

Europeana Learning Scenario

Title

From bird wings to planes: Bernoulli Principle

Author(s)

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Abstract

This learning scenario aims to give information about the flight principle to students aged 10 and over. It is aimed to explain that flying vehicles and planes that come with modern technology, are based on the Bernoulli principle. End of the lesson, students will learn the effect and power of the air flow formed between high pressure and low pressure. Teacher will share the bird wings with students to show how technology inspires from nature (The flying principle of the birds).

Keywords

Stem, physics, biology, flight principle

Table of summary

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Subject	Between science lesson and the flight principle of birds establish interdisciplinary approaches
Topic	Harmony between physics and biology
Age of students	10-14
Preparation time	30 minutes
Teaching time	45 minutes
Online teaching material	<p>Kahoot, QR code, table of Bernoulli principle</p> <ul style="list-style-type: none"> • https://create.kahoot.it/share/from-bird-wings-to-planes-bernoulli-principle/3c803614-03ef-4cec-9d9e-12d3cc2cb4fd • https://drive.google.com/file/d/1vkah9FLep_0GvOcgNd1Wm86708Ulcj9/view?usp=sharing • https://drive.google.com/file/d/1XaHJMnVYuQcAzBwJWRzLh3cn3l29DZ4o/view?usp=sharing
Offline teaching material	Kahoot game QR code

Table of summary

		
Europeana resources used	<ul style="list-style-type: none"> • Figure 1: image1 • Figure 2: image2 • Figure 3: image3 	

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Integration into the curriculum

The topic fits into the science curriculum for the 4th grade of school students. The learning scenario was applied in science lessons with an interdisciplinary approach to 10 years old students in primary school.

Aim of the lesson

In this learning scenario, it is aimed to establish interdisciplinary approaches between science lessons and the flight principle of birds. The students realized that many technological developments were inspired by nature. According to The Bernoulli, the airspeed which is greater than the air pressure decreases air pressure as it relates to a wing and by this way it helps birds fly. This discipline is explained, and a connection is established between the principle and how the birds fly. Moreover, students learn that Bernoulli's principle can also be derived directly from Isaac Newton's Second Law of Motion. It is also aimed to use Europeana resources which offer rich resources for this field.

