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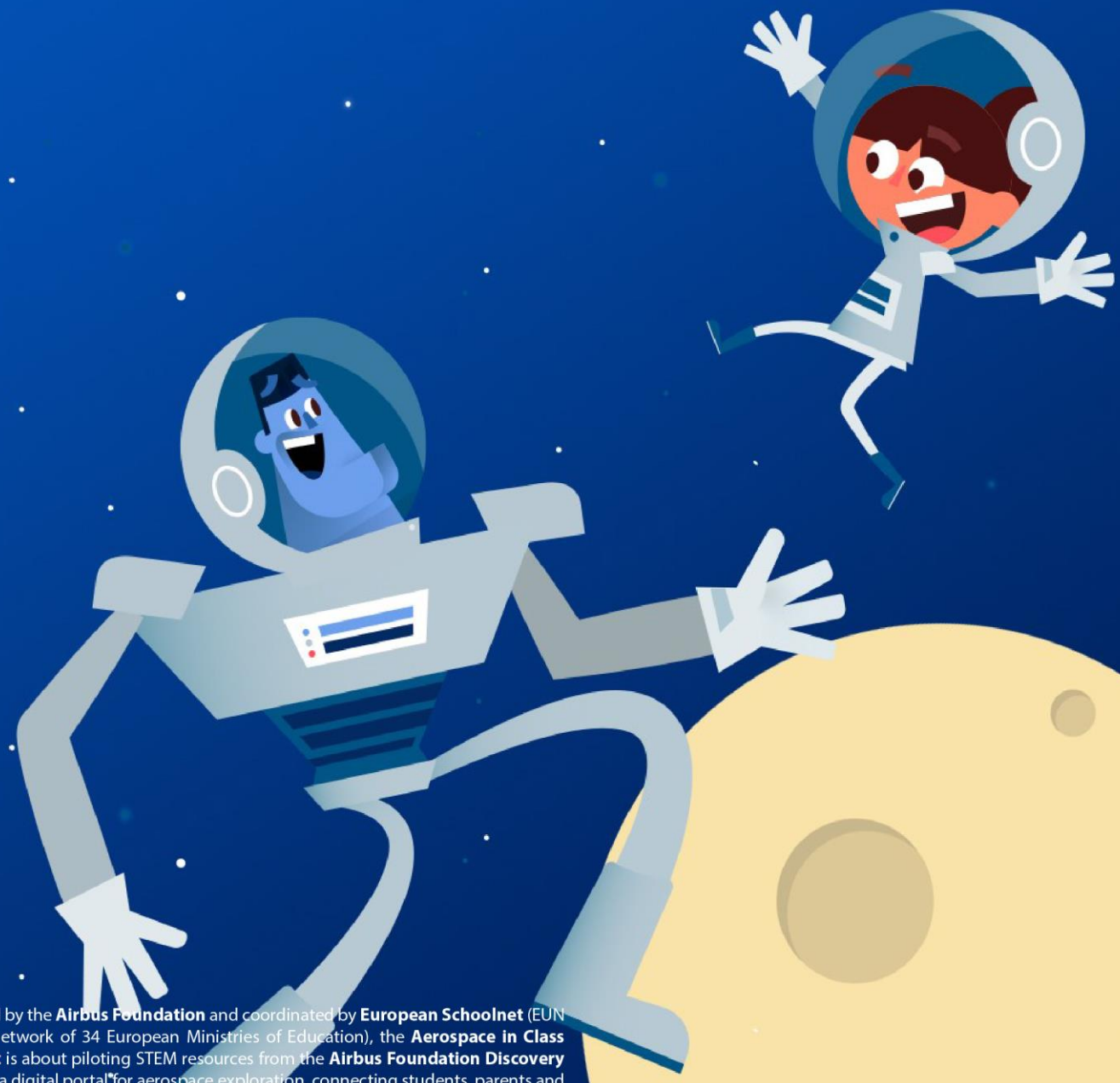
AEROSPACE IN CLASS LEARNING SCENARIO

Mission to the Moon: Lunar Road Trip



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: Lunar Road Trip

By Aleksandra Pešić

Abstract

The bumpy and unpredictable terrain of the Moon's surface is not so different from some parts of the Earth. We all need vehicles or some sort of robotic help for commuting, cargo transport or exploration of our planet. The topic will be introduced with a "guess the picture" game (Moon or Earth). Students will then watch the Airbus Foundation Discovery Space videos and have a group discussion. They will test their knowledge with an online game on the Airbus Foundation Discovery Space. Finally, students will build a Moon rover with a robotic arm and test it on a simulation of the Moon's surface. This learning scenario aims at stimulating students to think critically and to illustrate the importance of scientific research for space exploration, such as on the Moon.

