



# Exploring Space

A LEGO<sup>®</sup> Education Program

Introductory WeDo 2.0 Robotics Program

## Exploring Space

### LEGO® Education WeDo 2.0 Robotics Program

#### Elementary Robotics Program Overview

This outline will provide students with STEM focused hands on activities to promote 21st century skills as well as design engineering and computer science. Each day, students will participate in team building activities and opportunities for physical activity as well as receive a mission briefing for daily challenges aligned to standards. Daily challenges will help students develop skills and knowledge to complete the culminating project, to design a base in space.

Program at a Glance		
Day 1	Welcome to Space Academy Training How do astronauts prepare for a space journey? How do they work together?	<ul style="list-style-type: none"><li>• Glowing Snail</li><li>• Fan</li><li>• Spy Robot</li></ul>
Day 2	Exploration Why do we explore? What tools do scientist use to explore?	<ul style="list-style-type: none"><li>• Satellite</li><li>• Milo A, B, C and D</li></ul>
Day 3	Establishing a Base How do we send things to the moon? How do they land on the moon? What is a good way to create and build a base on the moon?	<ul style="list-style-type: none"><li>• Moon Base</li></ul>
Day 4	Basic Needs and Hazards What do people need to survive in outer space? What hazards do they need to be aware of?	<ul style="list-style-type: none"><li>• Robust Structures</li></ul>
Day 5	Culminating Project & Showcase	<ul style="list-style-type: none"><li>• Culminating project</li><li>• Showcase</li></ul>

#### Prior to First Day of the Program

- Sort sets
- Place batteries in WeDo 2 Hubs
- Download and install the WeDo 2 software on devices to be used for the program
- Determine a naming convention for each set.

- Suggestions include school initials and a number ( Example: Millcreek Elementary robotics kits names could be MES1; MES2; MES3)and write hub name on hub and on the set. Suggestions for hub names include school.
- Write name of set on the box and WeDo 2 hub
- Connect hub to iPad, Chromebook or computer and rename each hub on the computer to match the name you assigned to the set.
- Gather any consumable materials needed for the week.
- Make sure devices that will be used are fully charged, bluetooth is enabled and students can access the software.
- Determine a procedure for when a LEGO piece is dropped (everyone freeze; say LEGO down/LEGO found) and where to place the found LEGO pieces if they do not belong to the finder.

## **Exploring Space Day 1**

### **Welcome to Space**

#### **Big Questions:**

- How do astronauts prepare for a space journey?
- How do they work together?

#### **Materials:**

- WeDo 2 kits
- Devices with WeDo 2 software
- Chart paper
- Student journals (could be paper stapled together with students creating the outside of the journal using construction paper and other consumable materials)
- Various craft materials
- Pens
- Pencils
- Markers
- Team Badge templates
- Book about astronauts

## Day 1: Outline for the day

Outline of Day	Tasks	Time	Materials
9:00 - 10:30	Introductions	30 min	<ul style="list-style-type: none"> <li>• LEGO bricks</li> </ul>
	Establishing Group Rules and Expectations	15 min	<ul style="list-style-type: none"> <li>• Chart paper</li> <li>• Markers</li> <li>• Pens</li> </ul>
	Team Building Activity	15 min	<ul style="list-style-type: none"> <li>• LEGO bricks</li> </ul>
	Mission Briefing	5 min	<ul style="list-style-type: none"> <li>• None</li> </ul>
	Partner Selection, Team Name and Team Badge	25 min	<ul style="list-style-type: none"> <li>• Varies, based on the activity selected</li> <li>• Team badge templates</li> <li>• Markers</li> <li>• Pencils</li> <li>• Scissors</li> </ul>
10:30 - 10:35	Break		
10:35 - 11:25	Astronaut Training (physical activity)	10 min	<ul style="list-style-type: none"> <li>• Varies, based on the activity selected</li> </ul>
	Design a journal for record keeping	20 min	<ul style="list-style-type: none"> <li>• Student journals</li> <li>• Markers</li> <li>• Scissors</li> <li>• Construction paper</li> <li>• Other craft materials</li> </ul>
	Reading and wondering about astronauts	20 min	<ul style="list-style-type: none"> <li>• Book about astronauts</li> <li>• Student journals</li> </ul>
11:25	Get ready for lunch		

11:30 - 12:00	Lunch		
12:00 - 2:10	Mission Briefing 2	5 min	<ul style="list-style-type: none"> <li>• None</li> </ul>
	Challenge 1- Glowing Snail	30 min	<ul style="list-style-type: none"> <li>• Student journals</li> <li>• WeDo 2 set</li> <li>• Devices with software</li> </ul>
	Fan Challenge	60 min	<ul style="list-style-type: none"> <li>• Student journals</li> <li>• Sticky notes</li> <li>• WeDo 2 set</li> <li>• Devices with software</li> </ul>
	Break	5 min	<ul style="list-style-type: none"> <li>• None</li> </ul>
	Spy Robot	30 min	<ul style="list-style-type: none"> <li>• Student journals</li> <li>• WeDo 2 set</li> <li>• Devices with software</li> </ul>
2:10 - 2:30	Daily Debrief and Wrap Up	20 min	<ul style="list-style-type: none"> <li>• Student journals</li> </ul>

### Introductions

**Time:** 30 minutes

**Materials:**

- Loose LEGO bricks

Using the LEGO bricks, have students build a model that shows something they really like to do and one thing they really hope to learn during the robotics program. When it is time to share, have students say his/her name and share the model. The teacher can record what the group hopes to learn on a piece of chart paper.

### Group Rules and Expectations

**Time:** 15 minutes

**Materials:**

- Chart paper
- Markers

Using a piece of chart paper, establish group rules and expectations for the week as a class. You can have students sign the chart paper and then place the rules and expectations in a location that can be reviewed each day.

### Team Building Activity

**Time:** 15 minutes

**Materials:**

- Loose bricks

Explain to students that each day will include some kind of team building challenge. Working together is an important skill and just like other skills, we can practice it to get better and better.

### **Build the tallest tower**

Have students work in pairs. Make sure each group has the same bricks or give a constraint of using a specific number of bricks. Challenge students to build the tallest tower they can within 5 minutes. At the end of the 5 minutes, encourage students to reflect on:

- What was challenging?
- How did you overcome the challenge?
- What was successful?
- How did you work together?
- If you were to do this tower build again, what would you change?

### **Mission Briefing 1**

**Time:** 5 minutes

**Materials:** None

Your first task, new cadets, is to complete the following:

- Determine a partner for training exercises.
- Work with partner to determine a team name and design a team patch.
- Design a journal for keeping important records this week.
- Explore different ways astronauts prepare for a space journey.

