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AEROSPACE IN CLASS LEARNING SCENARIO

Mission to the Moon: Hack 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: Hack the Moon

By Selçuk Yusuf Arslan

Abstract

This learning scenario aims to teach students some basic information about the Moon in an enjoyable way. Thanks to 3D design and game-based learning, students will experience STEAM[1] by developing both 3D design and coding skills while learning the subject of the Moon in the science curriculum. In addition, the videos which were prepared by the Airbus Foundation Discovery Space, will be used in this learning scenario.

Keywords

Moon, Space, Atmosphere, Oxygen, Life, Exploration

Table of summary	
Subject	*Physics, Coding, Biology, Geography, 3D Design*
Topic	*Moon Life*
Age of students	*8-12 years old*
Preparation time	*ca. 2 hours*
Teaching time	*160 minutes (4 lessons of 40 minutes each)* *The time can be adapted according to students' familiarity with 3D-design software (e.g. Tinkercad) and block-based programming software (e.g. Kodu Game Lab). Times may also need to be adjusted according to the foreign language and ICT skills of the students.*
Online teaching material	*Airbus Foundation Discovery Space Resources: https://www.airbus.com/company/sustainability/airbus-foundation/discovery-space/mission-to-the-Moon.html* *Living on the Moon Instructables: https://www.instructables.com/id/Airbus-Living-on-the-Moon/* *Tools:* *Learn how to use Tinkercad: https://www.tinkercad.com/learn* *Kodu Game Lab: https://www.kodugamelab.com/resources/*
Offline teaching material	*Laptop, 3D design software (Tinkercad is recommended, but Google SketchUp or Fusion 360 could also be used), Block based programming software (Kodu Game Lab), paper, pencil*
Airbus Foundation Discovery Space resources used	*Airbus Foundation Discovery Space – Mission to the Moon resources: https://www.airbus.com/company/sustainability/airbus-foundation/discovery-space/mission-to-the-Moon.html* *Videos:* *a) Waste management on the Moon* *b) Food on the Moon* *c) Air on the Moon* *d) Water on the Moon*

[1] Science, Technology, Engineering, Arts and Maths.

Licence

Integration into the curriculum

The subject of the Moon's structure and properties has been integrated by the Turkish Ministry of National Education into the fifth-grade science subject curriculum. This subject is one of the main topics of the course and aims to teach general information about the Moon which is the satellite of the Earth. Students are expected to learn the structure and properties of the Moon.

Aim of the lesson

This learning scenario aims to teach students basic information about the structure and properties of the Moon in a fun way. It also gives students space to make 3D design, encode an educational game and create a mind map.

Outcome of the lesson

At the end of this lesson, the students

1. Are able to explain the structure and features of the Moon.
2. Are able to design a 3-dimensional oxygen tank.
3. Have designed and coded an educational game about the Moon.
4. Have prepared a mind map for the concepts related to the Moon.

Trends

STEAM: increased focus on Science, Technology, Engineering, Arts and Mathematics subjects in the curriculum.

Design Thinking: is a process for creative problem solving.

Entrepreneurship: takes action to make a change in the world.

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

Edutainment: learning while having fun.

BYOD (Bring your own device): students bring their own mobile devices to the classroom.

Mind Map: an easy way to brainstorm.

21st century skills

Creativity: Students use their creativity in both 3D design and educational game design.

Critical Thinking: Students use critical thinking processes such as reasoning, analysis and evaluation between videos and their research.

Collaboration: Students collaborate with the multiplayer game that they play or when they prepare a digital board with a Padlet or any other collaborative tool.

Innovation: Students design an innovative material for the life on the Moon.

Problem Solving: Students solve a problem according to the instructions that are given to them. Similarly, they also solve problems in the mind map design.

Communication: Students communicate with each other during the brainstorming stage.

Productivity: In this learning scenario, students produce by preparing a 3D design, an educational game and a digital board.

Initiative and Self-Direction: Students develop their initiative and self-direction skills as they research for a purpose and evaluate each other's designs.

Media Literacy: Students develop their media literacy skills by accessing and using internet resources.

Activities

Activity	Procedure	Time
	Lesson 1	**40 min**
Internet Research	Information is given about the subject by the course teacher e.g. via a presentation. Students conduct a 15-minute study of the Moon and its structure. While doing research, they take notes with the resources about what they learned. The teacher can integrate aspects of critical thinking and how to use the internet (how to use search engines, evaluate and check sources critically, interpret content on the internet etc.).	15 min
Watch the AFDS Videos about the Moon	Students watch Airbus Foundation Discovery Space videos that give basic information about the Moon: a) Waste management on the Moon b) Food on the Moon c) Air on the Moon d) Water on the Moon	10 min
Class Discussion and Mind Map	Students compare videos with their own research. They describe the Moon's features that are not available in the videos. In this way, all the features of the Moon are examined. Students are asked to prepare a mind map about the Moon. Thanks to the mind map, students summarize what they have learned. Teachers should make sure that students are aware of the fact that there is no atmosphere on the Moon.	15 min
	Lesson 2	**40 min**
Design	A short summary of the previous lesson is made. Students are reminded that there is no atmosphere on the Moon and can shortly discuss how humans would be able to breathe and move on the Moon, before they are asked to design an oxygen tank with the Tinkercad program or any other tool.	40 min

