



Digital Water Quality Monitoring

STEM4inclusive schools
WP2 – Toolbox



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Structure of the activity

A Introduction

about the topic

What is water quality, and why is it important?
How can we measure and analyze water quality?
What role does technology play in water monitoring?

B Training phase

about the training

Learn the basics of water quality testing.
Design a data collection and analysis plan.
Develop scientific inquiry and critical thinking skills.





A: About the topic

What is Water Quality?

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What is Water Quality?

Water quality refers to the chemical, physical, and biological characteristics of water.

And what are the key indicators?

- **pH:** Measures how acidic or basic the water is.
- **Temperature:** Affects aquatic life and oxygen levels.
- **Turbidity:** Measures the clarity of water and presence of suspended particles.





Importance of Water Quality

For the Environment:

- Supports healthy ecosystems and biodiversity.
- Prevents harmful algae blooms and habitat destruction.

For Human Health:

- Ensures safe drinking water.
- Prevents waterborne diseases and contamination.

For Sustainable Development:

- Maintains clean water resources for agriculture and industry.
- Supports global water conservation efforts.



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Basic Tools for Measuring Water Quality

- **pH Strips:** Inexpensive and simple way to measure acidity.
- **Thermometers:** Measure temperature variations in different water sources.
- **Transparent Containers:** Allow for turbidity observation and sediment analysis.
- **Measuring Cups:** Used for collecting and comparing water samples.





Key Water Quality Parameters

1. pH:

- Scale: 0 (acidic) to 14 (basic); 7 is neutral.
- Affects water's ability to support aquatic life.

2. Temperature:

- Influences oxygen levels and metabolic rates of organisms.
- Sudden temperature changes can stress ecosystems.

3. Turbidity:

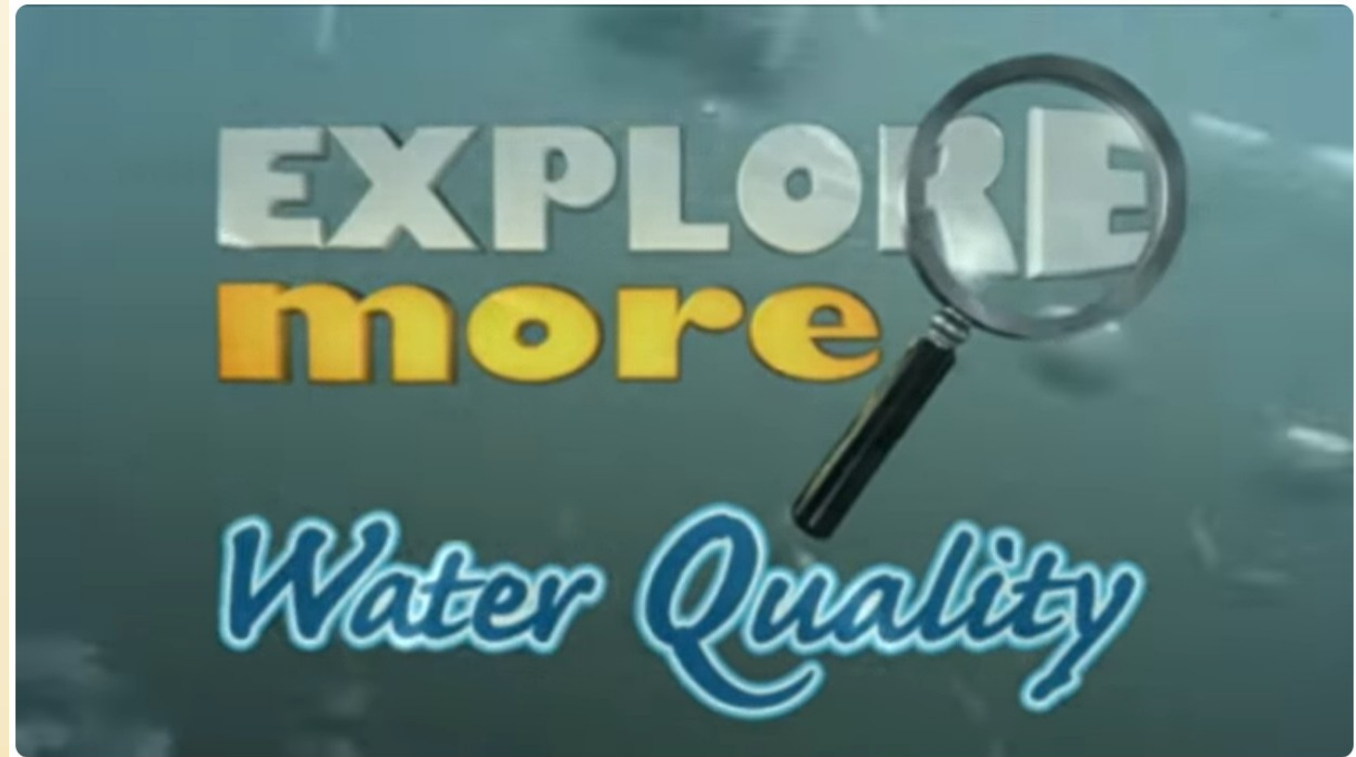
- Measures the clarity of water.
- High turbidity can indicate pollution or excessive sediments.