Keywords

Moon Ranger, STEAM, Exploration, Helper Robots, Lunar Road Trip

Table of summary	
Subject	*Engineering, Science, English*
Topic	***Engineering:** students use their creativity to build a rover with robotic arm and Moon's surface* ***Science:** learning about transport and/or exploring the planet* ***English:** the students discuss based on pictures, videos and a quiz*
Age of students	*11-12 years old*
Preparation time	*4 hours*
Teaching time	*90 minutes (2 sessions of 45 minutes each)*
Online teaching material	*Instructables for a jet toy car for kids (idea for Moon rover):* *https://www.instructables.com/id/Jet-Toy-Car-for-Kids/* *How to make a robotic arm:* *https://www.youtube.com/watch?v=AZ9niSVM4Lk*
Offline teaching material	*Cardboard, hot glue, bottle caps, scissors, cutter, wooden skewer, drinking straws, aluminium foil, rocks, balloon, smartphone or tablet device for quiz*[1]
Airbus Foundation Discovery Space resources used	*Airbus Foundation Discovery Space:* *https://www.airbus.com/company/sustainability/airbus-foundation/discovery-space.html* *Airbus Foundation Discovery Space Videos:* 1. *How to communicate on the moon* 2. *What experiments can you do on the moon* 3. *Local lunar sights* 4. *Robots on the moon* *Airbus Foundation Discovery Space quiz game #4 – "Working 9 to 5": https://foundation.game.airbus.com/?view=mail#*

[1] Please make sure that you follow maximum safety protocols during this LS, as this LS uses some perhaps dangerous utensils (like cutters) in the classroom.

Licence

Integration into the curriculum

Engineering: Creating and designing
Problem analysis / Problem solving
Individual & teamwork
Tools

Science: Observation and facts
Research
Experiments

English: Reading experience
Ability to ask / answer questions

Aim of the lesson

The students will be able to think critically about claims and facts in science and be able to illustrate the importance of scientific research for space exploration, such as on the Moon.

Students will learn and understand how to create answers to sustainability problems concerning human living on the Moon.

Outcome of the lesson

Through creativity and innovation, students will be able to learn and test what life and driving on the Moon's surface look like. Also, through quizzes and discussions, students will develop and improve critical thinking and problem-solving skills.

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.

Game Based Learning & Gamification: learning is mixed with games or with game mechanisms.

21st century skills

Creativity and Innovation - empowers students to see concepts in a different light, which leads to innovation. Hands-on experiment: testing a Moon rover with a robotic arm across Moon's surface will enable students to learn how to be creative to solve a problem, working together to achieve a common goal.

Critical Thinking and Problem Solving – the students finding solutions for problems. Using the "Guess the picture" game, students will learn how to make observations and inferences.

Communication - crucial for students to learn how to effectively convey ideas among different personality types through discussion. Students use a group discussion to communicate and express their thoughts about commuting, cargo transport or exploration on the Moon's surface.

Collaboration - getting students to work together, achieve compromises, and get the best possible results from solving a problem. Using already prepared patterns and cardboard parts,

students will make Moon rovers with robotic arms and the bumpy and unpredictable terrain of the Moon's surface for the experiment.

ICT (Information, Communications and Technology) Literacy - helps students understand facts, figures, statistics, and data. Using a quiz, the teacher will evaluate the students on what they have learned and test them through lessons and practical work.

