

WORKING ON ERASMUS+
UNIVERSE AN ODYSSEY OF SPACE AND TIME
TEACHER GUIDE



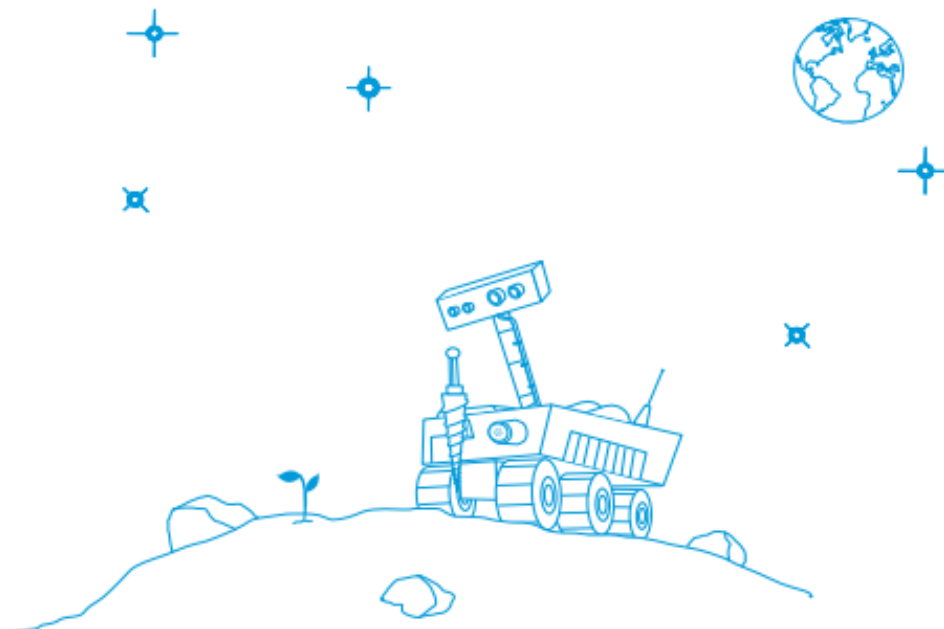
technology | T01a



teach with space

→ BUILD YOUR MARS EXPLORATION ROVER

Building and programming a LEGO rover to collect science data



teacher guide

European Space Agency

→ BUILD YOUR MARS EXPLORATION ROVER

Building and programming a LEGO rover to collect science data

FAST FACTS

Age range: 12-16 years old
Type: hands-on inquiry-based activity
Complexity: easy, for beginners
Teacher preparation time: 15 minutes
Lesson time required: 5 periods of 45 minutes
Location: indoors (space to test robots)
Include use of : LEGO Education Mindstorms EV3 (one core set, one expansion set, and one temperature sensor for 1 group of students)

Outline

Students will design and program a LEGO- built rover. Basic instructions are first programmed with the LEGO brick. Then, to remotely control the LEGO-built rover, students will program it with the LEGO Mindstorms EV3 software. The objective is to conduct a space experiment using a scientific approach and collect data. Measurements will be analysed and modelled so that they can be compared with the student's hypothesis.

Students will learn

- Computer language
- To program basic instructions
- To use a robotic tool to explore scientific content
- To design a rover structure with mechanical constraints
- To design a wheel system based on scientific experiments
- To develop a scientific experiment using engineering
- To collect data with a sensor
- To analyse data and processes to answer scientific questions
- To develop relevant experiments controlling one parameter at a time
- To work and communicate together as a team

Summary of activities

	Title	Subject	Outcome	Requirements
1	What is the link between science, engineering, and programming?	Identifying the role of satellites and space technology.	To clarify students' preconceptions of satellites and introduce space technology.	None
2	How does the LEGO brick work?	Identifying components of the LEGO brick. Introducing motors and sensors.	To understand the LEGO brick language and code basic instructions with a space context.	None
3	How do you remotely control a robot?	Introducing basic programming with the LEGO brick and software.	Develop a strategy to determine and program experiment parameters.	Activity 2
4	How do you build a rover and have it move safely?	Designing a rover using engineering skills.	To identify a technical problem and propose a solution based on technical reasoning.	None
5	How do you collect data from a rover?	Recording data from a specific experiment.	To collect data using a scientific approach, analyse it, and confront it with a hypothesis.	Activity 3

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The ESA Education Office welcomes feedback and comments
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