Let's have a look at this
YouTube video!



The Basics of Water Quality



<https://www.youtube.com/watch?v=ldv5yRkm7yc>

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Real-World Applications of Water Monitoring

1. Environmental Protection:

- Detecting pollution in rivers and lakes.
- Supporting conservation initiatives.

2. Public Health:

- Ensuring safe drinking water supplies.
- Monitoring contamination risks.

3. Sustainable Development:

- Improving wastewater treatment methods.
- Promoting clean water initiatives.



Challenges in Water Quality Monitoring

- Access to accurate testing tools.
- Variability in water conditions across regions.
- Need for continuous monitoring to detect long-term changes.



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*Let's learn more about
water quality and see
how STEM subjects can
be useful in this matter?*



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Innovations in Water Quality Monitoring

- Use of AI for real-time water quality predictions.
- Development of biodegradable water sensors.
- Smart water filtration technologies.

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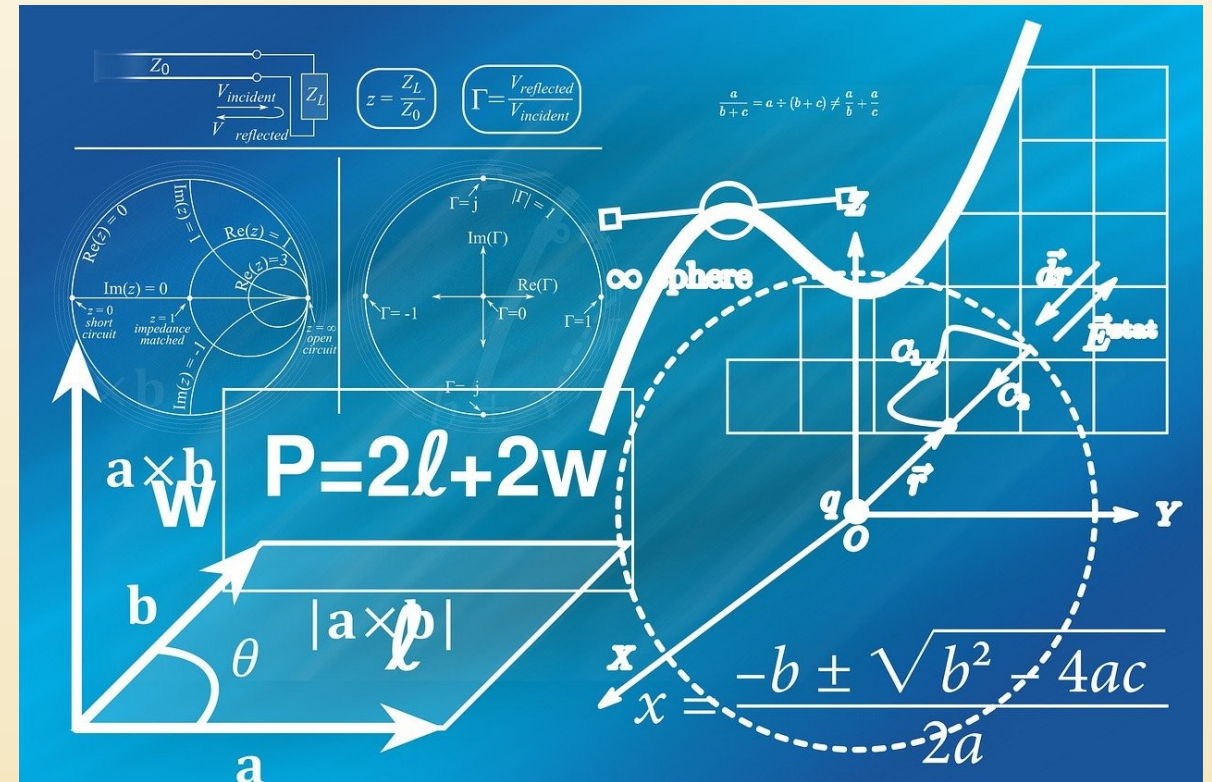