### **Partner selection, Team Name and Team Badge**

**Time:** 25 minutes

**Materials:**

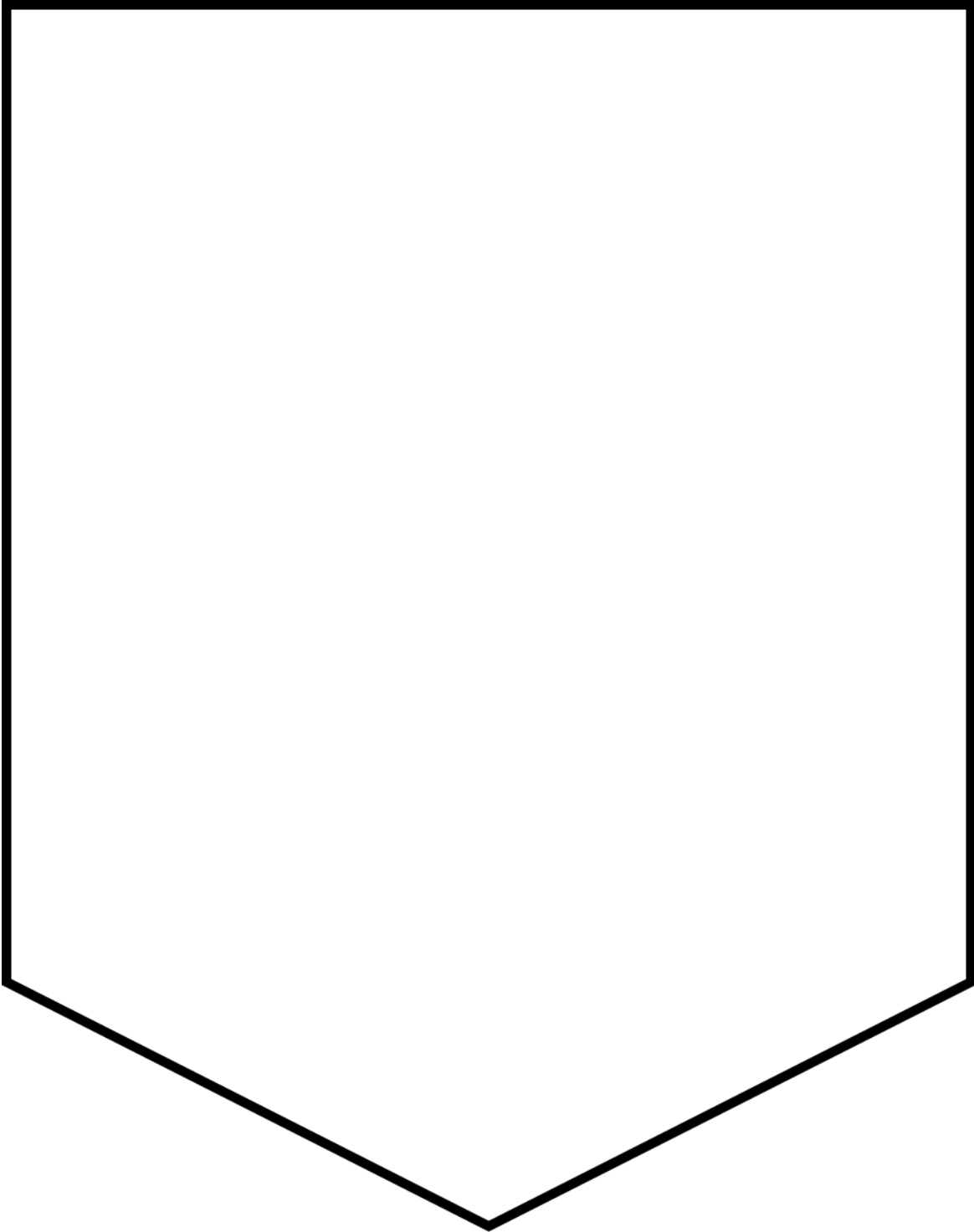
- Markers
- Scissors
- Construction paper
- Other craft materials

You can find suggestions for grouping or pairing students from various web resources. A simple web search for creative ways to group students may provide appropriate resources for you to review.

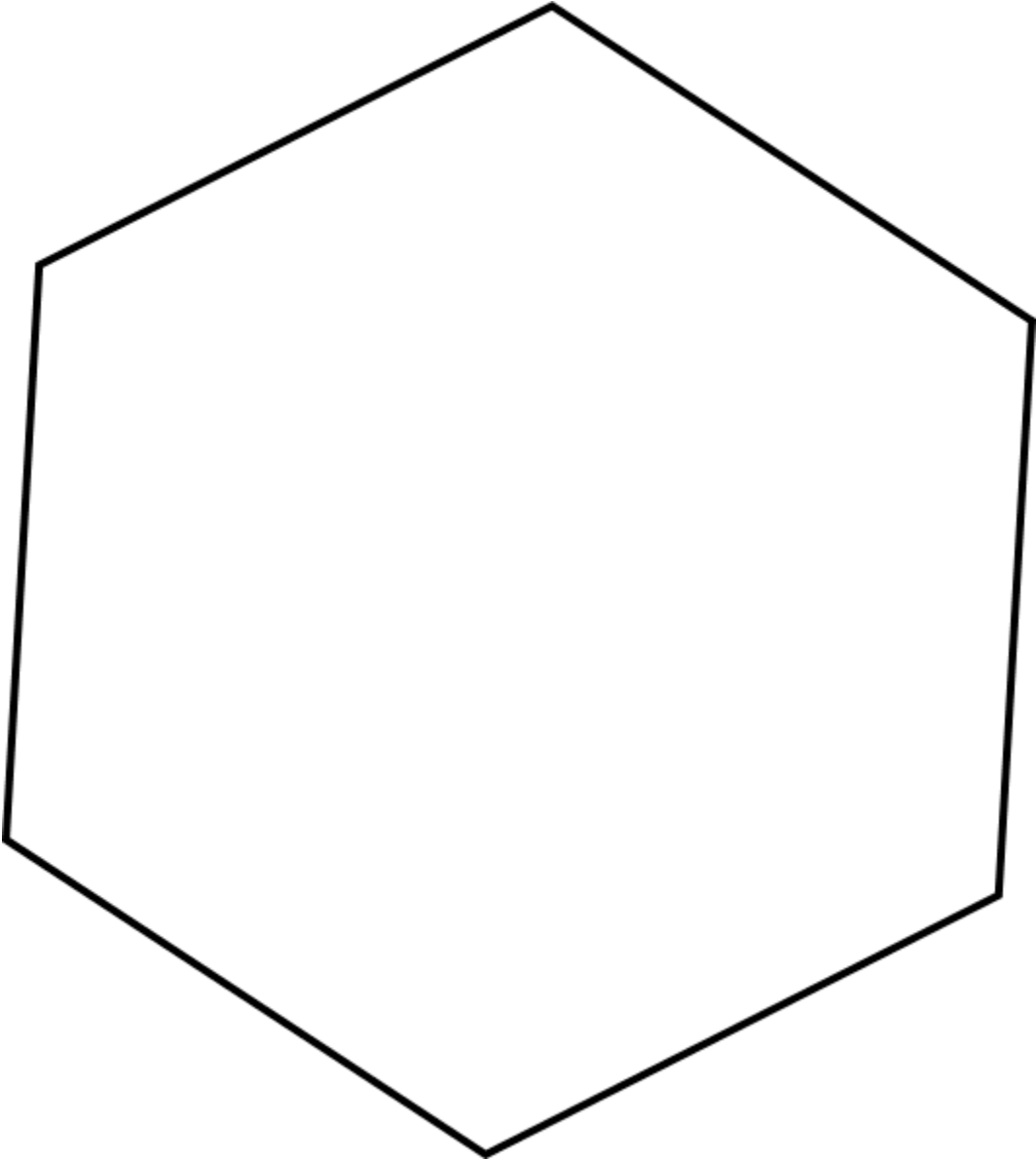
Once partners have been established, student teams can determine a name for their team and design a patch.

While teams are working, assign each group a WeDo 2 kit to use for the week.

