



Operation Lift Off: MISD Mission Moon

Resource Guide

The aim of Little Inventors workshops is to allow students to express the far reaches of their imagination. We want to inspire students to think up and draw original, ingenious, funny, fantastical or perfectly practical invention ideas. There are no limits!

Students will be able to draw and submit their own inventions to appear on misd.littleinventors.org, where they will be reviewed by the Little Inventors team and MISD. Their idea might be chosen as a Little Inventors Team Favorite, turned into an animation or even made into a real object by one of our Magnificent Makers.

This project at a glance: (timings can be boosted by the activities contained in each unit)

1	Introduction to inventing	40 - 90 mins
2	Launch: all about space	60 - 90 mins
3	Artemis: what is artemis and when is it happening?	40 - 60 mins
4	Moon: the geological south pole	40 - 80 mins
5	Challenge	40 - 70 mins
6	Prototyping	60 - 90 mins
7	Optional Extension activities	10 - 120 mins

More detail:

Operation Lift Off: MISD Mission Moon offers a creative approach to learning using invention. It is a learning program designed for Macomb County Intermediate Schools District in partnership with Little Inventors. Hearing about your experience using these resources in your school is really important to us so we ask that you complete an evaluation at the end of the project.

Operation Lift Off: MISD Mission Moon is comprised of:

1 Introduction to Inventing: Introduction to invention, getting students to think about how invention is part of everyday life and all around us. The presentation includes an open invention challenge using creative starter activities.

2 through 5: 2. Launch, 3. Artemis, 4. Moon and 5. Challenge: Students will become more familiar with the history of space exploration, conditions on the Moon and how NASA is working on an exciting return mission to the Moon after fifty years! From black holes to the south pole of the Moon, students will extend their existing knowledge of space and consider some of the challenges ahead for the Artemis team at NASA. Using their Inventor's Logs, students will gather information and creative ideas to develop some unique and exciting new inventions that could improve life on the Moon.

Each topic will end with the students using their new knowledge to come up with their own invention drawing. This gives students lots of opportunity to practice their invention skills before the final invention challenge at the end of the last unit.

The 5 best invention ideas from the final invention challenge will be selected by you (their teacher) and uploaded to misd.littleinventors.org for a chance to be made real.

6 Prototyping: To celebrate all of the hard work and creativity students can join our amazing designer Lottie to design a special object linked to the space theme.

Optional Extension Activities: For students who really enjoy the Operation Lift Off challenge and want to do more they can use the extension activities included to further expand on their invention ideas. They can create a mission badge or draw a comic strip, and many more fun and educational activities.

This project has been designed to be totally supportive and flexible to suit the needs of your students. You are best placed to select the activities and slides that will work best in line with your schedule. To support in-class delivery, each slide contains accompanying images and points are clear.



Familiarize yourself with the resources available before the workshop

#	Name of pack	Overview of resource	Activities included
1	Introduction to inventing	<ul style="list-style-type: none"> This will kick the project off in the right direction. Students will pick up top insights and invention skills to use as part of their challenge submission 	<ul style="list-style-type: none"> 1.1 Get Started 1.2 Character Profiler + cards 1.3 Mind Mapping 1.4 My Invention Drawing Sheet 1.5 Round up (no worksheet)
2	Launch	<ul style="list-style-type: none"> Students will be set the challenge of using their knowledge of space to create an invention for life on the Moon First stop on this inventing journey is space Students will explore space and consider the impact of gravity on life in space 	<ul style="list-style-type: none"> 2.1 Your name in the stars 2.2 What would you like to do in space? 0.0 My Moon Invention Drawing Sheet
3	Artemis	<ul style="list-style-type: none"> Travel to the Moon is not going to be a distant memory for long! Students will get up to speed with the mission through a Little Inventors lens Students will start to develop their understanding of what it might be like to be an astronaut and work behind the scenes in space travel and Moon landings 	<ul style="list-style-type: none"> 3.1 Inventing for a different type of astronaut <ul style="list-style-type: none"> Character Cards Character Profiler 0.0 Moon Mission Invention Drawing Sheet
4	Moon	<ul style="list-style-type: none"> Students will research the benefits and challenges of landing on the south pole of the Moon With more knowledge about the terrain, students will explore how on earth astronauts can live and work on the Moon The next challenge is to design a great lunar base that will keep astronauts safe and happy while on the Moon Students can then develop their creative thinking by imagining how YOU (yes you, their teacher) would cope if you were part of the Artemis crew 	<ul style="list-style-type: none"> 4.1 Invent your own lunar base 4.2 Unraveling the history of the Moon (no worksheet) 4.3 Moonday, Tuesday Wednesday 0.0 Moon Mission Invention Drawing Sheet
5	Challenge	<ul style="list-style-type: none"> Using the information and creative ideas they have covered in the project so far, students will go on to design and annotate their ideas for an invention that will address one of the most challenging aspects of life away from earth - loneliness Ideas don't all have to be about connecting astronauts with friends and family. Inventions could relate to exercise, good food, doing good deeds, learning a new skill, laughing! 	<ul style="list-style-type: none"> 5.1 Challenge Cards 5.2 Moon Mind Map activity 5.3 Mission Moon final worksheet 0.0 Moon Mission Invention Drawing Sheet 5.4 Round up (no worksheet)
6	Prototyping	<ul style="list-style-type: none"> Students can take their invention idea to the next level by bringing them to life in 3D Start by following the step-by-step instructions to make a cardboard astronaut helmet and then use the skills to make their own invention idea. 	<ul style="list-style-type: none"> 6.1 Helmet Tutorial