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The Role of Mathematics in Water Analysis

- Using formulas to calculate average pH levels.
- Interpreting temperature variations using statistical methods.
- Graphing trends to detect pollution spikes.



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STEM Fields in Water Quality Monitoring

- **Science:** Understanding chemical and biological water properties.
- **Technology:** Using tools and software for data analysis.
- **Engineering:** Developing water filtration and purification systems.
- **Mathematics:** Analyzing data trends and measurements.



Water Pollution and Its Impact

- Common pollutants: Industrial waste, agricultural runoff, plastic waste.
- Effects on marine and freshwater ecosystems.
- Long-term impact on drinking water sources.



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Let's have a look at this
YouTube video!

Water Pollution

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<https://www.youtube.com/watch?v=Om42Lppkd9w>



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Sustainable Water Management Solutions

- Reducing plastic waste and pollution.
- Implementing efficient wastewater treatment.
- Promoting conservation efforts at the local level.

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Hands-On Water Testing Activity

Today we will start our mini-project. You will:

- Collect a water sample from a natural or municipal source.
- Measure and record key parameters.
- Compare results with the rest of the class.

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Common Mistakes in Water Testing and How to Avoid Them

- Not rinsing collection containers before use.
- Misinterpreting pH strip color results.
- Skipping multiple measurements for accuracy.





Step-by-Step Guide for Water Sample Collection

1. Gather necessary tools:

- Sterile containers for water collection.
- pH test strips or digital pH meter.
- Thermometer for temperature measurement.
- Transparent container for turbidity observation.

2. Label the containers with sample location, date, and time.

3. Wear gloves to avoid contamination.



STEP 1



Collecting Water Samples

1. Visit the assigned water sources (e.g., river, lake, tap water).
2. Rinse the sample container three times with the water being tested.
3. Submerge the container just below the surface and collect approximately 500ml of water.
4. Secure the lid tightly and label the sample.

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Measuring pH

Using Test Strips:

1. Dip the strip into the water sample for 2-3 seconds.
2. Remove and wait 15-30 seconds for the color to stabilize.
3. Compare the strip color to the provided pH chart.
4. Record the pH value in the data sheet.

STEP 2

Using a Digital pH Meter:

5. Calibrate the meter using buffer solutions (pH 4, 7, and 10).
6. Insert the probe into the sample and stir gently.
7. Wait for a stable reading on the screen.
8. Rinse the probe with distilled water before the next sample.



Tip: Normal pH for drinking water is between 6.5 – 8.5.



STEP 3



Measuring Temperature

1. Use a thermometer with at least 0.1°C accuracy.
2. Immerse it in the sample water for at least 30 seconds.
3. Record the temperature once the reading stabilizes.
4. Compare with normal water temperature ranges (e.g., rivers: 5-25°C).