Badge Template

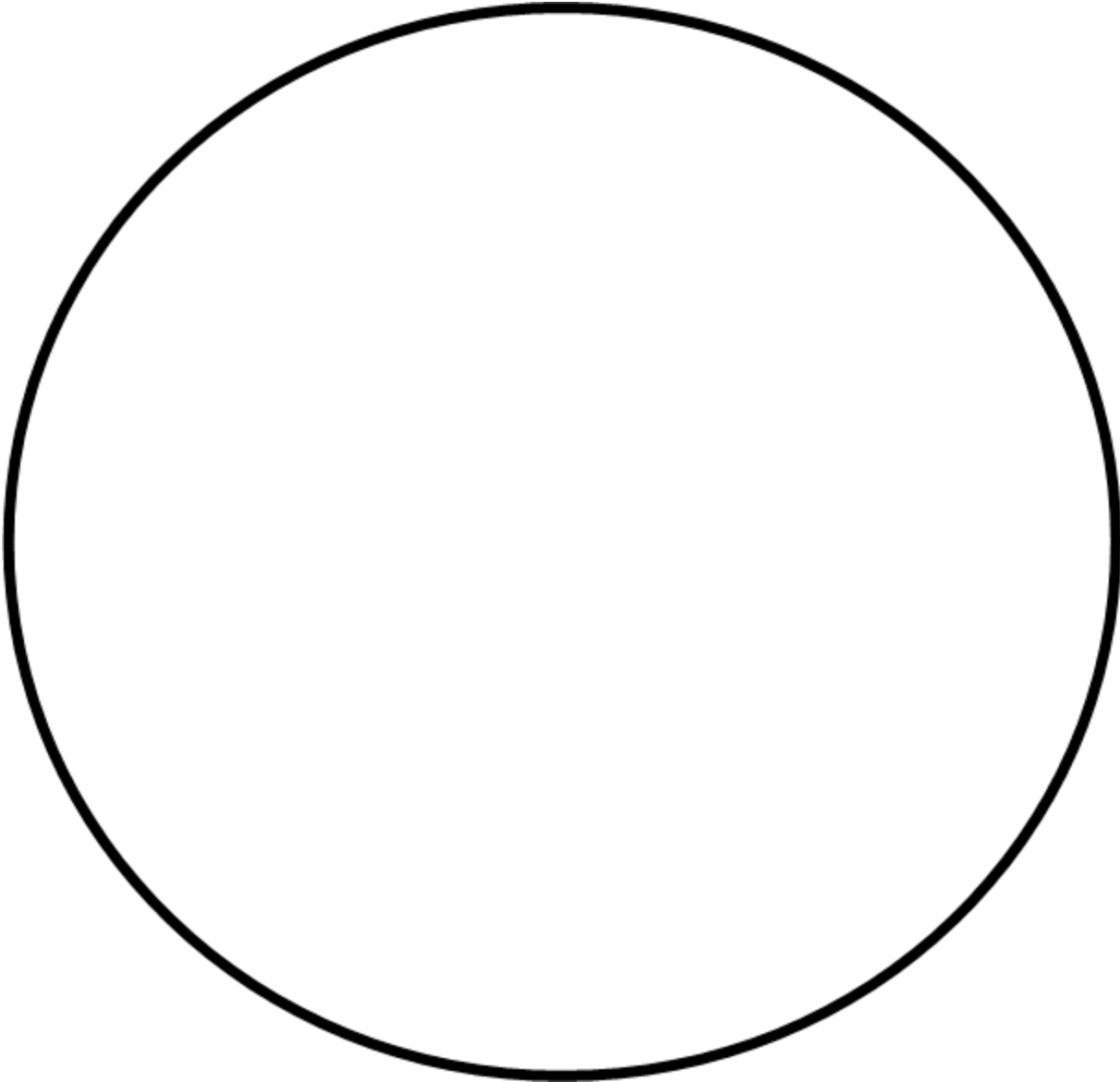


Badge Template

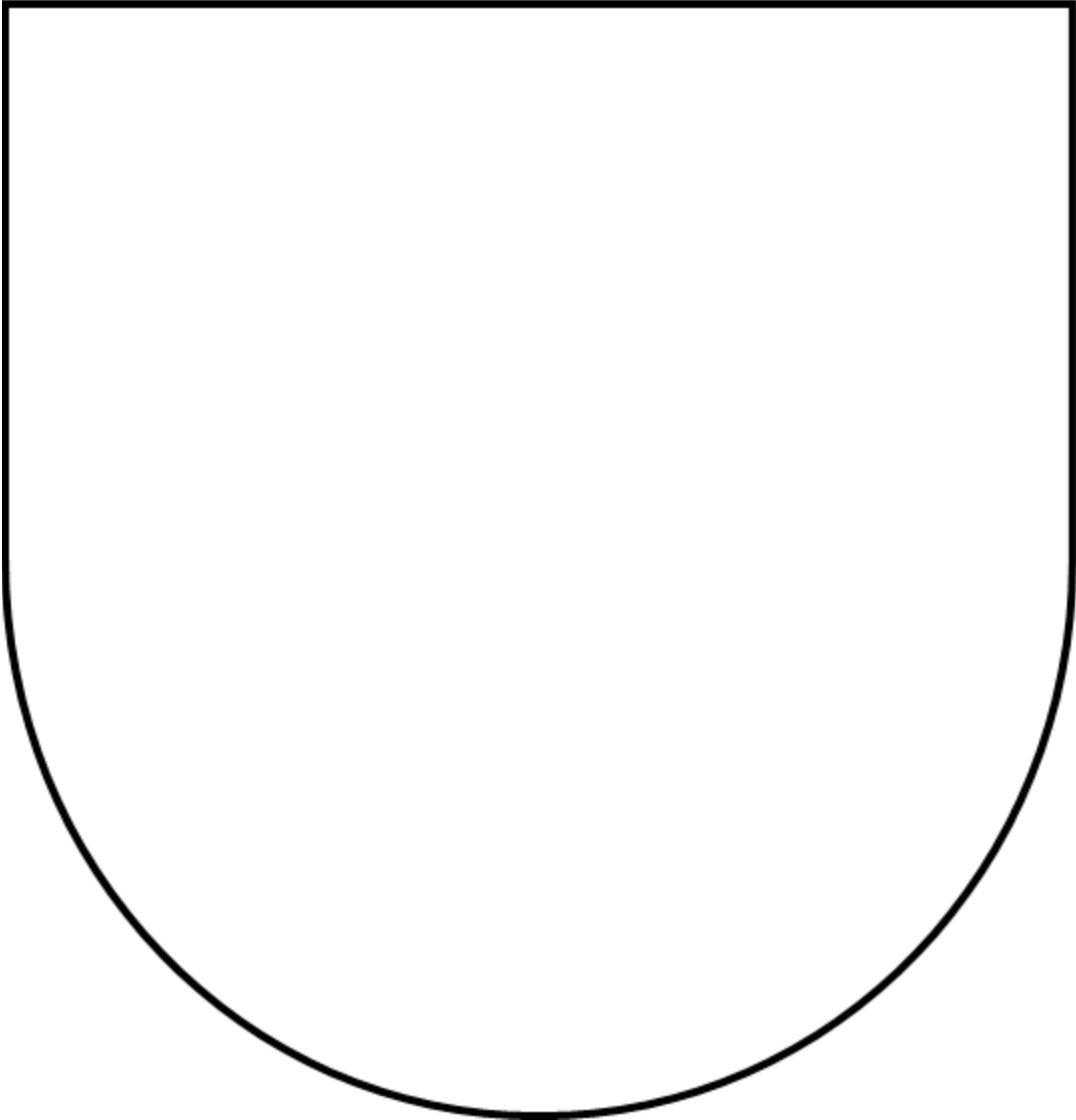




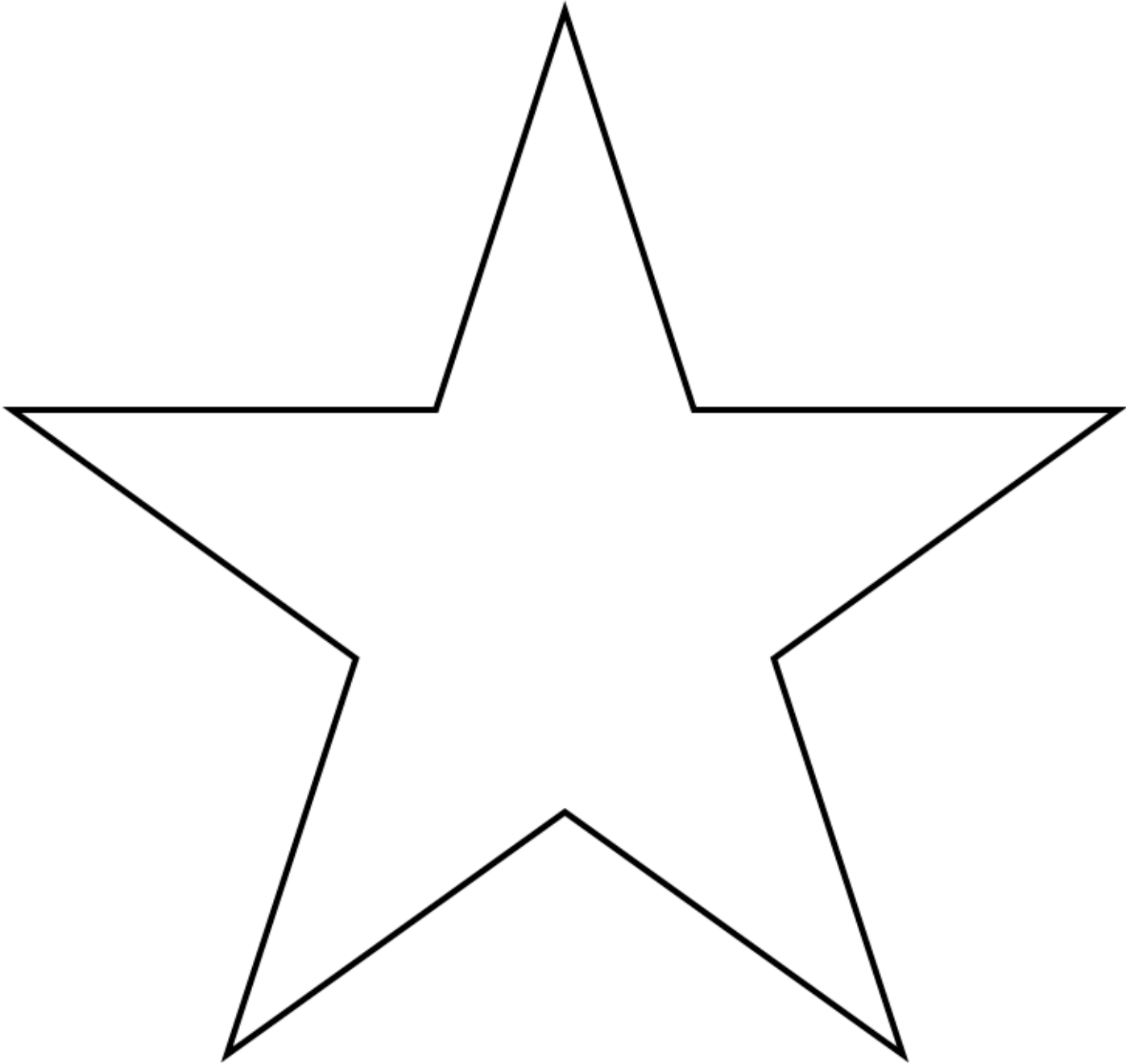
Badge Template



Badge Template



Badge Template



## **Break**

**Time:** 5 minutes

## **Astronaut Training: Physical Fitness**

**Time:** 10 minutes

### **Materials:**

- May vary depending on what activity is selected

Take a minute to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search.

## **Design a Journal**

**Time:** 20 minutes

### **Materials:**

- Student journals
- Markers
- Scissors
- Construction paper
- Other craft materials

Have students create a design journal to take notes, share wonderings, write reflections and collect ideas. Ideas for types of journals can be found online.

## **Readings and Wonderings**

**Time:** 20 minutes

### **Materials:**

- Book about astronauts or journal articles about astronauts

Read a book or a kid friendly journal article about astronauts and how they prepare for space through different types of training. Have students write things they wonder about astronauts in their journals.

## **Lunch**

**Time:** 30 minutes

## **Mission Briefing 2:**

**Time:** 5 minutes

**Materials:** None

Now that you have your team and have some background information about how astronauts prepare for work in outer space, you now have a new challenge. To be better prepared for the days ahead, you will need some basic training on the tools we will use this week. Your mission this afternoon is to:

- Explore how to program the light on the WeDo 2 hub by investigating a glowing snail.
- Learn how to program a motor and redesign a machine with materials provided.
- Learn how to detect objects through the design of a spy robot.

Be sure to work together, take good notes and have fun.

Go over a few general guidelines for using the WeDo 2 sets (what to do if you drop a piece on the floor, where do you put a piece you have found, what does sharing look like).

## **Glowing Snail Lesson**

**Time:** 30 minutes

**Materials:**

- WeDo 2 Sets
- Device with software
- Student journals

Students will:

- Build a LEGO model
- Connect the model and device
- Program the Smarthub LED to show a flash of light

*Scientists, Max and Mia have just returned to the space station. They have discovered a rare glowing snail that sends out flashes of green light to communicate. They want to build a model of the snail. Max and Mia need your help.*

Have students build and program the snail. Once the students have created and run their programs, ask them to think about and explain the program and the function of the snail. Students can take notes in their journals. They should be able to answer questions like:

