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| **MODULE 4** | **THE IMPACTS OF THE ENVIRONMENTAL PROBLEMS AND CLIMATE CHANGE** |
| **PART 4** | **Freshwater ecosystems** |
| **Lesson 1** | **Designing a water project** |

**SUMMARY**

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# 1. COURSE TIME, TARGET AND TOPIC

* **Age of target students:** 15+
* **Teaching time:** 1-2 hours – extended field work necessary
* **Disciplines:** Biology, Geography, Human science, Physics, Chemistry
* **Title:** Hydrology, water cycle, water use, recycling, water saving

# 2. COURSE OBJECTIVES

## Competences promoted in this lesson:

* Communication in foreign languages competency
* Digital competency
* Learning to learn competency
* Social and citizenship-related competencies
* Cultural awareness

## Lesson objectives:

* The students revise their knowledge regarding the topic of hydrology
* The students are going to gain awareness about how to design a water project
* The students are going present, compare and evaluate their outcomes

# 3. LEARNING – TEACHING PROCESSES

There are 6 steps in this lesson:

1. **EXPLORE:** Water project instructions, choosing a project
2. **ENGAGE:** Planning a project, collecting data
3. **EVALUATION:** Presenting findings, reflecting and evaluating
4. **EXTEND:** 10 examples of water project – inspiration for students, useful links

This part of the module serves and an extended part and requires long term preparation and development.

# 4. EVALUATION

The evaluation is based on peer2peer evaluation and assessment. Students compare their findings and reflect on other projects

# 5. DOCUMENTS

### EXPLORE

**Water Project Development Instructions**

**Objective:** The goal of this project is to explore, understand, and propose solutions related to water issues in your local area or globally. Your project will involve research, data collection, analysis, and presentation.

**Step 1: Choose a Focus Area**

* **Select a Topic:** Begin by choosing a specific water-related issue that interests you. Possible topics include water pollution, water conservation, the impact of climate change on water resources, groundwater depletion, or the role of wetlands in water purification.
* **Research Background Information:** Gather information from reliable sources to understand the basics of your chosen topic. Make notes on key facts, statistics, and existing solutions.

### ENGAGE

**Step 2: Plan Your Project**

* **Define Your Objective:** Clearly state what you want to achieve with your project. Are you aiming to raise awareness, propose a solution, or investigate a particular problem?
* **Develop a Hypothesis or Research Question:** Formulate a hypothesis or a key question that your project will address. For example, "How does urban development affect local water quality?" or "What are the most effective methods of water conservation in households?"
* **Outline Your Methodology:** Decide how you will gather data or conduct your research. Will you conduct experiments, survey the community, analyse existing data, or use models? Create a step-by-step plan for your approach.

**Step 3: Collect and Analyse Data**

* **Gather Data:** Depending on your methodology, begin collecting the necessary data. This might involve conducting water quality tests, interviewing experts, or compiling data from secondary sources.
* **Analyse the Results:** Carefully analyse your data to identify patterns, trends, or significant findings. Use graphs, charts, and tables to organize your data in a clear and understandable format.
* **Draw Conclusions:** Based on your data analysis, draw conclusions that address your research question or hypothesis. Discuss whether your findings support or contradict your initial assumptions.

**Step 4: Develop Solutions or Propose Actions**

* **Brainstorm Solutions:** If your project focuses on solving a problem, brainstorm possible solutions or actions that could address the issue. Evaluate the feasibility and effectiveness of each solution.
* **Propose an Action Plan:** Develop a detailed action plan that outlines steps that can be taken to implement your solutions. Consider who would be responsible, what resources would be needed, and any potential challenges.

### EVALUATE

**Step 5: Present Your Findings**

* **Create a Report:** Compile your research, data, analysis, and conclusions into a well-organized report. Include an introduction, methodology, results, conclusions, and references.
* **Prepare a Presentation:** Develop a presentation to share your findings with your classmates, teachers, or community members. Use visuals like slides, posters, or videos to enhance your presentation.
* **Practice Your Presentation:** Rehearse your presentation multiple times to ensure you can communicate your findings clearly and confidently.