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Measuring Turbidity

Using a Transparent Container:

1. Fill a clear plastic or glass container with the sample.
2. Hold it against a white background and observe the clarity.
3. Use a scale (low, medium, high turbidity) or a Secchi disk for more precise measurement.
4. Record observations (e.g., visible particles, cloudiness).

STEP 4

Tip: High turbidity can indicate soil erosion, algae blooms, or pollution.



STEP 5



Data Collection & Reporting

1. Record all measurements in a structured data table.
2. Take notes on sample location, weather conditions, and any unusual observations.
3. Compare results with official water quality standards.
4. Summarize findings in a final report or presentation.

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Tip: Digital tools like Excel or Google Sheets can help visualize trends!



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How to Summarize Findings in a Final Report or Presentation?



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1. Introduction

- State the purpose of the study.
- Mention the tested water sources.
- Identify the key water quality parameters measured (pH, temperature, turbidity).

2. Methodology

- Describe how and where water samples were collected.
- Explain the tools used for each measurement.
- Highlight any challenges faced during data collection.

3. Data Analysis

- Present recorded values in a table or chart.
- Compare results from different water sources.
- Identify patterns, trends, or anomalies in the data.





4. Interpretation of Results

- Explain what the values indicate about water quality.
- Compare findings to standard water quality guidelines.
- Discuss potential reasons for observed variations.

5. Conclusion and Recommendations

- Summarize key takeaways from the study.
- Suggest improvements for future testing.
- Provide recommendations for water conservation and pollution prevention.

Tip: Use visuals like graphs, images, and infographics to enhance clarity!

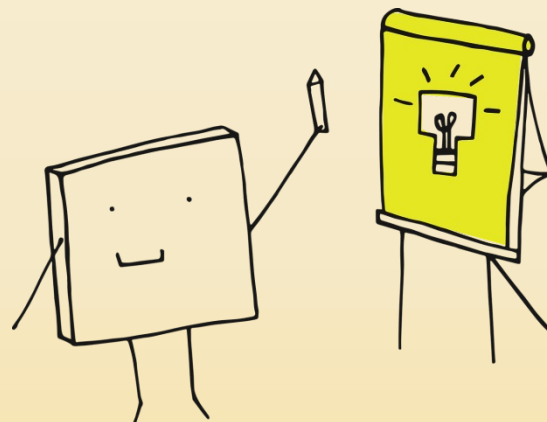


B: Digital Water Quality Monitoring



Training phase

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Your task:

- Learn how to use simple tools to measure water quality parameters and create interactive reports or presentations to communicate your findings.
- You have 6 days.
- Work in groups and show the results to the others.



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DAY 1

Discuss in your group:

1. What factors affect water quality?
2. Why are parameters like pH and turbidity important?
3. Use Table 1 to list water sources you plan to analyze and the parameters you will measure.

DAY 2-3

Visit the assigned water sources and collect samples. Measure the following parameters for each sample:

- pH: Use test strips or a basic kit.
- Temperature: Use a thermometer.
- Turbidity: Observe water clarity using transparent containers.

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DAY 4

Input your recorded data into a spreadsheet.
Create graphs or charts to visualize trends or differences between samples.

DAY 5-6

Summarize your findings in a report:

- Include graphs, charts, and observations.
- Provide conclusions about water quality and its implications.
- Prepare a presentation to share your results with the class.

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H5P- Tasks:

I had a problem with preparing H5P... Could you please help me? I prepared the content...



Drag the Words – Water Quality Parameters

Match the water quality parameter to its description:

1. pH – Measures how acidic or basic the water is.
2. Temperature – Affects the solubility of oxygen and metabolic rates of aquatic organisms.
3. Turbidity – Indicates the clarity of water and the presence of suspended particles.

Quiz – Understanding Water Quality

1. Which of the following indicates polluted water?

- a) High turbidity**
- b) Neutral pH
- c) Low temperature

2. Why is dissolved oxygen important in water?

- a) It helps plants grow.
- b) It supports aquatic life.**
- c) It indicates water clarity.





Congratulation!

You mastered the activity on Digital Water Quality Monitoring!

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