Activity	Procedure	Time
	Instructions for Tinkercad can be found here: https://www.instructables.com/id/Airbus-Living-on-the-Moon/ If students do not have access to a computer or the internet, an offline alternative to this exercise would be following the instructions for a Low Cost Astronaut Helmet can be found here: https://www.instructables.com/Low-Cost-Astronaut-Helmet/ As students create the helmet, the teacher can tell students about the dangers that astronauts may face on the moon.	
	Lesson 3	**40 min**
Design (continued)	Students continue designing their oxygen tanks from the last lesion.	15 min
Peer Review	Students examine each other's 3D designs and give feedback.	5 min
Design an Educational Game	With the Microsoft Kodu Game Lab, students prepare an educational game that tests the information that they learned in the first two lessons. They use the "rover" vehicle, which is the Moon vehicle in the game. A game is designed with a test of at least five questions about the Moon and can also be played by two people. The aim of the game is to reinforce the students by having fun about the structure and the features of the Moon. Students have 25 minutes to design a game. One point and one star are taken for each correct answer.	20 min
	Lesson 4	**40 min**
Design an Educational Game (cont.)	Students continue designing the game from the last lesion.	20 min
Playing the Game	When the game is completed, the game is played so that students can test what they have learned. Playing time is 10 minutes.	10 min
Assessment	Finally, students can share and discuss what moon features they learned about in these lessons. The teacher shares the quiz (see Annex 1) and the Feedback Form (see Annex 2) for the students to fill out.	10 min

Assessment

Content Quiz: A quiz is created by the teacher. The quiz will contain questions about the structure and the features of the Moon, 3D design and block-based coding. An example is provided in Annex 1.

Feedback Form: Additionally, it is good to get feedback from students on the lesson itself. For this, the feedback form included in Annex 2 is recommended.

Teacher's feedback

The author of this Learning Scenario adapted it for online teaching as well. Information on the adaptation can be found in Annex 3.

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: Content Quiz

Hack the Moon! 10 Questions (correct answer in marked red)

1. There is atmosphere on the moon (Please choose True of False)
    a) True
    b) False

2. NASA names their moon missions …… (fill in the blank)
    Apollo

3. How far away is the moon from the earth?
    a) 184000 km
    b) 284000 km
    c) 384000 km
    d) 484000 km

4. When we look at the moon from the earth, we can not see a particular surface of the moon (Please choose True of False)
    a) True
    b) False

5. What is the weight of a 100-kg person on the Moon, if the gravity on the Moon is 1.62?
    a) 12.4
    b) 16.5
    c) 20
    d) 21.8

6. What is *Lunar Rover?*
    a) Moon vehicle
    b) Sea on the Moon
    c) Moon darkness
    d) Moon surface

7. The only satellite of the world is the moon (Please choose True of False)
    a) True
    b) False

8. Who is the first person to walk on the moon?
Clue: “A small step for me but a big step for humanity”
    a) Elon Musk
    b) Yuri Gagarin
    c) Edwin Aldrin
    d) Neil Armstrong

9. According to the object positions given below in the Tinkercad program, which one can be said to be below the working place?
    a) -1
    b) 0
    c) 1
    d) 3

10. What action cannot we perform by right-clicking an object in Game Lab?
    a) Program
    b) Rotate
    c) Jump
    d) Change height

Annex 2: Student Feedback Form

STUDENT FEEDBACK FORM

Please help us to get better at what we do by completing this feedback form.
We want you to be honest about what you thought and felt about the lesson.

Title of the activity:

Lesson/Grade: Date:

Please mark appropriate number 5=extremely 1=not at all	**5**	**4**	**3**	**2**	**1**
This lesson topic was helpful					
This lesson held my attention					
This lesson was easy to understand					
The lesson duration was enough					
The lesson was well-prepared					
The lesson stimulated me to discuss and learn					
The teachers were effective in leading the class					
The instructions of designing 3D material were understandable					
The rules of educational game were clear					
The mind map was beneficial for connecting the concepts					
The Quiz reflected my learning					
Please answer the questions					
What I liked about this lesson:					
What I did not like about this lesson:					
What was innovative for this lesson?					
What was confusing for this lesson?					
What I would suggest to improve the lesson:					

Annex 3: Adaption to Online Implementation

This Learning Scenario was tested online on Zoom.

The students/parents were asked to prepare colourful pens and A4 paper for the first lesson.

The students/parents were asked to install Microsoft Kodu Game Lab on their computers for the third lesson.

Socrative was used instead of Mentimeter in evaluation because of the question limit.

The students faced problems with time during the 3D designing and educational game designing, which is why the lesson time has been extended from initially 120 to 160 minutes (+1 lesson of 40 minutes).