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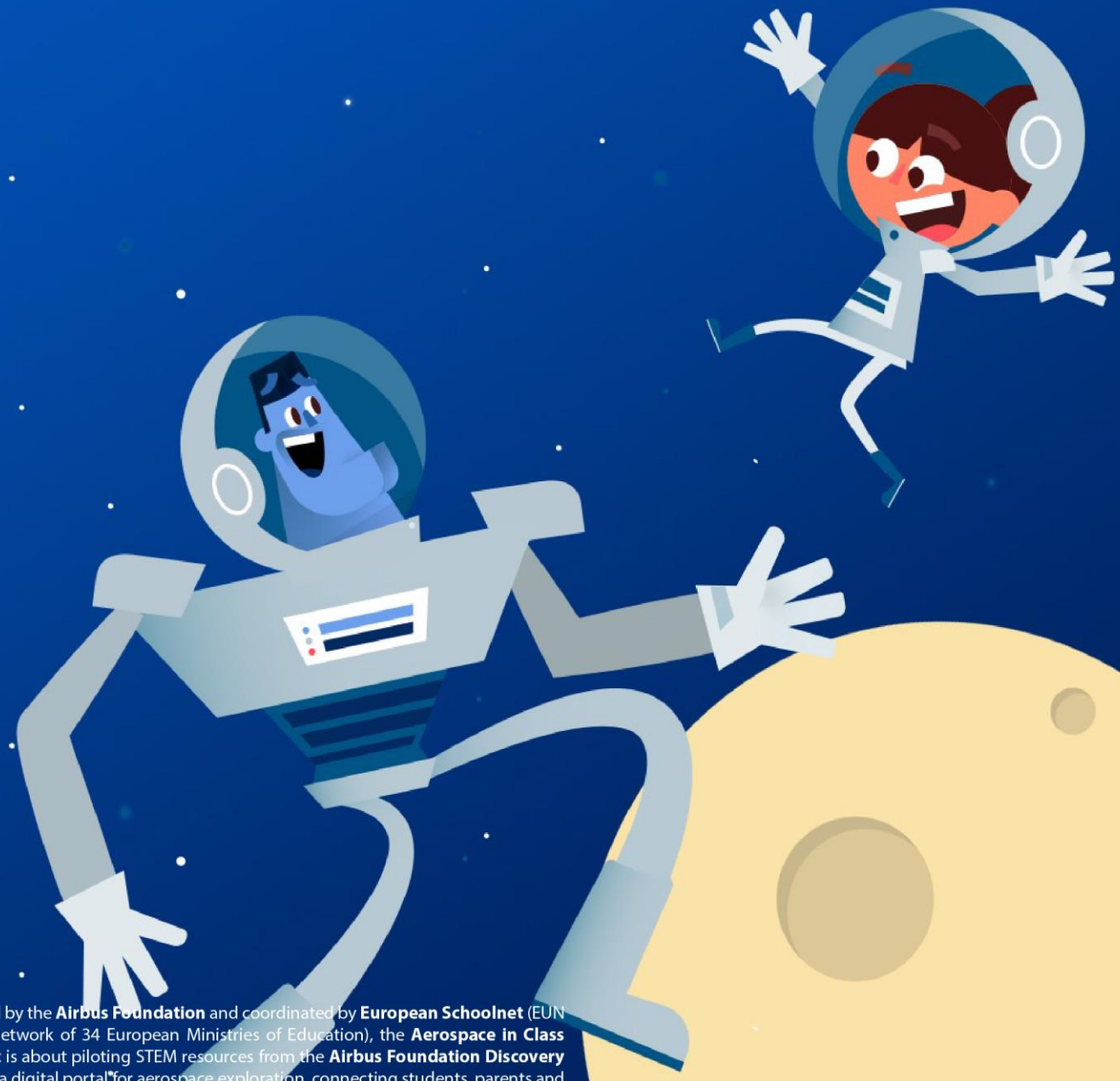
AEROSPACE IN CLASS LEARNING SCENARIO

Mission to the Moon: Fly me to the Moon



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

MISSION TO THE MOON: FLY ME TO THE MOON

By Barry McGuire

Abstract

This Learning Scenario is targeted at children from 8-12 years of age but may be adapted for older children.

