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AEROSPACE IN CLASS LEARNING SCENDARIO

How Things Fly: Why Birds Can Fly

Funded by the **Airbus Foundation** and coordinated by **European Schoolnet** (EUN – the network of 34 European Ministries of Education), the **Aerospace in Class Project** is about piloting STEM resources from the **Airbus Foundation Discovery Space**, a digital portal for aerospace exploration, connecting students, parents and educators across the globe with professionals in the field, bringing today's research and technology to life. The creation of this Learning Scenario is supported the **STEM Alliance** (an initiative that brings together industries, Ministries of Education, and education stakeholders to promote STEM education and careers to young Europeans) and by **Scientix**, funded from the European Union's H2020 research and innovation programme – project Scientix 4 (Grant agreement N. 101000063). The content of the document is the sole responsibility of the organizer and does not represent the opinion of the European Commission (EC), nor is the EC responsible for any use that might be made of the information contained.

European Schoolnet

How Things Fly: Why Birds Can Fly

By Jennifer McGarry

Abstract

This lesson plan takes into consideration the 4Cs of Learning and Innovation Skills (critical thinking, communication, collaboration, creativity).

Students consider why birds can fly and humans can't through a whole class discussion. Key vocabulary terms are then discussed through the Airbus Foundation Discovery Space video "Why birds are made for flying". Students consider the anatomy of a bird's wing compared to a human arm before beginning to design their own unique flying machine. Two options for activities are presented: (1) design a unique flying machine in Tinkercad and/or (2) design a unique flying machine using a micro-programming board and servos. Finally, students are asked to present their results to the class.

Keywords

Computer Science, Tinkercad, Small Programmable Boards, Flight, STEAM

Table of summary	
Subject	*Maths, English, Science, Computer Science, STEAM*
Topic	*"Things that Fly"* *Maths - 2D, 3D shapes and measuring length* *English - oral language* *Science - bird/human anatomy, flight* *Computer Science - programming micro servo motors*
Age of students	*10 – 12 years old*
Preparation time	***Option 1 Activity: Tinkercad*** *Ca. 10 mins (or 60 mins)* - *It takes approximately 10 minutes to set up accounts for your students on Tinkercad. If your students have never used Tinkercad before and/or there is a range of different skill levels in your class, it is recommended that additional lessons be undertaken in the basics of TInkercad before attempting to construct your 3D glider. Ideally, students should all have at least one 60-minute lesson in Tinkercad prior to this lesson, so they are familiar with the environment and have completed a basic tutorial. On the Tinkercad website (https://www.tinkercad.com/learn/designs), there are numerous tutorials to help your students understand the basics and build their confidence for designing their model.* - *Assuming a lesson has been dedicated to the basics prior to this lesson, the actual set-up of this lesson is very minimal: 10 mins to print out the "Bird Anatomy and Plane Design" worksheet* - *Another point to note, is that if you would like to actually print off your students 3D Tinkercad designs, then you*

	would need to factor in time to use/book your school's 3D printer or liaise with a local 3D printing facility. - *If the resources are not available to print out the Tinkercad creation, students could take screen shots of their design and present these to the class. They could print them out and use them in a presentation. Alternatively, they could also use these printouts as visual aids to create a cardboard or clay sculpture of their Tinkercad piece.* ***Option 2 Activity: Small programming boards*** *Ca. 30 mins* - *I would always recommend testing your code is working before the lesson and taking the time to make a basic working model of the elements that you expect the students to have moving on their construction (as per video on slide)* - *It is assumed that the students are familiar with coding small programming boards, basic computer science concepts and attaching a variety of sensors/LEDs to the programming board before engaging with Option 2.* *NB: Option 1 and Option 2 are not intended to be completed in the same class.*
Teaching time	*120 minutes*
Online teaching material	*Real-time voting / feedback app (for instance, Mentimeter.com)* *MakeCode: https://makecode.microbit.org/#*
Offline teaching material	*Laptops* ***For Option 2 Activity:*** - *junk art materials* - *Sellotape* - *masking tape* - *hot glue gun* - *1 micro:bit or similar* - *1 iot:bit or similar* - *2 micro servos 180° or similar* - *USB cable* - *2 servo extension cables or similar*
Airbus Foundation Discovery Space resources used	*Why birds are made for flying* *Tinkercad Instructions* *https://www.instructables.com/id/Design-and-Build-a-Glider-Using-Tinkercad/*

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Integration into the curriculum

Maths (5th/6th Class)

- **Strand:** Shape and space; Measures
- **Strand Unit:** 2D Shapes; Length
- **General learning outcomes:**
    - use 2D shapes and properties to solve problems.
    - select and use appropriate instruments of measurement,
    - estimate and measure length using appropriate metric units

Science (5th/6th Class)

- **Strand:** Energy and Forces; Living Things
- **Strand Unit:** Forces; Plant and Animal Life
- **General learning outcomes:**
    - Identify and explore how objects and materials may be moved.
    - Develop an increasing awareness of plants and animals from wider environments

English (5th/6th Class)