- How does the program work?
- What do the different program blocks do?

**Extension:** Challenge students to send a message using different colors; making a sound. If time allows, have each group tell a story about their snail and the message it is trying to send.

Take the snail apart and have students reflect in their journals:

- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

## Cooling Fan

**Time:** 60 minutes

### Materials:

- WeDo 2 Sets
- Device with software
- Student journals
- Sticky notes
- Thread

Tell them that the air in the spaceship needs to move around. Have students brainstorm some ways we can move air. Fans are one way we can move air. Explain to student that we are going to build fans to see which ones move the most air.

Go to the fan lesson. After they have made a variable speed fan (three different programs at different speeds) then have them add lights for different fan speeds. Add sounds for different speeds BEFORE it turns the motor on. Use a thread to see how much air is being moved. (very little if any)

Have students increase the length of the fan blades. Reengineering the base is required. Point out the engineering that the students are doing. Ask them about how much air is moving. Very little – Why? Blades are straight, not curved. Use sticky notes to create blades. Then curl them to make curved blades and attach. Notice how much more air is moved. Use a thread to show that more air is moved at the edges as compared to the center.

When done, take fans apart and have students put the pieces back correctly. Have students write a brief reflection on the activity in their journals.

- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

## Break

**Time:** 5 minutes

## Spy Robot

**Time:** 30 minutes

### Materials:

- WeDo 2 Sets
- Device with software
- Student journals

Scientists, Max and Mia, want to help the astronauts at the space station detect motion from objects coming close to them. Can you help them by

- Building a LEGO model
- Connecting the model and device
- Programming the Motion Sensor to detect motion

Have students build and program the spy robot.

Once the students have created and run their programs, ask them to think about and explain the program and the function of the robot.

They should be able to answer questions like:

- How does the program work?
- What do the different program blocks do?

**Extension:** Have students investigate additional ways to use the motion sensor block. Challenge students to use the sound recording tool in the software and then choose sound number 0 to play the sound they have recorded.