In this Learning Scenario, children will be learning about rocket flight and how we leave Earth, fly to the Moon and land on the Lunar surface. Children will be able to identify the key features of rockets which are required for them to fly into space and do so as safely as possible. This activity is based over 2 lessons, both lasting approx. 60 mins each (these can be adapted to suit both age and ability levels).

Lesson 1 concentrates on the learning of processes involved in the flight of rockets to space, identification of rocket features and the progressing to designing, drawing and labelling a rocket. This will be used to assess children's knowledge & understanding of key features and terms discussed during lesson. New words: gravity, aerodynamic, gravitational pull, thrust,

Lesson 2 concentrates on the construction of a rocket that will be launched and then reviewed on what went well and why and what would be changed and why.

Keywords

Rockets; Space Flight; Moon; Aerodynamics; Construction; Physics: Forces; Design & Make

Table of summary	
Subject	*Social, Environmental & Scientific Education (S.E.S.E):* *Science; History; Geography* *Technology, Mathematics, Physics, STEM*
Topic	*Flying to the Moon* *Features of rockets and rocket design*
Age of students	*8-12 years old*
Preparation time	*Lesson 1: 30 minutes* *Lesson 2: ca. 1 hour (Lay out materials and pre-prepare the card lengths of tape etc. Please note some materials may need to be purchased prior to commencing lesson.)*
Teaching time	*120 minutes (2 lessons of 60 minutes each)*[1]
Online teaching material	*Airbus Foundation Discovery Space – Mission to the Moon (Fly me to the Moon):* *https://www.airbus.com/company/sustainability/airbus-foundation/discovery-space/kids/mission-to-the-moon.html#Fly* *Instructables:* *https://www.instructables.com/id/Rubberband-Slingshot-Rocket/* *YouTube:* *https://www.youtube.com/watch?v=7B1TGHP7yx4* *https://www.youtube.com/watch?v=KMX7zgaLC0w*

[1] Times assigned to the activities can be changed as the teachers see fit to best accommodate their students learning.

Offline teaching material	*Paper A4 & A3, pencils, colouring pencils/crayons/markers, scissors, Sellotape, masking tape, rubber bands (different sizes), pencil eraser tips or glue gun sticks, large straws, paper clip, split pin, thick card, metal fastener, lollipop sticks*
Airbus Foundation Discovery Space resources used	*Mission to the Moon:* 1. *Launching into space video* 2. *How to Fly in Space*

Licence

Integration into the curriculum

This Learning Scenario ties in with the Irish S.E.S.E. (Social, Environmental & Scientific Education) Curriculum in a number of ways. Within S.E.S.E. children will be looking at the strands – materials; Energy & Forces and the strand unit – Properties & Characteristics of materials; Forces. This can also be linked to other lesson such as History where children can look at the history of space flight and the advancement in technology through time, this links into the continuity and change strand.

For cross curricular links, this lesson ties in with the New Primary Language Curriculum as children will developing their oral language through engagement in various parts of the lessons. Communicating and responding are key language elements of the Learning Scenario.

Primary Language Curriculum - Oral Language:

- Communicating
  - Engagement, listening and attention
  - Motivation & choice
- Understanding
  - Vocabulary
  - Demonstrating understanding
- Exploring & Using
  - Requests, questions and interactions
  - Information giving, explanation and justification
- Description, prediction and reflection

Aim of the lesson

The aim of this lesson is to engage and stimulate children to explore rocket flight. Children will be designing and making a rocket that will be launched to show the importance of aerodynamics. Children will also be learning about the different forces that can will have an effect on their rockets.

During this lesson children will be enabled to:

- Identify main features of rockets which are designed for space travel
- Determine design features need for safe space flight
- Create and make their own rocket
- Test flight of their designed rocket and review their findings.

