

## Space Challenge – Introduction

LEGO® Education is pleased to bring you the LEGO® MINDSTORMS® Education EV3 Space Challenge Set and Activity Pack - a fun, structured learning programme that will help you meet your Science, Technology, Engineering, and Mathematics (STEM) teaching goals.

### Who Is It For?

The Space Challenge is for all educators who want to teach STEM through hands-on problem-solving. Whether this is your first experience using LEGO MINDSTORMS or robotics, or you are an experienced user, this learning programme has been developed to support you and to make the materials suitable for your teaching environment.

### What Is It For?

This series of classroom-tested and easily implemented lessons will help you teach STEM concepts. The Space Challenge allows students to take responsibility for their own learning. They will work as young scientists and engineers, immersing themselves in motivating STEM activities that prompt creative problem-solving, communication, and teamwork.

### What Is in the Pack?

The set consists of three Learning Mats, one Challenge Mat, Dual Lock tape, and a large number of LEGO elements for building the Challenge models. On the Learning Mats, students use their academic skills to solve specific tasks as described in the Learning Missions. On the Challenge Mat, students work with the Challenge models – an engaging and motivating platform for creatively applying STEM knowledge and further developing problem-solving skills as students develop solutions to the Space Challenge.

The LEGO MINDSTORMS Education EV3 Space Challenge is designed for use with the 45544 LEGO MINDSTORMS Education EV3 Core Set and LEGO MINDSTORMS Education EV3 Software.



### Learning with the Space Challenge Set

In the Space Challenge Set, there are seven Challenge Missions, nine Learning Missions, and one Basics of Gears project. These are included in student and teacher materials within a multimedia-content environment.

Each Mission and project presents a fun STEM learning opportunity. The LEGO® MINDSTORMS® Content Editor features all the tools the students need for documenting and presenting the findings and results as they progress through the material.

Three Research Projects, co-developed with space engineers, provide rich opportunities for students to explore and create innovative solutions to current space-exploration topics. The Research Projects are built on three key problems that researchers around the world are trying to solve: how to ensure that humans survive in space; how humans can create energy in space; and how robots can help humans explore space.

### Comprehensive Teacher Notes

Throughout the detailed Teacher Notes, you will find everything needed for easy implementation and minimisation of the time you need to prepare for lessons. The Teacher Notes include key learning areas, explanations, hints, programs, and ideas for differentiation.

The Space Challenge consists of the following main categories:

#### Basics of Gears

Learn the basics of gears, so students can build effective robots by applying knowledge of physical science and mathematics principles.

#### Learning Missions

Students investigate, observe, calculate, and apply their knowledge to solve specific tasks.

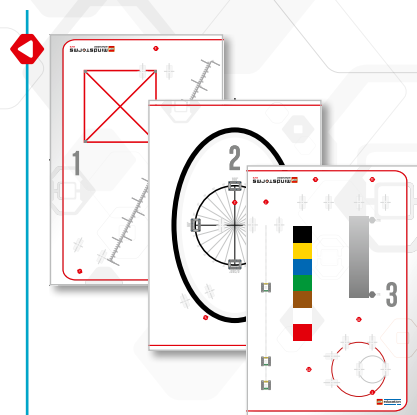
#### Space Challenge

Students apply and creatively adapt programming and problem-solving skills to make robots solve Challenges related to space exploration.

#### Research Projects

Discussions and projects designed to familiarise students with the planning and development for space exploration.

The Space Challenge also includes additional categories with Building Instructions and other supporting materials.



## How Do I Get Started?

### Before Starting the First Lesson

If you have never worked with LEGO® MINDSTORMS® Education EV3 before, you should ensure that:

1. Each student's computer has a pre-installed student version of the LEGO MINDSTORMS Education EV3 software. Refer to the **readme.txt** file for installation instructions. You can see which version is installed in the top bar of the software.
2. Each EV3 Brick has the latest firmware and is fully charged.

Depending upon your teaching goals, you might want the students to understand the relevance of the elements in the brick set. Discuss the naming and basic functionality of the key hardware components, and establish a set of brick management rules.

The User Guide is your source for everything relating to the LEGO MINDSTORMS EV3 hardware.

### The First Lesson

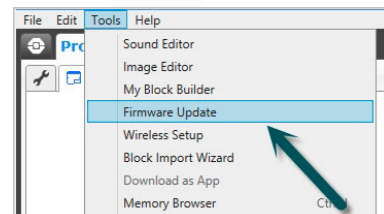
1. Take a look at the Quick Start videos that are available in the Lobby. The videos **Programming** and **Programming Overview** are recommended for most users. However, we suggest watching all Quick Start videos to gain a better understanding of the capabilities of the LEGO MINDSTORMS Education software.
2. Direct your students to the Robot Educator tutorial **Configuring Blocks** in the Basics category. This tutorial explains how to configure programming blocks.

### Continuing with the Space Challenge

There are many ways to utilise the Space Challenge learning program to reach your specific teaching goals. Our suggestions are as follows:

1. Lead the students through the Basics of Gears project and let them learn about gear ratio and mechanical advantage.
2. Then let the students progress at their own pace through Learning Missions. You may want to stop your students after the first five Learning Missions as these will teach your students the basics. The remaining Learning Missions will allow the students to proceed into more complex programs and functionalities.
3. Next, get the students to apply their skills in solving the Space Challenge.
4. Finally, challenge the students to initiate their own Research Project and to work on designing practical solutions to complex space exploration challenges.

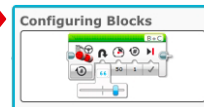
#### Firmware Update



#### Quick Start



#### Configuring Blocks



## Classroom Management Tips

### Content Editor

#### Customised Projects

The integrated Content Editor gives you the ability to customise the project files provided with the Space Challenge to create your own set of differentiated lessons. Here are a few ways to customise the projects:

- rephrase the text to better match the reading ability of your students
- add images that are more relevant to your students
- adjust the mission criteria to increase or decrease the level of difficulty
- change the activities brief to widen or narrow the scope of possible solutions
- create your own Learning Mission or Challenge Missions
- add your own rubrics or other assessment tools

To ensure that you do not overwrite the files provided in Space Challenge, any changes you make will be saved as a new project. All the files included with the original project will also be included in the new project file, which you are then free to share with your students (for example, on a network shared drive).

#### Student Documentation Tool

The Content Editor also allows students to document their progress and findings as they work through each activity. The Content Editor allows them to:

- write descriptions of their robot behaviour, observations, results, and reflections
- record their data in table or graph form
- post audio recordings of their work in progress, discussions, and robot behaviour
- insert their own pages
- add images and videos of their robot in action
- share their unique solutions with others

For more information on the **Content Editor**, watch the Content Editor Quick Start videos.



## Classroom Management Tips

### How Much Time Do I Need?

The time taken to complete each of the Space Challenges depends on a number of factors, such as: the level of complexity, the age of the student, and the student's experience with LEGO® MINDSTORMS®.

The following estimates provide a range of time that would be needed for an average student to complete the building and programming per mission:

Category	Suggested completion time (minutes)
Basics of Gears	45-90
Learning Missions	45-90
Challenge Missions	60-180
Research Projects	180-600

If you do not have a double session, students can use the digital tools to document their work and then pick up where they left off during the next session.

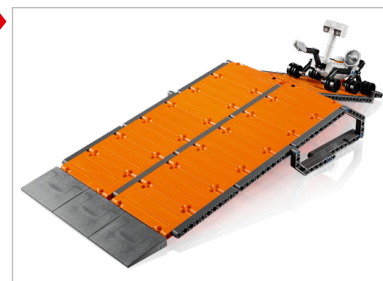
## Classroom Management Tips

### Reduce Building Time

Divide the Building Instructions for the Challenge models **Rocket and Launcher** and **Crater and MSL** into two parts. Have some students build half of each model. Then have the students combine their model parts together.

### Store the Challenge Models

Keep the Challenge models together after use rather than taking them apart. Preserve the models by wrapping them in cloth, paper, or plastic wrapping.



# Space Challenge Overview