Take the spy robot apart and have students reflect in their journals:

- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

## Daily Debrief and Wrap Up

**Time:** 20 minutes

**Materials:**

- Sticky notes
- Student journals
- Pencils
- Pens
- Markers

Have students take a quick inventory of the set for just the following materials:

- Motor
- Tilts sensor
- Motion sensor
- Hub (powered off)

Devices should be powered off and plugged in or stored for the next day.

Have students use sticky notes to write down three things they really enjoyed about the day. Have students use a different sticky note to write down one thing they are still wondering about. Place sticky notes in student journals.

## Exploring Space Day 2 Exploration

### Big Questions:

- Why do we explore?
- What tools do scientist use to explore?

### Materials:

- WeDo 2 kits
- Devices with WeDo 2 software
- Chart paper
- Student journals
- Various craft materials
- Pens
- Pencils
- Markers
- Book about space exploration or exploration in general

Outline for Day	Tasks	Time	Materials
9:00 - 10:30	Welcome	5 min	<ul style="list-style-type: none"> <li>• Student journals</li> </ul>
	Team Building Activity	15 min	<ul style="list-style-type: none"> <li>• LEGO bricks</li> <li>• Bricktionary Cards</li> </ul>
	Review Group Rules Chart	5 min	<ul style="list-style-type: none"> <li>• Group Rules Chart</li> </ul>
	Mission Briefing 2	5 min	<ul style="list-style-type: none"> <li>• None</li> </ul>
	Readings and Wonderings	20 min	<ul style="list-style-type: none"> <li>• Book or journal article about exploration; satellites</li> <li>• Student journals</li> </ul>
	Inventory Check	10 min	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> </ul>



	Satellite	30 min	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> <li>• Devices with WeDo 2 software</li> <li>• Student Journals</li> </ul>
10:30 - 10:35	Break		
10:35 - 11:25	Astronaut Training	10 min	<ul style="list-style-type: none"> <li>• Varies, based on the activity selected</li> </ul>
	Mission Briefing 2	5 min	<ul style="list-style-type: none"> <li>• None</li> </ul>
	Milo A	35 min	<ul style="list-style-type: none"> <li>• WeDo 2 kit</li> <li>• Devices</li> <li>• Student Journal</li> </ul>
11:25	Get ready for lunch		
11:30 - 12:00	Lunch		
12:00 - 2:10	Milo Continued	10 minutes	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> <li>• Devices</li> <li>• Student journal</li> </ul>
	Milo B	15 min	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> <li>• Devices</li> <li>• Student journal</li> </ul>
	Milo C	15 min	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> <li>• Devices</li> <li>• Student journal</li> </ul>
	Milo D	15 min	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> <li>• Devices</li> <li>• Student journal</li> </ul>
	WeDo Clean Up	10 min	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> <li>• Devices</li> <li>• Student journal</li> </ul>

	Break	5 min	
	Moon Surface Creation	70 min	<ul style="list-style-type: none"> <li>• Bulletin board paper</li> <li>• Craft supplies</li> </ul>
2:10 - 2:30	Daily Debrief and Wrap Up	10 min	<ul style="list-style-type: none"> <li>• Student journals</li> </ul>

### **Welcome**

**Time:** 5 minutes

**Materials:**

- Student journals

Welcome students back. Have students take a minute to read over the sticky notes placed in their journals from the previous day. Have students share their favorite moments from the previous day with a partner. (See link on Day 1 for ideas regarding partnering of students.)

### **Team Building Activity**

**Time:** 15 minutes

**Materials:**

- Loose bricks and cards with objects to build

Place students in groups of 4-5 for team building activity - Bricktionary.

**Bricktionary:**

Have students play one round of Bricktionary. Similar to Pictionary, students will draw a card from the stack without showing the word to their teammates. Then using bricks, students will build the object while teammates try to guess what it is. Game is over when everyone has had a turn.

Bricktionary Cards

Truck

Place

Bridge

TV

Flower

Tree

Boat

House

## **Review group rules and expectations**

**Time:** 5 minutes

**Materials:**

- Group Rules Chart

Quickly review the group rules and expectations.

Highlight positive moments from Day 1 (times when students helped each other, asking great questions, teamwork, helping to clean up...)

## **Mission Briefing 1**

**Time:** 5 minutes

**Materials:** None

*Hello fellow astronauts! This morning, your mission is to investigate why people explore. What are some of the tools they use to explore? Then, I will need you to specifically examine satellites. How do satellites help us explore? What kind of information do they help provide? Finally, you will build a model of a satellite to explore programming a motor with WeDo 2.*

## **Readings and Wonderings**

**Time:** 20 minutes

**Materials:**

- Books or journal articles about exploration
- Books or journal articles about satellites
- Student journal

Read a book or a kid friendly journal article about exploration. Discuss what motivates people to explore, tools used by explorers and how they work.

Have students record three things they learned about exploration and one thing they are still wondering.

## **Inventory Check**

**Time:** 10 minutes

**Materials:**

- WeDo 2 set

Ask students to find their partner from Day 1. They will work with this partner for the inventory check as well as the remaining WeDo 2 building and programming activities for the day.

Have students place elements from one tray compartment onto the lid of the box. Then, using the paper inventory sheet in the set (the one that is placed under the lid of the box) have students count and replace pieces back into the tray compartment. Teams should be able to inventory two compartments in ten minutes. If pieces are missing, have students search other compartments, look to see if the piece is stuck in or on another piece in the bottom of the bin or check the LEGO lost and found area in your classroom.

## **Satellites**

**Time:** 30 minutes

**Materials:**

- Books or journal article about satellites
- WeDo 2 kit
- Device with WeDo 2 software

Have students read a short article about satellites. They should investigate things such as what do satellites do and how do they help exploration.

Have students complete the moving satellite activity.

**Moving Satellite**

Introduce building and coding using the motor. Making the motor turn for a set amount of time and then change its direction.

Students will:

- Build a LEGO model.
- Connect the model and device.
- Program the motor to turn for a set amount of time.
- Program the motor to turn the other way.

Read the following story aloud or allow your students a few minutes to read it on their own.

*Max and Mia listen to the news. They hear about satellites controlled by scientists. Sometimes satellites need to move to avoid meteors. Now, they want to build their own satellite and Max and Mia need your help.*

Have students build and program the model.

**Extensions:**

Students can change the direction of the satellite by pressing once on the Motor This Way Block, or by dragging a Motor That Way Block into the program string.

Students can make the satellite turn for a longer period of time by changing the number shown on the Motor On For Block.

See if four groups can coordinate their satellites to move forward and backward (clockwise and counterclockwise) together. Then, have them offset by 1 or 1.5 seconds, so they fan from left to right.

After the lesson, have students take apart the satellite models and return pieces to correct places in the WeDo 2 set.

Have students reflect in their journals:

- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

## **Break**

**Time:** 5 minutes

## **Astronaut Training**

**Time:** 10 minutes

### **Materials:**

- Vary depending on what activity is selected

Take a minute to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search.

## **Mission Briefing 2**

**Time:** 5 minutes

### **Materials:** None

You have investigated why people like to explore and some tools used for exploration. I am presenting you with a new challenge. I would like for you to investigate what scientists and engineers do when they cannot go where they want to explore. To help with your investigation, you are going to build and program a rover and complete several different activities with it.

## **Getting Started Project: Milo, the Science Rover**

**Time:** 35 minutes

### **Materials:**

- WeDo 2 kit
- Device with WeDo 2 software
- Student journal
- Camera or device to take picture

Have students follow the lesson for Milo in the WeDo 2 software. During the explore phase of the lesson, students can brainstorm ways scientists and engineers explore places that are difficult to reach. Students can record ideas in their journals.