How to use these resources:

A downloadable PowerPoint presentation is available for each of the different modules:

1. Introduction to inventing
2. Launch
3. Artemis
4. Moon
5. Challenge

Before running this project with your students, explore each unit and decide the activities you would like to carry out with your students. Use the resource table above to check if the activity you would like to use has a worksheet associated with it. Students will have all of the required worksheets in their Inventor's Log.

Ensure you have printed -

One per student

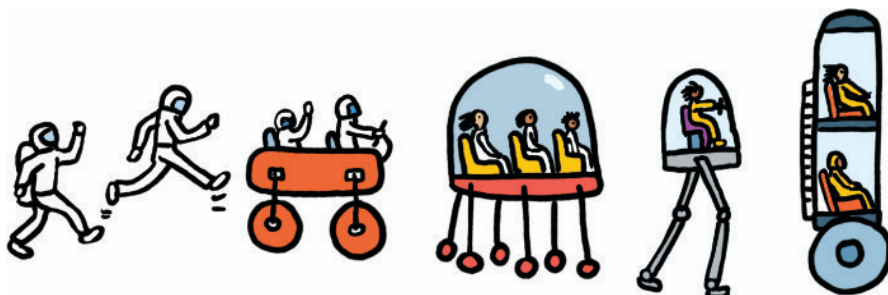
- Inventors Log (containing all activities)

One per class or group

- **1.2** Character Cards (for Introduction to Inventing)
- **1.4** Challenge Cards (for Introduction to Inventing)
- **3.1** Character Cards - MISD Moon
- **5.1** Challenge Cards - MISD Moon

Materials required (in addition to worksheets) -

- Scissors
- Pens and pencils for sketching activities
- Junk materials for students that prefer to think with their hands rather than sketching - this could simply be cardboard boxes, plastic soda bottles, pipe cleaners...anything destined for trash that can be re-used to make a model
- Voice recorder for students that prefer to record their ideas over voice messages



Running the workshop

The following activities are offered with indicative timings on how you could run a workshop. You could decide to run only some of the activities depending on time and attainment levels of your students.

Part 1 - Introduction to inventing

1.1 Get started! (5-10 mins)

Explain that in this workshop, children will be given a chance to come up and draw their own invention ideas.

Refer to the Little Inventors Introduction to Inventing powerpoint presentation to help you create an inspiring atmosphere. Watch the Little Inventors activated powerpoint video for this part [here](https://www.misd.littleinventors.org/collections/mission-moon), or find it on [misd.littleinventors.org/collections/mission-moon](https://www.misd.littleinventors.org/collections/mission-moon)

Have a class discussion on inventions, for example:

- What is an invention?
- Can you name some well-known inventions?
- What about ordinary objects? Why were they invented?
- Inventions are used to solve problems – can you think about problems or things that could be made more interesting or fun?
- Can you think of someone who has a problem or finds things difficult? How can you help them?

Note some children may draw robots to tidy their bedroom or do their homework for example. While robots are fun, try to encourage the creation of unique and original invention ideas.

Follow up: Depending on the time available and abilities, children can either move on to do the Character profiler, the Mind Mapping or go straight to drawing on the My Invention Drawing Sheet.

1.2 Character profiler (10-20 mins)

Inventions happen when someone needs help with something! Tell children that this Character profiler will help them form a picture in their mind of a character and what that character might find challenging.

- Give children a Character profiler worksheet.
- Ask them to choose one character card and put it on the worksheet.
- Ask them to write down information about this character, by thinking about who they are, where they live, what they like or dislike.

- Ask them to come up with an invention idea that their character would need or like.

Differentiation: Instead of writing their description, children could draw their character and add keywords to explain who they are, where they live, their likes and dislikes.

Extension activity: You could ask children to write a story, or draw a comic strip about this character, their life and how the invention could change their life.

Follow up: Depending on time available and abilities, children can either move on to do Mind Mapping or go straight to drawing with My Invention Drawing Sheet?

1.3 Mind Mapping (10-20 mins)

This Mind Mapping exercise aims to encourage children to think about challenges in a bit more depth in order to develop a better idea for an invention.

Look at the Mind Mapping Example sheet within the 'Shared worksheets' folder to see how this sheet can be used.

- Ask students to find the Little Inventors Mind Mapping worksheet.
- Get them to choose one ready-made challenge card and put it on the sheet.
- Ask them to write down words that come to their minds when reading their challenge.
 - You might want to get children to work in pairs or small groups to share their ideas.
 - You can help them by asking them to think about different questions: what it is, where does it take place, when, who is involved, what happens? etc.
- Ask children to repeat the process with the words they have written down to create another layer of words.
- Ask them to explore words they have written down – what idea does it give them for an invention?

