Course document

Inquiry Scenario

Plan Design form

for the promotion of Sustainability Citizenship

Co-funded by
the European Union

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Education and Culture Executive Agency (EACEA). Neither the European Union nor the granting authority can be held responsible for them.

SYNAPSES

School Details	
School Name	D.Afonso III
City name (Rural/ small town/ middle town/ big city)	Faro (small town)
Number of pupils and teachers	500
How many students and teachers will be involved in the Plan?	50

Sustainable Contact Details:	
Name	Berta Rodrigues
Email	berta.rodrigues73@gmail.com

Contents

Title:

Does atmospheric pollution affect the life of aquatic ecosystems? How can we help our planet?

Short Description (Max 500 words):

The anthropogenic increase in the concentration of CO_2 and CH_4 in the atmosphere contributes to global warming.

Much of the greenhouse effect is associated with methane emissions (much more than carbon dioxide emissions). This methane comes essentially from the intensive production of cows, pigs and poultry for human consumption.

In addition to serving as a refuge for biodiversity, seagrasses consume carbon dioxide, release oxygen (during the day, through the process of photosynthesis) and retain carbon, known as blue carbon.

On the other hand, the carbonated shells of living beings prevent an abrupt drop in pH, combating the acidification of the oceans, at the cost of the wear and degradation of the shells, making these living beings more vulnerable and leading to their death.

The aim of this project is to investigate the impact of increasing CO_2 and CH_4 concentrations on the balance of the Ria Formosa ecosystems.

Keywords (Up to 5):

carbon dioxide, methane, aquatic weeds, aquatic animals, aquatic ecosystems, students, planet, pH

Information about the Implementation

Language of the students:

Age of the students:

☐9-12 ☒ 12-15 ☐ 15-18 ☐ 18+

Number of Lessons – Duration (per lesson):

Number of Lessons: 30 Duration per Lesson: 45min

Is this activity a STEM Activity?

For which subject(s) the activity is usable, is it an interdisciplinary activity?

Science ☒

Physics ☐ Chemistry ☒ Biology☐ Geosciences☐ Environmental☐ Other☒

Technology ☒

Engineering ☐

Arts ☒

Mathematics ☒

Information about the Scenario

Curriculum and country:

Link of the current activity to the curriculum:

Country:	Faro	Class:		Grade:	8° year

Topic: pH, chemical reactions, atoms, molecules and ions, concentration of solutions, ecosystems, constructing and analysing graphs

Objectives (Max 100 words):

Description of the learning objectives

The aim of this project is to investigate the impact of increased CO_2 and CH_4 concentrations on the balance of the Ria Formosa ecosystems and what measures each of us can take to minimise our CO_2 and CH_4 emissions.

Materials (Max 100 words):

Which resources and materials (software, hardware) are needed?

Software	Hardware
Excel, canva, power-point	Labtop, camera

Use of School Infrastructure

How are school facilities and equipment used in your educational scenario?

School Infrastructure	School Materials
Chemistry classroom (not absolutely necessary)	Basic laboratory material, 3 aquários

Green competences:

Which green competences are covered by the activity?

Embodying Sustainable Values	Valuing Sustainability	☒	Supporting Fairness	☒	Promoting Nature	☒
Embracing Complexity in Sustainability	Systems Thinking	☒	Critical Thinking	☒	Problem Framing	☒
Envisioning Sustainable Futures	Futures Literacy	☒	Adaptability	☒	Exploratory Thinking	☒
Acting for Sustainability	Political Agency	☒	Collective Action	☒	Individual Initiative	☒

The definition of the following terms can be found in GreenComp that is translated in all European Union languages.

Working with the community

Which external actors will be involved within the framework of the training scenario?

Organisation Type	Organisation Name
NGOs (Non-Governmental Organisations)	Clube de Surf de Faro
PTA (Parent-Teacher Association)	--
Local business	---
Other (please explain)	University of Algarve, Câmara Municipal de Faro

How will the above-selected institutions help in the educational scenario?

The Clube de Surf de Faro will provide us with the club's infrastructures so that we can have a support house during the field trip to the Ria Formosa.

Faro City Council will provide transport for the field trips.

The University of the Algarve is providing us with a professor in the field to help us implement the whole project.

Detailed activity description

Fill in the table below according to the hours of the training activity and its content (fill in the table with the subjects contained in your training scenario).

The educational scenario should follow the 5E didactic model of inquiry-based learning.

Number and name of courses	Course content	Teaching hours
1	Firstly, the students are set the challenge. Then the students will have to learn the following topics: atoms, molecules, ions, chemical reactions, pH and ecosystems.	12
2	There will be a field trip to the Ria Formosa where water, sediment, seagrass and shells will be collected in order to reproduce in the laboratory the two very important natural environments of our Ria Formosa: on the one hand, the sandy bottoms with shells, and on the other, the seagrass meadows.	4
3	Three aquariums will be set up at the school: In **Aquarium 1**, the control aquarium, sediment, seagrass and shells will be placed. This tank will have an air pump/sharpener. In **Aquarium 2**, sediment and seagrass will be placed. In **Aquarium 3**, sediment and bivalve shells will be placed. Both Aquariums 2 and 3 will be subjected to stress situations, subjecting them to highly polluting greenhouse gases (methane and carbon dioxide). These gases will be produced by two bio-digesters: one will use yeast and sugar to produce carbon dioxide (aerobic fermentation) and the other will use chicken faeces (anaerobic fermentation), without oxygen, to produce methane. The latter bio-digester will be covered in aluminium foil to prevent light from entering, eliminating the possibility of photosynthesis.	2
4	The following monitoring will be carried out: - The mass of the shells in the aquarium 3. The shells will first be dried in an oven at a temperature of 60 °C for 24 hours. - Nitrates, nitrites, phosphates and the ammonia/ammonia ratio, using colourimetric tests. - Temperature, pH, oxygen content and electrical conductivity using a probe.	3
5	building and analysing graphs with the data obtained	1
	analyse the data obtained and draw conclusions	
6	To organise activities for the educational community with the aim of making people aware of the importance of preserving living beings that are characteristic of lagoon systems, such as our Ria, since it is these that make it possible to control a large part	2

	of the harmful effects caused by polluting gases, namely carbon dioxide and methane.	
7	Promote actions to protect the seagrass meadows and living beings in the Ria, emphasising those with these carbonate shells.	2
8	Suggest measures that we can all take to reduce the emission of polluting gases into the atmosphere, such as adjusting our diet so that we eat less meat.	2
9	Disseminate this study through participation in student conferences / events organised by bodies, which may take place / regional and national conferences, among others	2

Evaluation (if any):

Please write how students are going to be evaluated

Formative Evaluation:

- Direct observation;
- Evaluate the Field Diaries;
- Assessing the student's ability to argue, respect and defend different points of view on the basic theme of the activity, through de discussion/debate.

Summative Evaluation:

- Ask the students to build a map of the concepts involved in this project;
- Self-Assessment, self-evaluation and Hetero-Assessment. Students should reflect on the knowledge they have acquired and their performance during the activity. They should also give constructive feedback to their classmates.

References (if any)

Sustainable Contact Details:

Name	Berta Rodrigues
Email	berta.rodrigues73@gmail.com

Annex

Feel free to add any more information and material you have, indicatively photos from the activity, constructions needed or any handbook that may be available online.