Europeana DSI-3

Future Classroom Scenario

Title of the scenario:

The Story of Darwin and the Comet Orchid

Names of author(s)

Matteo Cattadori

Relevant Trend/s

Write the trend(s) or trends the Scenario is intended to respond to.

The relevant trend that the scenario intends to respond to is to give students a sense of what "scientific prediction" means. Scientific prediction happens because of a mix of ingredients, such as deep understanding of scientific discipline, uncommon observation skills of the natural world, outstanding mind and creativity.

This scenario has a narrative style as it tells the story of how Charles Darwin, the founder of modern evolutionary biology, was able to predict the presence and shape of an insect based on the study of the shape of a pollinated flower (an orchid). This prediction came true only 40 years later. The activity (in form of a Google Module) tells the whole story by means of original material (books and letters) and biological samples retrieved autonomously by students in the Europeana archive. The key scientific topic is biological evolution and in particular co-evolution, a process that happens when two different living beings are so closely related that they evolve together.

Other generic competencies promoted by this scenario and included in the Italian curriculum are: information retrieval, performing simple measurements, unit conversions, hypothesizing and language skills.

In addition, the activity tries to convey astonishment for the process by which organisms change their heritable characteristics over time as well fascination for the role played by interactions between living forms in this process. This might lead to strengthen motivation for a further study of the process of biological evolution in general.

Learning Objectives, Skills and competencies

What are the main objectives?

What skills will the learner develop and demonstrate within the scenario? (e.g. 21st Century Skills).

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LEARNING OBJECTIVES

1. to foster the importance of biological evolution process in shaping living forms
2. to let students know about the story of Darwin's intuition on pollination of the comet orchid
3. to trigger reflection and genuine curiosity for biological evolution
4. initiation of students to the study of the biological phenomenon of coevolution
5. to enhance student motivation on using real data (in the form of original documents as well as biological sample) in their learning processes

SCIENCE COMPETENCES

All the science competencies of the present activity belong to the main competence A of the framework of competences of the Italian Ministry of Education (see Note #1 here below).

1. being able to use a scientific model to understand morphology and functions of living forms and structures
2. to understand that morphology of a structure is related to its function
3. being able to compare, find analogies and differences and make correlations
4. to make hypothesis, logical connections and come to conclusions based on scientific evidences
5. to relate the nature of science on how new explanations may confirm or change a scientific theory in light of new evidences

OTHER KEY COMPETENCES

For definition and frameworks adopted see Note #1 here below

LEARNING AND INNOVATION SKILLS

1. Creativity and innovation.
    a. Think creatively. Create new and incremental concept
2. Critical thinking and problem solving
    a. Reason effectively. Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation
    b. Make Judgments and Decisions. Effectively analyse and evaluate evidence, arguments, claims and beliefs. Interpret information and draw conclusions based on the best analysis
3. Communication and collaboration
    a. Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
    b. Reading skills in foreign language (only for non-English speaker students)

INFORMATION MEDIA AND TECHNOLOGY SKILLS

1. ICT (Information, Communications and Technology) LITERACY
    a. Apply Technology Effectively. Use technology as a tool to research, organize,

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evaluate and communicate information

LIFE AND CAREER SKILLS

1. Initiative and self-direction
    a. Work Independently. Monitor, define, prioritize and complete tasks without direct oversight

Skills

- to perform simple measurements on digitized biological samples
- to improve observation skills of original documents and biological sample
- carrying out small investigations collecting and organizing information and data
- summarising the key points of a small research in the form of a small written report
- interpreting information in the form of historical documents
- to put events in chronological order
- to further refine the results of a search according to specific needs

NOTES

Note #1

COMPETENCES. The Frameworks

The framework used for the definition of the competences is from the Italian Ministry of Education that transposes the EQF European Qualification Framework (2008).