Outcome of the lesson

Lesson 1: As this lesson is discovery and discussion-based children's knowledge and understanding will be assessed by peer reviewing each child's individual rocket design. Each of these designs needs to have labelled elements which the children will have to include in their designs to show understanding. By looking at the tip of each child's rocket the teacher will be able to assess if the children have fully understood what is meant by "aerodynamic design"

Lesson 2: This lesson is project-based and will assess if children can bring their learning from the previous lesson to the practical application in this lesson. Children will need to follow directions/steps to create a rocket which will be launched after construction. Children will have to face challenges in designing the fins and attaching them to the straw (body) accurately so as to help the rocket fly rather than hinder it. Children will understand the concept of drag and propulsion when this lesson is complete.

Trends

Project-Based Learning: students get fact-based tasks, problems to solve and they work in groups. This kind of learning usually transcends traditional subjects.

Lifelong Learning: learning does not stop when leaving school.

Collaborative Learning: a strong focus on group work.

Outdoor Education: learning outside of the school building in the "real" environment

Edutainment: playful learning. Learning while having fun.

21st century skills

Learning & Innovation Skills:

- Creativity and Innovation
- Critical Thinking and Problem Solving
- Communication
- Collaboration

In this Learning Scenario, children will be encouraged to think creatively and to be innovative in their design and how they apply their learning to their project. While constructing their rockets children may face some issues and will be encouraged to use critical thinking and problem-solving skills to come to a suitable solution. Working as a group, communication and collaborating with each other are vital skills for the children to allow them to progress with each step of the process efficiently.

Information, Media & Technology Skills:

- Information Literacy
- Media Literacy
- ICT (Information, Communications, and Technology) Literacy

Children, where possible, will be using ICT to assist their learning. Children will be watching the Airbus Foundation Discovery Space videos either through Interactive Whiteboard (IWB) or on individual iPads/tablets. Recording of their rocket flights can be videoed in slow motion using iPads/tablets.

Life & Career Skills:

- Flexibility and Adaptability
- Initiative and Self-Direction

- Social and Cross-Cultural Skills
- Leadership and Responsibility

While working in group activities children will need to be flexible and adapt their skills as necessary to face any problems that arise in their rocket design/construction. Having initiative to solve problems and to help direct those around them is key in this project-based lesson. Developing their Oral Language skills through various aspects of the lessons with speaking and understanding. Each member of the group will need to take responsibility for their task and for completing each step of the process.

Activities

Activity	Procedure	Time
	Lesson 1	**60 min**
Introduction	Children will be introduced to the lesson "Fly me to the Moon" (for examples using these slides prepared). Teacher introduces children to the topic of rockets and how we use these to travel to the Moon. After the introduction, the children will complete a KWL chart[2] (for example like the one provided in Annex 1) labelled "How Rockets Fly" to assess their knowledge base. The whole class will then discuss how rockets fly and what they need to fly to outer space safely. (*Peer discussion on topics raised by this and information recorded on Whiteboard/Flipchart/Copies etc.*)	10 min
Main body Intro	Children will watch the "Launching into Space" video by the Airbus Foundation Discovery Space. Each child will be given a balloon that they will be instructed to fill with air by blowing into the balloon. Children will then see what happens to the balloon when the air is quickly released (some children may need help with the inflation of balloons). After the video, children will discuss the word *Aerodynamic* with a think/pair/share session. Peer discussion on why one shape is more aerodynamic than another and where they would see this in the world around them: Cars/Trains/Planes etc. Questions posed will include: - *How exactly does a rocket engine work?* - *What factors will affect your space launch?* - *How can we design an aerodynamic rocket to fly to the Moon?* The class will look at the features of a rocket and why they are used: for example, fins, pointed nose cones etc. After discussing these features, children will watch "How to Fly in Space" and discuss what is meant by gravity and how this will affect a rocket launch and flight. Questions posed will include: - *What does gravity do?* - *How does gravity affect you?* - *Is gravity the same on earth and the moon?*	20 min

[2] A KWL Chart is an active reading strategy that can start students thinking about what they already know about a topic. The acronym stands for "**Know already – Want to know/Wonder – Learned**". It can be used as an assessment for learning because a teacher can quickly tell what students already know and understand about a topic.