Have students build and program Milo.

After lunch, students will complete the share phase of this lesson.

## **Lunch**

**Time:** 30 minutes

## **Milo, the Science Rover continued**

**Time:** 10

### **Materials:**

- Built Milo Rover from WeDo 2 kit
- Device with WeDo 2 software
- Student journals

Wrap up Milo, the Science Rover lesson with sharing out. Have a short discussion with your students about scientific and engineering instruments. Have your students describe how science rovers are helpful to humans. Students can document ideas in their student journals.

Take pictures of the student teams with their science rovers next to the team badge created on Day 1. Pictures can then be incorporated into culminating project at the end of the program.

Have students reflect in their journals:

- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

**Additional information for the teacher:** Students often ask if Milo, the science rover can turn. Encourage them to think through why Milo cannot. If you look carefully how Milo is constructed, you will notice that both wheels are attached using one axle rod. Based on the way Milo is built, the motor will always turn both wheels at the same time.

Leave Milo built for next activity.

### **Getting Started Project, Part B: Milo's Motion Sensor**

**Time:** 15 minutes

**Materials:**

- Built Milo from WeDo 2 kit
- Device with WeDo 2 software installed
- Student journals

Have students complete the lesson in the WeDo 2 software. Students will work through each phase: explore, create and share.

#### **Explore phase**

How is the use of science instruments important to the task scientists have to do? Encourage students to answer the question with any ideas they have in their science journals.

#### **Create**

Students will be building an attachment for Milo, a motion sensor and then program Milo to stop when a flower specimen is detected.

#### **Share**

Students can record video of their mission, if they would like. Students can discuss how the motion sensor works and other objects that a scientist, engineer or astronaut might need to be able to detect in space.

Students will need to remove the motion sensor attachment, but leave the rest of Milo intact for Part C of this lesson. The flower will be used in Part D of lesson.

### **Getting Started Project, Part C: Milo's Tilt Sensor**

**Time:** 15 minutes

**Materials:**

- Built Milo from WeDo 2 set
- Device with WeDo 2 software installed
- Student journals

Tell students that Milo has found a plant specimen and it needs to report to base. That means a special way to communicate between the rover and the base. When rovers locate what they are looking for, they send a message back to the base.

Questions for discussion:

- Why is communication between a rover and the base important?  
Suggested answer: If a rover is successful in its mission but fails to send back the results, the whole mission will be worth nothing. Communication remains to link between the remote mission and the base.
- What are some ways you might communicate with rovers?  
Currently satellites are used to send radio signals between the base and the rover.

Have students complete Milo's Tilt Sensor.

**Note:** The motor will not move the tilt sensor. Students will need to physically move the sensor themselves.

### **Share**

Have students discuss different ways the rover could communicate with base.

**Extension:** Have students write a conversation between base and Milo. You can teach them how to use quote marks and explain why they would be using language like "Roger" for yes and "Over" for ending a statement to allow the other party to start speaking.



## Getting Started Project, Part D: Collaborating

**Time:** 15 minutes

### Materials:

- Built Milo from WeDo 2 kit
- Device with WeDo 2 software installed
- Student journals

**Note:** Student teams will need to be placed in pairs. If there is an odd number of student teams, you will need to make sure you have either an additional built Milo for one team to use OR you could have a group of three teams (6 students) with three students in each group.

### Explore:

Now that your rover has found the plant sample, it is time to carry it back. But wait – it might be too heavy! Let's see if you can collaborate with another rover to move the sample forward together.

Have students complete Getting Started Project, Part D, Collaborating. Each team will need to work with another team to complete this activity.

### Share

Have students talk about their experiences:

- Why is it important to collaborate to solve a problem?
- Give an example of good communication among teams.

Have students reflect in their journals:

- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

Extension: Have students complete a challenge to make a figure 8 around two objects. You can also make it a race by letting a few students use phone timers or stopwatches to time each team as they complete the course. Other students can write the teams' times on a chart.

### WeDo 2 Clean Up

Have students take apart Milo and return pieces back to the set. Ask students to take a quick inventory to check for the following pieces:

- Motor
- Tilts sensor
- Motion sensor
- Hub (powered off)

Make sure devices have been powered off and plugged in or stored for the next day.

## **Break**

**Time:** 5 minutes

## **Culminating Project Work: Moon Surface Creation**

**Time:** 70 minutes

### **Materials:**

- Device for research
- Bulletin board paper
- Craft materials

Place three student teams together for the culminating project. (6 students total)

Have students research the surface of the moon. In groups, have students create a moon surface for the final project. Students can use a large piece of bulletin board paper, construction paper, markers, crayons, etc. Surface needs to be large enough for demonstrating different tasks for the showcase. Students will be adding to this project each day.

Day 2: Create moon surface.

Day 3: Build the base.

Day 4: Add elements to meet basic needs of people.

Day 5: Showcase and team demonstration – pairs of students will share their solutions for different needs on the moon base.

## **Daily Debrief and Wrap Up**

**Time:** 10 minutes

### **Materials:**

- Student journals
- Markers
- Colored pencils
- Crayons

Have students write one word that they feel reflects what they have learned today.

Write and illustrate the word in their student journals.

## Exploring Space Day 3

### Establishing a Base

#### Big Questions:

- How do we send things to the moon?
- How do they land on the moon?
- What is a good way to create and build a base on the moon?

#### Materials:

- WeDo 2 sets
- Devices with WeDo 2 software
- Student journals
- Various craft materials
- Pens
- Pencils
- Markers
- Book about moon landings; space travel

Outline for Day	Tasks	Time	Materials
9:00 - 10:30	Welcome	5 min	<ul style="list-style-type: none"> <li>• Student journals</li> </ul>
	Team Building Activity	15 min	<ul style="list-style-type: none"> <li>• LEGO bricks</li> </ul>
	Review Group Rules Chart	5 min	<ul style="list-style-type: none"> <li>• Group Rules Chart</li> </ul>
	Mission Briefing	5 min	<ul style="list-style-type: none"> <li>• None</li> </ul>
	Readings and Wonderings	10 min	<ul style="list-style-type: none"> <li>• Various books or articles on moon landings and space travel</li> </ul>
	Inventory Check	5 min	<ul style="list-style-type: none"> <li>• WeDo 2 set</li> </ul>
	Moon base	45 min	<ul style="list-style-type: none"> <li>• WeDo 2 set</li> <li>• Device with WeDo 2 software</li> </ul>

10:35 - 10:40	Break		
10:40 - 11:25	Continue Working on Moon Base Lesson	45 min	<ul style="list-style-type: none"> <li>• WeDo 2 set</li> <li>• Device with WeDo 2 software</li> <li>• Student journals</li> </ul>
11:25	Get ready for lunch		
11:30 - 12:00	Lunch		
12:00 - 2:10	Astronaut Training	10 min	<ul style="list-style-type: none"> <li>• Varies, based on the activity selected</li> </ul>
	Mission Briefing 2	5 min	<ul style="list-style-type: none"> <li>• None</li> </ul>
	Building a Moon Base	90 min	<ul style="list-style-type: none"> <li>• Craft materials</li> <li>• Moon surface created on Day 2</li> </ul>
	Unplugged CS Activity	30 min	<ul style="list-style-type: none"> <li>• Varies based on the activity selected</li> </ul>
2:10 - 2:30	Daily Debrief and Wrap Up	15 min	<ul style="list-style-type: none"> <li>• Student journals</li> </ul>

## Welcome

**Time:** 5 minutes

**Materials:**

- Student journals

Welcome students back. Have students take a minute to share the words they created yesterday with a neighbor. Compile a list of the words as a group. You can create a word cloud to share on the last day of the program.