Outcome of the lesson

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Trends

Student Centered Learning

Game Based Learning and Gamification

Brainstorming

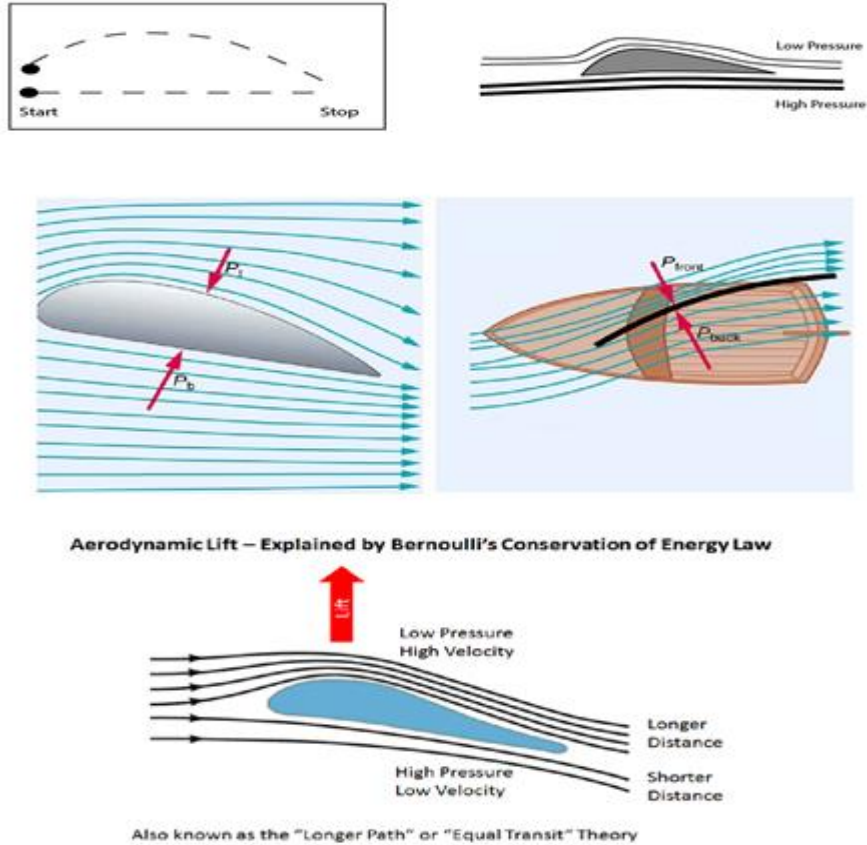
Interactive and collaborative learning

21st century skills

Interdisciplinary connection, cooperative learning, digital literacy

Activities

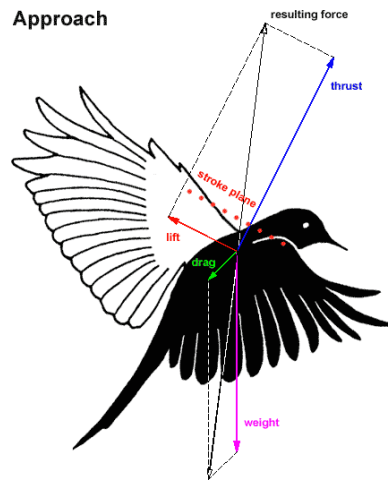
Name of activity	Procedure	Time
Introduction	As a preparation for the course, teacher asks students if many technological developments were inspired by nature or not.	10 min
Description of Problem Activity	<p>The teacher asks students these questions:</p> <ul style="list-style-type: none"> -How do the birds fly? -Do you think that there is similarity between the birds and planes? -What is the similarity between the flight principles of birds and planes? <p>In this way, students begin to think interdisciplinary.</p> <p>Teacher shows figure 1, 2 and 3 from Europeana resources to students. Students learn about Daniel Bernoulli and his book “Hydrodynamica”. This book is in Latin and public domain. Teacher explains that these figures are Bernoulli Principle. He tells students that the principle is named after Daniel Bernoulli who published it in his book Hydrodynamica in 1738.</p>	20 min



Teacher shows the table of aerodynamic above.

Teacher says that birds fly by using pressure of air pushing force to create wing lift. This is achieved by the physical law known as the Bernoulli Principle. Daniel Bernoulli, an 18th century mathematician, discovered that as air speed increases, the air pressure decreases.

Teacher shows the aerodynamics of bird wings in the diagram below as well.



Students develop cross-curricular thinking skills. Teacher asks the same questions again after they learn about Bernoulli principle.

- 1- How do birds fly?
- 2- What is the similarity between the flight principles of birds and planes?
- 3- Do you know that you will find a large number of archives related to physics and biology in the Europeana collections?

Teacher tells about aerodynamic table and tells the similarity between the wing of birds and the wing of planes. Then, students play Kahoot game by reading qr-codes.



Solving the problem	Timing to solve the problem may change according to the students' level and age.	5 min.
Evaluation	In the evaluation process, not only the answers to questions, but also the ability to make interdisciplinary connections is evaluated.	10 min.

Students are expected to give feedback what they have learnt during Kahoot activity. Teamwork can be done to discuss on questions.

Assessment

1. Teacher can ask open-ended questions, example: What do you think there is a connection between physics and biology?
2. The teacher can use Kahoot quiz to evaluate students.

***** AFTER IMPLEMENTATION *****

Student feedback

Fun and permanent learning is possible with gamification methods such as Kahoot.

Teacher's remarks

The learning scenario was applied to 10-year-old students in primary school. Students learned that Bernoulli's principle could also be derived directly from Isaac Newton's Second Law of Motion. Europeana offers students a large scale of learning resources in this topic.

Students also learned that they could access to many books and photos related to physics and biology subjects. However, they understand that the data in the digital environment is protected and may contain copyright.

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.