Activities

Activity	Procedure	Time
	Lesson 1	**45 min**
Presentation and Introducing the Topic	The teacher begins the lesson with a "Guess the picture" game, in this case "Moon or Earth". Two places of the classroom are assigned to the Moon and the Earth, respectively (e.g. the left side of the classroom represents the Moon and the right side the Earth). The teacher shows the pictures of the presentation and asks the students to choose a side, depending on what they think is shown on the picture. After each picture, the teacher asks both groups why they chose that side. Using the "Guess the picture" game, the teacher prompts students to make observations and inferences. If doing the exercise 'Guess the picture' online, students can take two blank sheets of paper and write moon in the first and earth at the second, then raise the sheet that they chose per picture guessed, or use emoticons to guess moon or earth if they do not have a camera.	10 min
Debate: Watching videos and group discussion/test knowledge with online game	**Option I:** The class is split up into five groups[2], each of which will watch one of the five Airbus Foundation Discovery Space videos and have a brief discussion about what they saw in the videos: • Traveling on the Moon • What experiments can you do on the moon • How to communicate on the moon • Robots on the moon • Local lunar sights **Option II:** The students will be split into the two groups, the Moon and Earth sides. After watching the videos (priority should be given to the two first videos), they will have a debate, in which they will compare cargo transport or exploration on the moon's surface with cargo transport or exploration on the earth's surface. **Option III:** Students can test their knowledge with the Airbus space quiz game #4 – "Working 9 to 5"	15 min
Building:	Before starting, the teacher needs to divide the students into three groups: A, B and C.	20 min

[2] The activities can be done without splitting the class in groups, or having the class split in different group formations. Number of groups is just a suggestion, and teachers should see what works best with their classroom size.

Activity	Procedure	Time
Moon rover with robotic arm and Moon's surface	Using already prepared patterns and cardboard parts, students from groups A and B will make two Moon rovers with robotic arms. See Instructables and video on how to make a robotic arm. Group C will make the bumpy and unpredictable terrain of the Moon's surface for the experiment. For the surface to be as realistic as possible, it should not be flat and covered with stone or sand. If possible, students can also use garden areas (replacement for rocky areas). There should be craters and rocks. To create craters, students should drop different stones on a set surface consisting of sand (or other materials such as rice, confetti, flour) from a height of a few centimetres. If there is enough time, they can also model the craters from cardboard, paper and glue. For the rocks, one can use real or decorative stones or make them out of plasticine or paper.	
	Lesson 2	**45 min**
Division into groups	Students are divided into two groups. Group A will be able to test the rover over the crater and group B will be able to test the rover over the rocks.	5 min
Hands-on experiment: Testing a Moon rover with a robotic arm across Moon's surface	Rovers were placed on a previously made lunar surface. Students will launch the Moon rovers by inflating balloons that are attached to the vehicles. The air from balloons will give them power to move. That way, students will test the inaccessible terrain of the Moon using the simulation of a Moon rover with a balloon over rocks and craters. We will also measure the time it takes for the rovers to travel a certain distance. The teacher can prepare some kind of obstacle such as a paper ball, pebbles, a small box or something that will create an image as if the experiment is happening on the moon. Students can try to lift these obstacles with the robotic arm and measure the time this takes.	20 min
Kahoot quiz: Evaluation	Using a quiz (example provided in Annex 1), the teacher will evaluate the students on what they have learned and test them through the lessons and practical work.	20 min

Assessment

Using a quiz (e.g. like the one found in Annex 1), the teacher will evaluate all the students on what they have learned and test them through the lessons and practical work.

Teacher's feedback

The author had to adapt the Learning Scenario for online teaching. The adaptations have been added in the Annex 2.

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: Evaluation Quiz

1. What is the moon made of?

a) Sand
b) Rock
c) Dust
d) Cheese

2. How far you can travel in two seats moon rover?

a) 1000 km
b) 150 km
c) 9 km
d) 90 km

3. Can you bring a telescope or lab on moon closed rover?

a) True
b) False

4. How much is the laser faster than average internet connection?

a) 25 times faster
b) 60 times faster
c) 100 times faster
d) 20 times faster

5. How much the laser can reach kilometres per second?

a) 300.000 km/s
b) 200.000 km/s
c) 50.000 km/s
d) 400.000 km/s

6. There is no dangerous radiation on the Moon?

a) True
b) False

7. Can robots do experiments and grow fruits and vegetables?

a) True
b) False

8. The biggest visible impact crater in the Solar System is?

a) Hellas Planitia
b) South Pole-Aitken Basin
c) Vredefort
d) Yalode

* correct answers are marked in ***bold and italics***.

Annex 2: Adaption to Online Implementation

- Online tools – Google Classroom, Google Forms, Zoom, Padlet, Gmail
- Students use Google Classroom for instructions
- Students finished hands-on experiment by themselves
- Students have the possibility to record their work and send it to the teacher