## Team Building Activity

**Time:** 15 minutes

**Materials:**

- LEGO bricks

Place students in pairs.

## **Build a Bridge**

Challenge students to build a LEGO bridge that spans two tables.

### **Extensions:**

Build the longest bridge

Build the tallest bridge

Build a bridge that can the most weight (use a bucket and some weights to test)

## **Review Group Rules Chart**

**Time:** 5 minutes

### **Materials:**

- Group Rules Chart

Quickly review the group rules and expectations created on Day 1 by the students.

Highlight positive moments from Day 1 (times when students helped each other, asking great questions, teamwork, helping to clean up...)

## **Mission Briefing 1**

**Time:** 5 minutes

**Materials:** None

*Hello! This morning, your mission is to investigate different ways we can send materials to space in order to build a moon base for people to visit or live.*

## **Readings and Wonderings**

**Time:** 10 minutes

### **Materials:**

- Various books or materials on space travel or moon landings

## **Inventory Check**

**Time:** 5 minutes

### **Materials:**

- WeDo 2 set

Ask students to find their partner from Day 1. Have students place elements from one tray compartment on the lid of the box. Then, using the paper inventory sheet in the set (the one that is placed under the lid of the box) have students count and replace the pieces back into the compartment. Teams should be able to inventory one compartment in five minutes. If pieces are missing, have students search other compartments, look to see if the piece is stuck in or on another piece in the bottom of the bin or check the LEGO lost and found area in your classroom.

## **Moon Base Lesson**

**Time:** 45 minutes

### **Materials:**

- WeDo 2 Sets
- Devices with WeDo 2 Software

Complete the Moon Base Lesson in the WeDo 2 software.  
Students should work for about 45 minutes, then take a break.

### **Break**

**Time:** 5 minutes

### **Moon Base Lesson Continued**

**Time:** 45 minutes

#### **Materials:**

- WeDo 2 sets
- Devices with WeDo 2 Software
- Rulers in centimeters
- Student journals

Remaining time should be used to complete differentiation activities:

- Use more than two modules.
- The trajectory must be completed within one minute.
- The robot can only turn 90-degrees right during the trajectory.

The following math-related problems could be formulated:

- Two of the modules have landed perfectly on the moon. The other two modules have landed in a line that is parallel to the previous two. Demonstrate where the modules could have landed and program the robot to pick up the modules.
- Two modules have landed at a distance of 20cm of each other. The other two modules have landed so that the four modules in total create a rectangle with a perimeter that is smaller than 60cm. Demonstrate where these modules could have landed and program the robot to pick them up.
- The four modules need to be picked up by two different robots, but they have to arrive at the base at the same time.

Have the students build their own modules and create their own mission about building a base on the moon.

Have students reflect in their journals:

- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

### **Lunch**

**Time:** 30 minutes

## **Astronaut Training**

**Time:** 10 minutes

**Materials:**

- Vary depending on what activity is selected

Take a minute to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search.

## **Mission Briefing 2**

**Time:** 5 minutes

**Materials:** None

Now that you have explored space travel, moon landings and transportation of materials for a moon base, your team will begin construction of a Moon Base on the moon surface you created yesterday. Your base will need to service the following:

- A place to gather supplies
- Areas for shuttle landing
- Area to store rovers and shuttles
- Area to suit up to travel outside of the Moon base
- Basic needs and work space
- Areas for entertainment and physical activity

You may need to spend a little time planning prior to construction.

## **Building a Moon base**

**Time:** 90 minutes

**Materials:**

- Various craft materials, boxes, construction paper, tape
- Moon base foundation from Day 2

Working the in the large teams from Day 2, have groups construct a Moon Base on the foundation created on Day 2.

**NOTE:** students will continue to add to this build up until showcase on Day 5.

See daily descriptions listed on Day 2 for Creating Moon Surface.

## **Unplugged CS Activity**

**Time:** 30 minutes

**Materials:**

- Varies

Select an unplugged activity for students to complete. You can find unplugged activities for computer science through a simple internet search.

## Daily Debrief and Wrap Up

**Time:** 20 minutes

**Materials:**

- LEGO Bricks
- Student journals
- Camera or something to take a picture

Have students use LEGO bricks to build a model that represents two things they learned today. Have students draw a sketch of the model and take some notes regarding their models in their journals. Have students take pictures of their models. Use pictures to create a collage for display for Day 5.

**Note:** You can leave the models intact for morning activity if it suits. Place a post it note on each model with child's name for easy retrieval. If not, you can simply use student journal documentation.



## Exploring Space Day 4 Basic Needs and Hazards

### Big Questions:

- What do people need to survive in outer space?
- What hazards do they need to be aware of?

### Materials:

- WeDo 2 sets
- Devices with WeDo 2 software
- Student journals
- Chart paper
- Various craft materials
- Old magazines that can be cut up (optional)
- Pens
- Pencils
- Markers
- Glue sticks

Book about space hazards, basic needs for human life, living on the international space station

Outline for Day	Tasks	Time	Materials
9:00 - 10:45	Welcome	5 min	<ul style="list-style-type: none"> <li>• Student journals</li> </ul>
	Team building activity	15 min	<ul style="list-style-type: none"> <li>• LEGO bricks</li> </ul>
	Review Group Rules Chart	5 min	<ul style="list-style-type: none"> <li>• Group Rules Chart</li> </ul>
	Mission Briefing 1	5 min	<ul style="list-style-type: none"> <li>• None</li> </ul>
	Readings and Wonderings	10 min	<ul style="list-style-type: none"> <li>• Books or articles about potential space hazards (moonquakes).</li> </ul>
	Inventory Check	5 min	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> </ul>

	Robust Structures	60 min	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> <li>• Devices with WeDo 2 software</li> <li>• Student journals</li> </ul>
10:45 - 10:50	Break		
10:50 - 10:55	Robust Structures Wrap Up and Clean Up	15 min	<ul style="list-style-type: none"> <li>• WeDo 2 sets</li> <li>• Devices with WeDo 2 software</li> <li>• Student Journals</li> </ul>
10:50 - 11:25	Readings and Wonderings	20 min	<ul style="list-style-type: none"> <li>• Books or articles about basic needs of people living in space</li> </ul>
11:25	Get ready for lunch		
11:30 - 12:00	Lunch		
12:00 - 2:10	Astronaut Training	10 min	<ul style="list-style-type: none"> <li>• Varies, based on the activity selected</li> </ul>
	Moon Base Additions to Support Life	120 min	<ul style="list-style-type: none"> <li>• Various craft materials</li> </ul>
2:10 - 2:30	Daily Debrief and Wrap Up	20 min	<ul style="list-style-type: none"> <li>• Student journals</li> </ul>

## Welcome

**Time:** 5 minutes

### Materials:

- Student journals

Welcome students back for the day. Have each student share their models from Day 3 debrief with a friend as a way to review what they had learned yesterday.

If models were left intact, have students take them apart and return LEGO bricks to the set.

## Team Building Activity

**Time:** 15 minutes

**Materials:**

- LEGO bricks

Create a Creature

Have each student create a LEGO creature. Have them give their creature a name and a special characteristic. Have students share their creature with their partner. Have the pair create a short story that includes both creatures.

### **Review Group Rules Chart**

**Time:** 5 minutes

**Materials:**

- Group Rules Chart

Quickly review the group rules and expectations created on Day 1 by the students. Highlight positive moments from yesterday (times when students helped each other, asking great questions, teamwork, helping to clean up...)

