

Europeana Learning Scenario

Title

From the photon to the leaf

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Summary

The purpose of the learning unit is to reflect on the importance of chlorophyll in the biological systems.

Using the IBSE methodology, I involved students in researching information, data processing and analysis of the errors, which allowed them to answer to the key questions on Chlorophyll and Photosynthesis.

Table of summary

Subject	<i>Chemistry, Biochemistry, Biology, Physics</i>
Topic	<i>Photosynthesis</i>
Age of students	<i>16-18 years old</i>
Preparation time	<i>180'</i>
Teaching time	<i>330'</i>
Online teaching material	<i>Adobe Spark (https://spark.adobe.com/), Scientix (www.scientix.eu) Go-Lab (www.golabz.eu) Olabs (www.olabs.edu.in/) Coggle (https://coggle.it/) or Popplet (http://popplet.com/)</i>
Offline teaching material	<i>Paper for TLC, Plants, Organic solvents, Glassware, UV/visible spectrometer</i>
Europeana resources used	<i>Current challenges in photosynthesis: From natural to artificial: https://www.europeana.eu/portal/en/record/9200235/researchtopic_1008_current_challenges_in_photosynthesis_from_natural_to_artificial.html?q=photosynthesis Chlorophyll as a measure of plant health: Agroecological aspects: https://www.europeana.eu/portal/en/record/92040/BibliographicResource_3000135741503.html?q=Photosynthesis#dcId=1545040447260&p=1 Photosynthetic mechanisms of green plants: http://www.europeana.eu/portal/en/record/08711/item_26632.html?q=photosynthesis</i>



Carbon assimilation; a review of recent work on the pigments of the green leaf and the processes connected with them:

http://www.europeana.eu/portal/en/record/08711/item_118106.html?q=photosynthesis

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Integration into the curriculum

This Learning scenario can be used for an interdisciplinary activity involving Organic Chemistry, Biochemistry, Analytical Chemistry and English and is designed for students aged between 16 and 18 years.

The topic covered during the activities is part of National Indications for Technical Institutes, issued by the Italian Ministry of Education, particularly suitable for the technological sector called "Chemistry, Materials and Biotechnology".

Aim of the lesson

The lesson has the following general aims:

1. Define and apply the operational sequence of the expected analytical method;
2. Report individual and group activities and present the results of an analysis;
3. Elaborate the results of the experimental investigations, also with the use of dedicated software;
4. Use the necessary structures and terminology to define, operate and report activities in English.

Trends

IBSE, CLIL, STEM

21st century skills

Learning and Innovation Skills: Creativity and Innovation, Critical Thinking and Problem Solving, Communication and Collaboration.

Information, Media and Technology Skills: ICT (Information, Communications and Technology) Literacy. Students are required to use software to be able to obtain pigment absorption spectra and then analyze spectroscopic data, as well as online and offline didactic tools to define, design and report the activities.

Activities

Name of activity	Procedure	Time
Problem identification	The teacher introduces photosynthesis.	30'
	Students are divided into groups and invited to look up Europeana for documents about photosynthesis, using keywords, such as chlorophyll, photosynthesis, carbon assimilation, light, etc..	30'
Formulating hypotheses	Students choose a plant species and prepare the leaves to be treated with the solvents, then they perform the necessary technical procedures for the separation of pigments and determine qualitatively and quantitatively the pigments present in the leaves. Students have to write down their hypotheses	60'
Investigation	TLC (Thin Layer Chromatography) and UV / VIS spectroscopy are used to determine the main pigments presents in the chosen leaves and their concentration.	180'
Collecting data and data analysis	The students compare and analyze the obtained data and interpret the results.	30'

Assessment

The teacher evaluates students by crossing data obtained from:

- Observing how they work during practical activity (interest and participation) – **Progress Report A**;
- Observing how they learn to write scientific explanations linking their hypotheses to the evidence collected during the investigation phase – **Progress Report B**;
- The results of the final test – **Progress Report C**.

AFTER IMPLEMENTATION

Student feedback

The students can provide feedback either in written form (a questionnaire/checklist prepared by the teacher) or through a class debate/discussion focusing on the following aspects:

- relevance of the chosen topic;
- perceived effectiveness of the activities performed;
- suitability of the technical and educational materials;

- what they found easy or difficult to perform in the different steps of the learning scenario;
- degree of satisfaction with respect to the specific methodologies used by the teacher.
- appreciation of the different activities in relation to students' learning styles.

Teacher's remark

The used methodology, Inquiry based laboratory (ILAB) proved to be effective and engaging. He helped students better understand key concepts and critically reflect on their activities.

The students kept an active listening and acquired awareness of which they learned, sharing the results obtained in the final phase.

About the Europeana DSI-4 project

[Europeana](#) is Europe's digital platform for cultural heritage, providing free online access to over 53 million digitised items drawn from Europe's museums, archives, libraries and galleries. The Europeana DSI-4 project continues the work of the previous three Europeana Digital Service Infrastructures (DSIs). It is the fourth iteration with a proven record of accomplishment in creating access, interoperability, visibility and use of European cultural heritage in the five target markets outlined: European Citizens, Education, Research, Creative Industries and Cultural Heritage Institutions.

[European Schoolnet](#) (EUN) is the network of 34 European Ministries of Education, based in Brussels. As a not-for-profit organisation, EUN aims to bring innovation in teaching and learning to its key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners. European Schoolnet's task in the Europeana DSI-4 project is to continue and expand the Europeana Education Community.