- **Strand:** Oral Language
- **Strand Unit:** Communicating; Understanding; Exploring and using
- **General learning outcomes:**
    - Actively listen and attend for extended periods of time, to include other languages where appropriate, listening from more details and nuanced meanings
    - Listen and speak with increasing confidence, independence and skill in order to work collaboratively with others and to share feedback, ideas, decisions and outcomes in a range of contacts and familiar and unfamiliar audiences
    - Respond creatively and critically to what they have heard and experienced
    - Express personal needs, opinions and preferences, explaining and justifying their perspective

Aim of the lesson

I would like to have achieved the following with my students in this lesson:

- Watched the Airbus Foundation Discovery Space video on “Why birds are made for flying” and discussed key vocabulary terms
- Compared the anatomy of a bird's wing to a human armSketched out and designed an innovative and unique Flying Machine into their Science Journals
- *Option 1:* Created a Flying Machine in Tinkercad
- *Option 2:* Constructed a Flying Machine with junk art, a programming board and micro servos

Outcome of the lesson

Students will be enabled to:

- Read aloud information on gliders and thermals/updrafts/downdrafts
- Explain why understanding the difference between hot/cold air is important when flying a glider

- Create a unique Flying Machine using the Tinkercad software (Option 1) or create a unique flying machine using a microprogramming board and servos (Option 2)
- Evaluate their learning through questioning/exit tickets

Trends

- Inquiry-Based Science Education
- Project-Based Learning
- Collaboration Learning
- Student-Centred Learning
- Peer Learning
- STEM Learning
- Visual Search and Learning
- Open Source Learning

21st century skills

Learning Skills: **Critical Thinking, Creativity, Communication**

Literacy Skills: **Information, Media, Technology**

Life Skills: **Flexibility, Leadership, Initiative, Productivity, Social**

- Students must analyse information from the PowerPoint presentation and from the Airbus Foundation Discovery Space video to create a Flying Machine design in Tinkercad that is unique. Students also have the option of creating a unique flying machine using microprogramming boards and servos where possible. They must be able to explain the workings of their design using the key vocabulary from the video through general class discussions and a formal presentation to their peers.

Activities

Activity	Procedure	Time
Introduction Real-time voting / feedback	A presentation can be used to guide the lesson. Slide 2: Use a real-time voting / feedback app (for instance, Mentimeter.com) to open the lesson and discuss students' prior knowledge on how they think birds and planes fly.	10 min
Introduction Watch video	Slide 3: Watch the Airbus Foundation Discovery Space video on "Why birds are made for flying". Discuss key vocabulary and question in a thought bubble / brainstorming session. A real-time voting / feedback app (like Mentimeter.com) could be used again to aid this discussion. Slide 4: Recall the three main differences between humans and birds as described in the Airbus Foundation Discovery Space video. Slide 5: Compare the anatomy of a bird's wing to that of a human's arm (it would be beneficial to have completed a lesson on the human skeletal system at some stage prior to this).	15 min

Activity	Procedure	Time
Activity (*Option 1*) Create a Flying Machine	***Option 1:*** Students log in to Tinkercad to follow instructions as per instructions in Instructables and begin designing and creating their Flying Machine.	*65 min*
Activity (*Option 2*) Construct a Flying Machine	***Option 2:*** Code a programmable board to move 2 micro servos or similar. Once servos have been coded successfully, students may begin to construct their Flying Machine out of junk art materials. (*NB: for the functioning coded model that I use as an example, I usually keep my models very basic so that I am not putting ideas into my students head of what the finished product should look like!*)	*65 min*
Exit ticket **KWL Chart** **Presentation of work**	Students complete exit ticket (Annex 1) and stick into their science journals. Students present their finished pieces to the class. They should be encouraged to use some of the key vocabulary from the Airbus Foundation Discovery Space video when presenting their work.	30 min

Assessment

- Self-assessment – Exit Ticket
- Teacher observation – Creation of artefact
- Teacher questioning – Exit Ticket, talk and discussion

About the Aerospace in Class Project

The "Aerospace in Class" Project is about integrating STEM resources from the Airbus Foundation Discovery Space in classes for 8- to 12-year-old students. The project is funded by the **Airbus Foundation** which is committed to bringing together the products and people of the global aerospace company Airbus to help address the challenges of today's society. Youth development is one of the pillars upon which the Airbus Foundation is built, empowering young people for the challenges of tomorrow. The **Airbus Foundation Discovery Space** is a digital portal for aerospace exploration, connecting students, parents and educators across the globe with professionals in the field, bringing today's research and technology to life. **European Schoolnet** is coordinating this project. EUN is the network of 34 European Ministries of Education, based in Brussels, which aims to bring innovation in teaching and learning to its key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners.

The "Aerospace in Class" Project has also been supported by the STE(A)M Partnerships programme of Scientix, funded from the European Union's H2020 research and innovation programme – project Scientix 4 (Grant Agreement N. 101000063), coordinated by European Schoolnet (EUN). The content of the document is the sole responsibility of the organizer and it does not represent the opinion of the European Commission (EC), and the EC is not responsible for any use that might be made of information contained.

Annex 1: Exit Ticket Handout

3-2-1 Exit Ticket

3 things I learned from this workshop:

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_____

2 questions I still have:

_____

_____

1 idea that stuck with me...

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