### **Mission Briefing 1**

**Time:** 5 minutes

**Materials:** None

Today, you will have one mission. To investigate basic needs for life in space as well as potential hazards. Then, you will continue work on building your Moon Base.

Remember your base should include the following:

- A place to gather supplies
- Areas for shuttle landing
- Area to store rovers and shuttles
- Area to suit up to travel outside of the Moon base
- Basic needs and work space
- Areas for entertainment and physical activity

### **Readings and Wonderings**

**Time:** 10 minutes

**Materials:**

- Books or articles about potential space hazards. Include moonquakes.
- Student journals

Read a book or a kid friendly journal article about space hazards. Discuss potential hazards and compare these to potential hazards on earth.

Have students record at least two potential hazards for living on the moon in their student journals.

### **Inventory Check**

**Time:** 5 minutes

**Materials:**

- WeDo 2 set

Ask students to find their partner from Day 1. Have students place elements from one tray compartment onto the lid of the box. Then, using the paper inventory sheet from the set, (the one that is placed under the lid of the box) have students count and replace elements back into the tray compartment. Teams should be able to inventory one compartments in five minutes. If pieces are missing, have students search other compartments, look to see if the piece is stuck in or on another piece in the bottom of the bin, or check the LEGO lost and found area in your classroom.

## **Robust Structures**

**Time:** 60 minutes

### **Materials:**

- WeDo 2 kits
- Devices with WeDo 2 software
- Student journals

Complete the WeDo 2 lesson on Robust Structures. Students should work with their Day 1 partners.

## **Break**

**Time:** 5 minutes

## **Robust Structures Wrap up and Clean up**

**Time:** 15 minutes

Wrap up the lesson of robust structures by have students put materials away. Have students answer these questions in their student journals:

- What structure design is best for withstanding earthquakes.
- How can this information help you when thinking about building structures on the moon where they have moonquakes?
- What was easy about this challenge?
- What was difficult about this challenge?
- What did I learn from this challenge?

## **Readings and Wonderings**

**Time:** 20 minutes

### **Materials:**

- Books or journal articles about living in space, basic needs of people
- Student journal
- Chart paper
- Markers

Read and discuss the needs of people for living on a space station. Needs might include oxygen, food, water, shelter. As you determine needs, write them on a piece of chart paper so teams can reference them in the afternoon. Students may also list needs in their student journals.

## **Lunch**

**Time:** 30 minutes

## **Astronaut Training**

**Time:** 10 minutes

**Materials:**

- Vary depending on what activity is selected

Take a minute to complete a short physical activity. You may find several ideas for short physical activities for students through a simple web search.

## **Living in Space: Moon Base Additions to Support Life**

**Time:** 120 minutes

**Materials:**

- Various craft materials
- Boxes
- Glue
- Construction paper
- Moon base foundation from Day 2

Working in the large teams from Day 2, have groups continue to construct a Moon Base on the foundation created on Day 2. Teams may elect to add a structure that would be safe from a moonquake. Base should have elements included to support life (food, water, oxygen, etc.).

**NOTE:** Students will continue to add to this model until showcase on Day 5. See daily descriptions listed on Day 2 for Creating Moon Surface.

## **Daily Debrief and Wrap Up**

**Time:** 20 minutes

**Materials:**

- Student journals
- Old magazines that can be cut up
- Colorful paper
- Markers
- Stickers
- Glue sticks

Ask students to create a “self-portrait” collage that only uses positive words about themselves. Have them include words related to positive contributions they can make to a team. Place collage in their student journals.

**Exploring Space Day 5**  
**Culminating Project**  
**Let's Share What We've Learned**

Outline for Day	Tasks	Time	Materials
9:00 - 10:30	Welcome and Team Building Activity	10 min	<ul style="list-style-type: none"> <li>LEGO bricks</li> </ul>
	Review Group Rules Chart	5 min	<ul style="list-style-type: none"> <li>Group Rules Chart</li> </ul>
	Mission Briefing	5 min	<ul style="list-style-type: none"> <li>None</li> </ul>
	Hazard Alarm	60 min	<ul style="list-style-type: none"> <li>WeDo 2 sets</li> <li>Devices</li> </ul>
	Showcase Overview and Expectations	10 min	<ul style="list-style-type: none"> <li>Craft materials</li> </ul>
10:35 - 10:40	Break		
10:40 - 11:25	Culminating Project: Setup for Showcase	45 min	<ul style="list-style-type: none"> <li>WeDo 2 sets</li> <li>Devices</li> <li>Student projects</li> </ul>
11:25	Get Ready for Lunch		
11:30 - 12:00	Lunch		
12:00 - 1:30	Showcase	90 min	<ul style="list-style-type: none"> <li>Student projects</li> </ul>
1:30-2:30	Daily Debrief, Clean Up and Program Wrap Up	60 min	<ul style="list-style-type: none"> <li>WeDo 2 sets</li> <li>Certificates of Completion</li> </ul>

**Welcome**  
**Time:** 5 minutes

**Materials:**

- Student journals

Welcome students back. On a piece of chart paper, draw a really large light bulb. Have students write positive things they discovered about themselves during the program. Students can use their reflection on the end of Day 7 for ideas.

**Team Building Activity****Time:** 15 minutes**Materials:**

- LEGO bricks

**Build Something That**

- Work in groups of 4-5
- Place the bricks in front of you
- Teacher names a category
- As a group, build an 2-3 items that belongs in this category
- Explain why this item belongs in the category

Build something that:

- can fly
- is an animal
- can be used for transportation
- you can have for lunch or dinner

**Tip:** Ideas for other categories: a movie, cartoon characters, buildings, etc.

**Mission Briefing****Time:** 5 minutes**Materials:** None

*Today, your mission is to share what you have learned and built with others. First, we need to make sure your moon base is complete. Yesterday, we discussed potential hazards that astronauts could face on the moon. Your team needs to design a Hazard Alarm added to ensure the safety of the people working there.*

**Culminating Project: Hazard Alarm****Time:** 60 minutes**Materials:**

- WeDo 2 sets
- Devices with WeDo 2 software
- Craft materials
- Student journals

Complete the WeDo 2 lesson Hazard Alarm. Students should work with their Day 1 partners.

## **Showcase Overview and Expectations**

**Time:** 10 minutes

**Materials:** None

Go over your expectations for the showcase in the afternoon so students are prepared for guests. The mission is to share what you have learned and built with others. You will need to be prepared for our guests. Working in your large teams, you will need to do the following:

- Make sure your moon base is complete.
- Have designated areas for each pair to demonstrate their project on or near the moon base
- Be prepared to answer questions from our guests

**Note:** Groups should brainstorm potential questions for students to answer.

## **Break**

**Time:** 5 minutes

## **Culminating Project: Set up for Showcase**

**Time:** 45 minutes

**Materials:**

- WeDo 2 sets
- Devices with WeDo 2 software
- Craft materials

Have each pair of students display their team badge near the Moon Base. Each Moon Base should have three badges since three pairs of students were working together on the finished projects.

## **Lunch**

**Time:** 30 minutes

## **Showcase**

**Time:** 90 minutes

**Materials:**

- Student work

Students should be set up and ready when guests arrive. Other materials you might have on display:

- Charts created during the week
- Video of space games
- Pictures

## **Daily Debrief, Clean Up and Wrap Up**

**Time:** 60 minutes

**Materials:**

- Student projects
- Certificates



Have students disassemble their WeDo 2 models. Make sure sets have the hub, motor, sensors and that sets are in good order. Make sure devices are powered off and stored.

Have students clean up materials from the showcase.

Students can take home their journals.

You can present each student with a certificate of completion.