DISCIPLINE COMPETENCES

The main competences (m.c.) for the "Cultural axis of Science and Technology" are defined by formal documents in this way:

A. *to observe, describe and analyse natural and biological phenomena and distinguish the different forms of system and complexity*
B. *to analyse the quality and quantity of phenomena related to the transformation of energy from real experiences*
C. *being aware of potential and constraints of ICT in the cultural and social context in where they are adopted*

OTHER KEY COMPETENCES

The framework here adopted is "DigComp 2.0 - Digital Competence framework for citizens" https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/digcomp-20-digital-competence-framework-citizens-update-phase-1-conceptual-reference-model

Learner's Role

What sort of activities will the learner be involved in?

The learner is involved in an activity aimed at finding and using original resources from Europeana repository and other archives, in order to understand and try to give an answer

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to one of the most famous debates within the theory of evolution: the evolutionary explanation of the unique shape and function of the comet orchid and its nectary.
This lesson includes activities such as: searching in databases, performing small measurements on digitized samples, analysing clues, guessing and hypothesizing, giving events in a chronological order.

Tools and Resources

What resources, particularly technologies, will be required?

Technologies

The student worksheet: Google Form (eventually) Software (offline or online) for performing measures on screen images, building a timeline.

Websites

The whole activity is online here:
http://bit.ly/Cattadori-Europeana
Italian version here:
http://bit.ly/Darwin-orchidea-IT

At the end of each section there is a list of the URL of images used in that part.

Link to dataset
Darwin Correspondence Project https://www.darwinproject.ac.uk/
Darwin online - http://darwin-online.org.uk/
Natural History Museum - Data portal http://data.nhm.ac.uk/
Europeana website: http://www.europeana.eu/portal/en

Learning space

Where will the learning take place e.g. school classroom, local library, museum, outdoors, in an online space?

Laboratory of ICT or online

Future Classroom Scenario Narrative

Describe in max 10 sentences the main ideas of the scenario.

This is a self-paced lesson (entirely made in the Google Form environment) aimed at explaining the story of the first evolutive interpretation given by Darwin to the shape of the

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comet orchid (*Angraecum sesquipedale*) a rare orchid growing in the Madagascar forest. This interpretation implied the existence of a moth that had been observed in the nature, for the first time, only 40 years later after he predicted it (and 20 after his death). This insect got the term “predicta” in his scientific name, in honour of Darwin’s detailed intuition and it is one of the most famous and acknowledged predictions in the history of biological evolution.

The main idea of this scenario is to follow the approach of the IBSE (Inquiry Based Science Education). According to this method, the activity starts with the introductory phase, presenting the activity and triggering interest for the topic and the whole story.
In the following stage titled “Studying the flower” the students will find original sample of the flower through a guided search on the Europeana repository. Then, in a final step of this stage they work in groups and with the support of measures made and additional resources they try to hypothesize role and biological function of this apparatus.
Hence, in the third stage titled “Darwin’s hypothesis”, students will look for and study original documents where Darwin explains informally (in a letter) and then formally (in a scientific paper) his outstanding intuition that the shape of that nectary implied the existence of a pollinating moth with a specific shape, despite the fact that it had not been observed.
During the final stage “Conclusions” students will study the original documents published 40 years after Darwin prediction, where scientists describe for the very first time such insect (*Xanthopan*) found in the Madagascar forest. Then they will perform final observation and measurements on original biological sample and video footage of the real pollination act.
The final outcomes of this activity will be:

- a set of answers given by students to the guiding questions posed during the lesson
- a set of measures performed by students on pictures of real samples of *Angraecum* flower as well as *Xanthopan* moth
- a series of guided inquiry and searches to the Europeana search engine and archive
- (eventually) a timeline made by students that resume the main events of the whole story.

Learning Activities

Add the link to the Learning Activities created with Learning Designer (http://learningdesigner.org)

The description of the Learning Activity with Learning Design tool is here https://v.gd/0CMfqe

This Future Classroom Scenario has been developed as part of the Europeana DSI-3 project.

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