**Step 6: Reflect and Evaluate**

* **Reflect on Your Work:** After completing your project, take time to reflect on what you learned and how the project could be improved.
* **Evaluate the Impact:** Consider the potential impact of your project. Did it raise awareness, contribute new knowledge, or inspire action?

**Deadlines:**

* **Topic Selection Deadline:** [Insert Date]
* **Data Collection Deadline:** [Insert Date]
* **Final Report Submission:** [Insert Date]
* **Presentation Date:** [Insert Date]

OpenAI. (2024). *ChatGPT* [Large language model]. https://chatgpt.com/c/8795eab5-2ce6-4413-9ac3-265f07175cda

### EXTEND

Here are 10 examples of water projects that high school students can design:

**1. Water Quality Monitoring**

* **Objective:** Test and analyse the water quality of local streams, rivers, or lakes for parameters like pH, turbidity, nitrate levels, and presence of pollutants.
* **Outcome:** Create a report on the current state of water quality in the area and suggest measures to improve it.

**2. Rainwater Harvesting System**

* **Objective:** Design and build a rainwater harvesting system for the school or a community building.
* **Outcome:** Demonstrate how rainwater can be collected and reused for irrigation, reducing the demand on municipal water supplies.

**3. Greywater Recycling**

* **Objective:** Develop a small-scale greywater recycling system that can treat and reuse water from sinks, showers, or laundry.
* **Outcome:** Show how water conservation can be achieved by reusing greywater for non-potable purposes like gardening.

**4. Water Conservation Awareness Campaign**

* **Objective:** Create a campaign to educate the school or local community on water conservation practices.
* **Outcome:** Develop educational materials such as posters, brochures, and social media content to promote water-saving techniques.

**5. Stormwater Management Plan**

* **Objective:** Analyse the school's stormwater runoff patterns and propose solutions to reduce flooding and pollution.
* **Outcome:** Design a stormwater management plan that includes features like rain gardens, permeable pavements, or detention basins.

**6. Water Footprint Analysis**

* **Objective:** Calculate the water footprint of various products or activities (e.g., food items, clothing, daily routines) to raise awareness of indirect water use.
* **Outcome:** Create a presentation or infographic showing how everyday choices impact water resources and suggest ways to reduce water footprints.

**7. Aquaponics System**

* **Objective:** Design and build an aquaponics system that uses fish waste to fertilize plants, creating a sustainable and efficient water cycle.
* **Outcome:** Demonstrate the principles of aquaponics and how it can be a viable method for growing food with minimal water use.

**8. Drought-Resistant Garden**

* **Objective:** Design a garden using native, drought-resistant plants that require minimal watering.
* **Outcome:** Showcase the benefits of xeriscaping as a water-efficient landscaping method.

**9. Water Pollution Documentary**

* **Objective:** Research and create a short documentary film on the causes and effects of water pollution in a local water body.
* **Outcome:** Raise awareness through visual storytelling and suggest actionable steps to reduce pollution.

**10. Global Water Crisis Research**

* **Objective:** Investigate the global water crisis, focusing on issues like access to clean drinking water, water scarcity, and the impact of climate change on water resources.
* **Outcome:** Write a research paper or create a multimedia presentation that highlights the challenges and potential solutions to the global water crisis.

These projects not only encourage creativity and problem-solving but also help students gain a deeper understanding of water-related issues and their importance in the environment and society.

Sources:

OpenAI. (2024). *ChatGPT* [Large language model]. https://chatgpt.com/c/8795eab5-2ce6-4413-9ac3-265f07175cda

Here are some links with other worksheets, projects.

<https://thewaterproject.org/community/student-resources/water-related-education-materials-for-high-school/>

<https://www.sciencebuddies.org/science-fair-projects/project-ideas/EnvSci_p024/environmental-science/water-quality>