



PROTECTING GLOBAL BIODIVERSITY CAMPAIGN

#GAIA2030 #GenerationRestoration

GAIA 20:30 Biodiversity Sub-Goals:

1. Preserving existing and creating new forests or natural areas, e.g., school gardens, parks, green neighbourhoods, etc.;
2. Promoting sustainable management of the coastal zone;
3. Combatting pollinator and insect loss;
4. Raising awareness of and supporting actions to remove invasive alien species.

1. AUTHOR DETAILS

a.Name/s	Vitor Martins, Maria José Araújo
b. Country	Portugal
c.Institution/School	School EB2, 3 André Soares and Science Center of Braga
d. Email	
e.Programmes the school is participating in (Eco-Schools/LEAF/YRE/other)	Eco-Schools and Young Reporters for the Environment
g.Would you like to receive monthly updates through our Newsletter? Yes/No	Yes
h. Submission date (dd/mm/yyyy)	

2. THE LESSON PLAN

A. Theme - Hands-on in the school Pond!

B. Introduction

Building and exploration of an educational pond as a scientific and educational resource with the aim to contribute to the knowledge of biodiversity, and the importance of these wetlands for the preservation and restore of local biodiversity. These habitats can host more biodiversity than rivers and lakes, as well as a greater number of rare and endangered species. A school pond is an important educational resource, as it allows the promotion of numerous recreational and scientific activities linking different subjects and involving the school community. With this lesson plan we also pretend to capacity teachers and create local pond networks.

C. Age Group – 8- 14 years old

D. Objectives or Learning Outcomes –

Students will be able to:

- Learn, build and monitoring a pond to understand the value for the biodiversity preservation;
- Realize the importance of materials to build a functional artificial pond;
- Recognize the biodiversity present in the pond as an aquatic ecosystem and understand the interactions between animals (macroinvertebrate crustaceans, amphibians and reptiles) and vegetal species. Recognize the importance of invertebrates as bioindicators of invisible pollution and pond health;
- Relate the learnings to sustainability and increase awareness;
- Present their ideas and research to the rest of the class using digital tools.

E. Time required to deliver the lesson plan –

This lesson plan will be divided in part A and part B.

Part A:

Lesson 1 - 45 min: Introduce the themes of ponds and biodiversity.

Lesson 2 - 90 min: Build of the pond.

Lesson 3 - 45 min: Create a presentation to celebrate World Wetlands Day and/or Global Action Days. Link for more information to World Wetlands Day: <https://www.worldwetlandsday.org/home>.

Part B:

Lesson 1 - 60 min: Collect water from the pond to start the identification of the invertebrates using a binocular magnifying lens in the school lab.

Lesson 2 - 45 min: Students will observe the insects and birds in the pond and take photographic records.

Evaluation - 30 min

F. Remote preparation

Students need to collect cardboard, fabric blankets, pond native plants and, if possible, a frog.

G. Planning considerations

Before building the school pond, the teacher needs to plan the size (between 4m² to 40m² maximum), the depth (maximum 1 meter), the location and accessibility. Before starting to build the pond the school technicians need to dig the pond.

During the practical activities students may write their notes and recognize the species present in the pond using identification guides or the internet. All the materials need to be disinfected before and after the use to prevent contaminations. It's best not to add fish to the pond as they can pollute the water and eat the other plants and animals. Water samples collected to be analysed in the laboratory must always be handled with care and must be returned to the pond at the end of the lesson.

H. Resources Required to deliver the lesson plan –

For the lessons: notebook, pencil, camera, computer, phone.

For the building of the pond: gloves, pond liner, shade net gardening, good spade or mini-digger, rocks, plank of wood or a similar ramp.

For monitoring: fishing net, container, Petri dishes, Pasteur pipettes, trays, binocular magnifying glasses, identification guides.

I. Activity –

a. Introduction

- Brainstorming with the ideas of students about what is a pond and the importance of this ecosystem.
- Recognizing the biotics relationships involves interactions between different species in wetland environments.
- Learning the steps to build a school pond ([how build a pond](#)).

b. Development

- The students will handle and explore the necessary materials to build a pond and understand the physical characteristics. It is essential that a pond liner has, for example, flexibility with the ability to accommodate any variation in ground contours or movements, high puncture resistance, a water-tight membrane and UV resistance.

Additionally, it is important to understand the reasons for using some materials such as sand, rocks, liner, and shade net gardening.

- In the pond whole (free from sharp stones) place cardboard and fabric blankets on the base and sides of the excavation before positioning the liner. Anchor the liner in position with bricks/rocks, then fix the shade net and start to establish the plants. Add water, preferably collected rain.

It is expect that after three weeks, the pond has an increase in biodiversity and the students can now monitor the pond (Annex 1).

- Students will collect water from the pond and then recognize the invertebrates, using a binocular magnifying lens, in the school lab (Annex 2) Links to help identification: [Macroinvertebrates as Bioindicators](#), [Invertebrate Identification Guide](#), [Invertebrate Identification Guide](#)).
- The students will understand that some species act as bioindicators of pollution, for example mayflies, *Daphnia magna* and dragonflies.
- Students will observe the insects and birds in the pond and take photographic records.

c. Conclusion

Wetlands are disappearing dramatically. The loss or degradation of these ecosystems, due to urban development, drainage and intensive farming, is linked to a huge decline in wildlife.

There is a lot we can do in our own school, gardens and communities to help the ecosystem restoration and preservation. Even a small pond can be a crucial ecological hotspot for biodiversity, including damselflies and dragonflies, frogs and newts. It could also become a feeding ground for birds, hedgehogs and bats. In this lesson plan one of the objectives was to understand the importance of invertebrates such as water fleas, *Daphnia magna*, as bioindicators of invisible pollution and pond health. This crustacean is intolerant to pollution and toxicity and their presence means that the water pond is healthy and unpolluted. The students learned how to handle binocular magnifying glasses, and recognize

some invertebrates such as *Daphnia magna*, dragonflies, aquatic beetles, aquatic snails, etc. It's important to conclude that diversity is equal to healthy ponds and healthy aquatic systems.

A pond doesn't need to be big! Even a small pond can host more species than rivers and lakes. We can build a pond in home gardens and contribute to the increase of biodiversity and wetlands. It is also important to create pond networks between schools in the local area, between the community and to share their experiences using social media and digital tools. A pond is an excellent pedagogical resource to teach children and adults how a natural ecosystem works.

J. Evaluation and Assessment- Mentimeter account for feedback and learning progress, Google forms, quizzes Kahoot

K. Dissemination:

- Investigative reporting (photography, and video journalism) for young reporters for the environment.
- Photo pond ark exhibition,
- Infographics and visits to the pond guided by the students for the local community.

L. Follow-up activity - Quizzes Kahoot

M. Adaptations for students with learning difficulties- Adapted tables to do the monitoring and identification of species with pictures and collaborative work with gifted students.

N. Extension for gifted students – Peer mentors

O. Background information for teachers –

- <https://www.epa.gov/national-aquatic-resource-surveys/indicators-benthic-macroinvertebrates>
- <https://calphotos.berkeley.edu/>
- <http://invasoras.pt/>

P. References

- <https://www.panoramaed.com/blog/comprehensive-guide-21st-century-skills>
- Marchante E, Freitas H, Marchante H (2008) Guia prático para a identificação de plantas invasoras de Portugal Continental. Imprensa da Universidade de Coimbra, Coimbra.

Annex 1: Learning product

Annex 2: Learning support