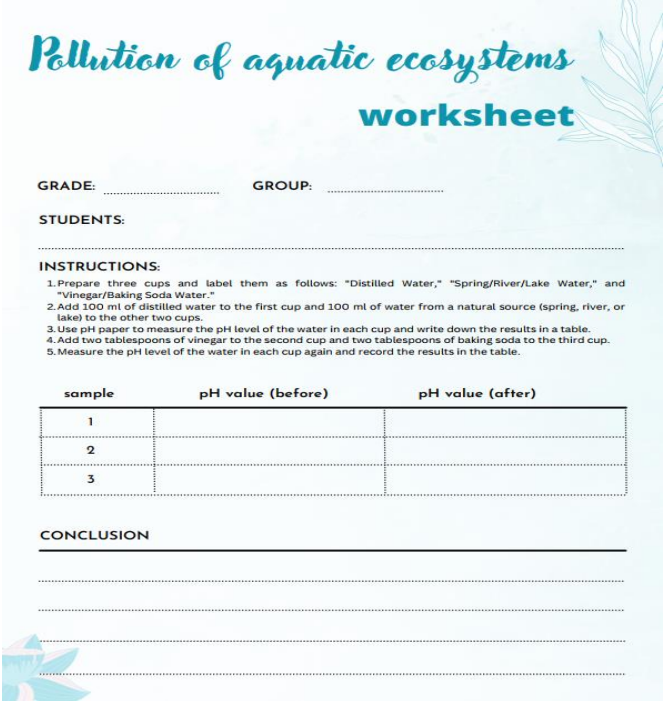
FUN FACTS:

- *Over 97% of the Earth's water is salt water in oceans and seas. Another 2% is frozen in icecaps and glaciers.*
- *The main causes of water pollution are industrial waste, agricultural waste, sewage, and oil spills.*
- *Every year, about 8 million tons of plastic end up in the ocean, which can harm marine animals and ecosystems.*
- *Every year, more people die from unsafe water than from all forms of violence, including war.*

ASSESSMENT:

Students have the opportunity to demonstrate their research abilities and participation in drawing conclusions through participation in the group activity.

Worksheet for determining the pH value of waters:



Pollution of aquatic ecosystems worksheet

GRADE: ..... GROUP: .....

STUDENTS:

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INSTRUCTIONS:

1. Prepare three cups and label them as follows: "Distilled Water," "Spring/River/Lake Water," and "Vinegar/Baking Soda Water."
2. Add 100 ml of distilled water to the first cup and 100 ml of water from a natural source (spring, river, or lake) to the other two cups.
3. Use pH paper to measure the pH level of the water in each cup and write down the results in a table.
4. Add two tablespoons of vinegar to the second cup and two tablespoons of baking soda to the third cup.
5. Measure the pH level of the water in each cup again and record the results in the table.

sample	pH value (before)	pH value (after)
1		
2		
3		

CONCLUSION

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Students can show what they have learned from the lesson through an interactive quiz game in Wordwall:

https://wordwall.net/resource/56488520

EVALUATION:

The evaluation of student's success and the attainment of their results is done by:

- oral answers to questions in the discussion;
- contribution to group activity;
- contribution to deriving the conclusions;
- answers to a worksheet/quiz.