Activity	Procedure	Time
Designing an Aerodynamic Rocket	Children will be given out A3 paper and asked to draw their rocket design using the information that they have covered in the lesson. Children will be encouraged to include critical design features for safe flight of the rocket and look at images of rockets to provide stimulation. Children will need to label their rocket elements and be able to explain why they have chosen to use these design features.[3]	20 min
Plenary	Once the children have completed this task, they will peer review each other's work by using a checklist to assess the design. They will look back over their KWL chart and fill in as needed.	10 min
	Lesson 2	**60 min**
Introduction	Children will review the last lessons work and will review the KWL chart completed. Any remaining issue will be discussed.	5 min
Warm-up activity	A quiz based on elements from last lesson can be used with the students. Suggested questions can be found in Annex 2 (this is optional based on availability of devices).[4] If devices are not available, the teacher can further discuss words introduced in last lesson and ask children to give examples where possible.	5 min
Main Activity	The resources for this lesson will be then handed out. Children will require: - Cap eraser - Brass split pin - A5 sheet card - Rubber bands (different sizes) - Lollipop stick - Large drinking straw - Masking tape - Ruler - Pencil Children can either work as a group or individuals depending on skill level and materials. Instructions are available at the following link and can be printed out where necessary: http://www.instructables.com/id/Rubberband-Slingshot-Rocket/ See YouTube link for process: https://www.youtube.com/watch?v=7B1TGHP7yx4 (*Please note I have used the split pin instead of the paper clip as this will be easier to manipulate for younger children.)* Students can use different rubber bands to discover the effect of different strengths and the build-up of potential energy.	35 min

[3] Teachers should decide if they rather have students working individually or in pairs.
[4] If using Kahoot is not a possibility, teachers could print out the questions instead.

Activity	Procedure	Time
Review of rocket	After construction, each child will fill out a review chart (see Annex 3) on the following questions: What went well? What would you change? Why?	5 min
Plenary	Feedback to class about what was learned in both lessons and review KWL chart.	10 min

Assessment

The assessment for Lesson 1 of this activity is through peer review:

- 2 stars and a wish
- Teacher based assessment

The assessment for Lesson 2 of this activity is through self-evaluation of the child's finished project.

- What went well? Why/Why not?
- What would you change? Why/Why not?
- Teacher assessment of finished product.

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.

KWL Chart

Name: _____

Date: _____/_____/_____

Topic:

_____

Know	Wonder	Learned
What do you think you already know about this topic?	What do you wonder about this topic? Write your questions below.	After you complete your project, write what you have learned.

Annex 2: Quiz for Lesson 1 Review

Kahoot Quiz

Aerospace in the Classroom - Fly Me to the Moon

1. What does Gravity Do?
    - Gravity always pushes us down (x)
    - Gravity always pulls us back (√)
    - Gravity pushes us away (x)
    - Gravity doesn't do anything (x)

2. How fast must you travel to leave Earth's atmosphere?
    - 10,000 km (x)
    - 20,000 km (x)
    - 30,000 km (x)
    - 40,000 km (√)

3. By burning fuel rockets push out ____ to move the rocket in the opposite direction.
    - gas (√)
    - fuel (x)
    - smoke (x)
    - liquid (x)

4. What do we call the cargo & fuel of a rocket?
    - Expense-load (x)
    - Cost-load (x)
    - Payload (√)
    - Trade-load (x)

5. Rocket's payload is made up of 90% fuel (True or False)
    - True (√)
    - False (x)

6. To help air get out of the way a rocket needs to be _____ when it is moving fast.
    - Aerodynamic (√)
    - Powerful (x)
    - Flat (x)
    - Speedy (x)

7. If a rocket is aerodynamic it is….
    - Fat and Rough (x)
    - Thin and Smooth (√)
    - Long and Wide (x)
    - Short and Stubby (x)

Fly Me to the Moon – Rocket Review

Name: _____

Topic: _____ **Date:** _____

Things that went well:

Things that did not go well:

Bright Ideas:

How I would do it again: