

**Build to Launch** A STEAM Exploration Series

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LEGO<sup>®</sup> Education is teaming up with NASA to bring students and teachers an out of this world STEAM Learning experience! The LEGO Education and Artemis lesson series creates joyful learning moments and brings STEAM learning to life through the real-world application of space exploration.

LEGO® Education is teaming up with NASA to bring students and teachers an out-of-this-world STEAM Learning series! *Build* to Launch explores the technology, STEAM concepts, and careers behind the Artemis I mission to the Moon. Join the all-new LEGO® Space Team and their Artemis I Team counterparts for a 10-week interactive digital learning adventure. In each episode, students will find themselves in the shoes of NASA engineers, scientists, and—of course—astronauts. Through open-ended lessons, students will get hands-on experience and solve the same problems the Artemis I Team faces as they *build* toward launch!

Find more Build to Launch resources online: LEGO Education and NASA's Artemis Mission: Taking STEAM Learning to new heights!

# **Course Design**

The *Build* to *Launch* **Program** is fueled by LEGO Education's commitment to learning through play and exposing students to all the possibilities their future might hold.

The program is designed to:

- Encourage innovative thinkers and problem solvers
- Connect classrooms to the Artemis I Mission
- Encourage students to connect with the LEGO Education and NASA teams
- Allow students to showcase their design engineering skills and STEAM practices

Each of the three modules will:

- Engage students through a mission briefing that introduces STEAM concepts for students to explore
- Challenge students with 2 open-ended, 45-90 minute lessons that encourage problem-solving
- Encourage creativity and solution diversity via the engineering design process
- Expose students to the diversity of careers and people working at NASA
- Provide inspirational models from LEGO Education with links to the full lesson plans that can be completed prior to starting missions for additional scaffolding
- Include resources from NASA including images, videos, and lessons with links to expand learning further

The Moon is Earth's only natural satellite and the fifth largest moon in the solar system.

"Every NASA mission requires people from a wide range of STEM careers, skills, backgrounds, and interests."

- Mike Kincaid, Associate Administrator of NASA's Office of STEM Engagement

## Build to Launch Program Overview

On Tuesday, September 14th, *Build to Launch* will kick off with an exciting mission briefing to spark discussion and get students thinking about the technology, STEAM concepts, and careers behind the Artemis I mission. This 10-week program has three modules: Getting to Space, Testing and Transport, and Working in Space. Each module lasts three weeks. The first week of each module features a mission briefing led by both LEGO® Space Team and NASA team members. The following two weeks feature lesson-based "missions" where students will step into the shoes of NASA experts and take on open-ended prompts. Finally, we'll highlight student work, review concepts they've mastered, and count down to the Artemis I launch slated for later this fall.

# **Learning Promise**

In this program, your students will investigate themes and careers related to space exploration and the Artemis I mission. Students will utilize STEAM skills and practices while solving problems based on the challenges the Artemis I Team might face. They will apply engineering design skills as they brainstorm, prototype, iterate, and explain their ideas in preparation for launch.



# Module 1 Getting to Space

### Mission Briefing Tuesday, September 14

In this first briefing, students will meet the LEGO® Space team and learn about NASA's Artemis I Mission. They'll gain an understanding of how the 10-week digital series will work and get their first set of marching orders should they "choose to accept" their mission.

### Autonomous Movements Mission Tuesday, September 21

Students will explore the importance of autonomous technology in space. Their first mission will be to design and build a prototype vehicle that can move independently and complete specific tasks on the lunar surface.

### Working Together Mission Tuesday, September 28

Students will learn how communication and planning are essential in assembling a spacecraft whose parts are built by many independent groups. A spacewalk also shows students how critical teamwork is to ensure that things go smoothly.

# Module 2 Testing and Transport

### Mission Briefing Tuesday, October 5

In this briefing, students will get a unique look at life on the International Space Station and its complexities. We'll also recap learnings from the "Getting to Space" module and showcase student prototypes from the previous missions. Finally, they'll receive instructions for their next challenge.

### Take Aim Mission Tuesday, October 12

Students will investigate the need for thorough testing and precision when it comes to space travel. Then, they'll apply these ideas to design and build a device that can aim and move toward a target.

### The Crawler Mission Tuesday, October 19

Students will discover how NASA moves an entire rocket to the launch pad. Then they'll design and build a prototype vehicle that can move large, heavy objects easily.



The Moon's distance from Earth is about 240,000 miles (385,000km).

# Module 3 Working in Space

### Mission Briefing Tuesday, October 26

Students will go behind-the-scenes of the upcoming James Webb Space Telescope launch set for later this fall. We'll also review concepts and showcase student prototypes from the "Testing and Transport" module. The episode concludes with the challenges of working in space and a brief for their next missions.

### Hazard Alert System Mission Tuesday, November 2

Students will consider hazards in space, learn how spacecraft and equipment are built to protect against them, and design and build an alert system that ensures a safe mission.

### Using Tools in Space Mission Tuesday, November 9

Students will examine the physical work astronauts do and the unique tools they use, then it will be their turn to design and build a suitable tool for use in space.

### Countdown to Launch Tuesday, November 16

In this final mission debrief, we'll recap the learning outcomes from the entire series, highlight more student work, and explore final preparations for the Artemis I launch.





# **Engineering Design Approach**

The lessons included in the Build to Launch program are created for students to stretch their design engineering skills. The lessons do not specify an engineering design process to follow, but ideally students will follow a predetermined series of steps when creating their solutions. If you do not have such a process in place, consider providing your students with this helpful guide below.

### 03 Prototype

Students should consider their ideas and the constraints of the problem to select the best idea to move forward with. Consider having students create sketches of their idea and then build a prototype model.



solution. Ask students where they had difficulties, what they iterated on, and how they met the constraints.

problem. Ask students to think about what the problem is and different ways they could solve it. Encourage students to share all ideas. No idea is too silly in this phase. Help students understand what constraints or requirements

approach it.

### 04 Test and Redesign

how they approached finding their final



# **Engineering Design Rubric**

Indicator		3	2	1
Identify or Define Problem	Student clearly identifies the problem to solve.			
Generate Ideas	Student provides several ideas. Ideas are reasonable to meet the need.			
Identify best idea based on constraints	Student selects the idea to model that best fits the problem and provided constraints.			
Design and Build a prototype	Student builds a prototype that meets a need and can be tested.			
Testing Prototype	Student conducts tests of the model to evaluate if it meets needs and records findings.			
Evaluating Tests	Student uses test results to identify best characteristics for final solution.			
Iterating and Redesigning	Student modifies the prototype model based on information from tests.			
Explaining results	Student presents a final solution with clear explanation of how it meets the need and explains process to get to final model.			

### Resources

**Engineering Design Notebook:** Have students keep an engineering design notebook throughout the program where they can record their ideas, challenges, iterations, and final solutions. A LEGO® Education branded engineering design notebook will be available for download from the LEGO Education website in August. You have the option to use this notebook or take inspiration from it for students to create their own.

Professional Development Support: Access the LEGO Education Professional Development Platform at https://pd.legoeducation.com/ to check out excellent resources for teaching to the open-ended project approach you'll find in *Build to Launch* as well as product training if you're using LEGO Education solutions.

**LEGO Education Community:** Connect with other *Build* to *Launch* participants and educators who use LEGO Education materials to teach a wide variety of open-ended projects at community.legoeducation.com. In this forum, LEGO Education Master Educators will jumpstart a weekly discussion around each mission. Join that conversation on the #BuildtoLaunch Mission Control page, see how other educators are solving the open prompts, or leave a question for the LEGO Education team.

LEGO Education Lesson Plans: To continue learning with LEGO Education content, access our full library of lessons at www.legoeducation.com/lessons. You'll also find resources for guided lessons that are useful for getting students started before they try open-ended lessons.

"We are at a pivotal moment in education, and to rethink how students learn we must provide meaningful, hands-on learning experiences."

- Esben Stærk, President of LEGO Education

# Differentiating

The Build to Launch program was designed with students in upper elementary and middle school in mind. However, we encourage teachers from all grade levels to utilize this program to expose students to engineering design, the Artemis I mission, and various careers at NASA. Each lesson will provide tips for differentiating learning for all age groups.

# Celebrating Student Work

Celebrate your innovative thinkers by sharing their work with LEGO® Education using #BuildtoLaunch on Instagram and Twitter. Work can also be shared in the LEGO Education Community on the #BuildtoLaunch Misson Control page. Selected work will then be reshared on the LEGO Education social channels, highlighted in the LEGO Education community, and even featured in the *Build to Launch* episodes released weekly on YouTube. If chosen, LEGO Education will reach out directly with instructions for completing a release form required for any images or videos containing people (adults and/or children).

# Connecting with the Team

Please take advantage of this unique and exciting opportunity to connect your students with the NASA or LEGO Education teams! Submit questions for them via the LEGO Education Community #BuildtoLaunch Misson Control page or on Twitter using the hashtag #BuildtoLaunch. Then watch in suspense to see if the NASA or LEGO teams answer your students' questions during the weekly episodes.



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