Differentiation: Choose one ready-made challenge and discuss it with the class and choose 4-5 keywords or themes for children to work from.

Extension activity: Give children both a ready-made challenge card and their completed Character profiler and ask them to think about how they could link the two together.

Follow up: Depending on time available and abilities, children can either explore the Character profiler if they haven't already completed it or start drawing with My Invention Drawing Sheet.

1.4 My Invention Drawing Sheet (20-40 mins)

Once children have had a chance to develop their ideas a little through discussion in Introduction to Inventing, the Character profiler and/or the Mind Mapping, give them a Little Inventors drawing sheet to draw and explain their invention.

- Make sure that children put their name and age on the worksheet.
- First, ask them to draw using a black pen as an outline, and add colors to their invention to bring it to

life. Tell them to fill as much of the drawing sheet as possible. Ask them to label parts on their drawing to explain how it works.

- Secondly, ask children to name and explain their invention - what does it do? who is it for? what is it made of? how big is it?
- Tell them they are briefing someone to make their invention (which could happen!). Students can draw more than one invention if they want.

Differentiation: Children make a video or audio recording to explain how they got their idea in their own words.

Extension activities: Children come up with their own invention ideas, draw them and explain how they think it can work and how it can be made. Children can also create adverts for their invention by designing leaflets or making a video.

Follow up: Use Round-up to finish the session.

1.5 Round-up! (5-15 mins)

Gather all the children's invention drawings in a gallery around the classroom/ workspace.

Get children to discuss their favorite ideas – what do they like and why? Encourage positive feedback throughout.

- What do they think of their invention?
- What are its strengths and weaknesses?
- What would they do differently?
- Can they imagine other people using their inventions? What would they say?
- What other ideas or challenges can they think of?
- Why are inventions useful?
- How will they approach problems in the future?

Now it's time to set off to space! Open the powerpoint presentation for 2.1 Launch.

Part 2 - Launch

There are several activities in this unit, approximate timing guides are provided below.

- For additional support and guidance please refer to the slide notes where tips for delivery have been provided.
- Should all activities be used the timing range for this unit is 1hr -1hr 30 mins
- The unit can be delivered over a number of lessons

Slide 1	Welcome all of your students to the new MISD Mission Project
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Slide 2	Watch the challenge launch animation
Slide 3	Introduction to the new challenge
Slide 4	Examining existing knowledge about space
Slide 5	Some more facts to share
Slide 6	Examining existing knowledge about space Activity: 2.1 Create your own constellation activity (10 minutes)
Slide 7	Space exploration timeline
Slide 8	Super Duper Space Facts
Slide 9	Dealing with microgravity
Slide 10	Inventions from space
Slide 11	Your journey into outer space Activity: 2.2 What would you like to do in space? (10 minutes)
Slide 12	Activity: 0.0 Moon Mission Invention Drawing Sheet

2.1 Your name in the stars activity (10 mins)

- Hand out the create your own constellation worksheet
- Students can join the stars whose names begin with each letter on their name - this will allow them to create their own constellation

Differentiation

Create a set of enlarged create your own constellation worksheets and allow students to create their own constellations by joining the dots. Can they make a butterfly constellation? A tree? A train!?

Extension

This activity can be extended by giving each student graph paper and creating a constellation graph challenge. Students can use an online constellation guide such as <https://www.dkfindout.com/uk/space/constellations/> to draw constellations using coordinates. Students can then challenge a partner to interpret a set of coordinates and match the coordinates to a constellation.

Follow up

Depending on time available students can move on to the What would you like to do in space activity (see below).

2.2 What would you like to do in space? (10 mins)

- Ask students to work on their What would you like to do in space? worksheet

- Encourage students to work with a partner or in small groups to begin discussing some fun things to do in space
- Students can use the worksheet to record their ideas

Differentiation

Some students may want to focus on one particular activity in space e.g. eating/sleeping/moving

Extension

Students can develop their ideas further by roleplaying a scenario in space - can they improvise how they might behave?

Follow up

The worksheets can be used to create a display for other students at school to enjoy.

0.0 Moon Mission Invention Drawing Sheet (20 - 40 mins)

Once students have had a chance to develop their ideas a little, give them an invention sheet to draw and explain their own invention.

Students can draw more than one invention if they want.

Differentiation: Students make a video or audio recording to explain how they got their idea in their own words.

Extension activities: Students come up with their own invention ideas, draw them and explain how they think it can work and how it can be made. Students could also make a model of their invention. Students can create a poster for their invention or make a video about it. You could ask your students to write a story, or draw a comic strip about this character, their life and how the invention could change their life.

Once the activities have been completed ask your students if they are ready for more! The next stage is a deep dive into the Artemis mission!

Part 3 - Artemis

- The approximate timing range for this unit is 40 minutes to 1 hour

Slide 1	All about Artemis (see slide notes for extra references to support your delivery in class)
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Slide 2	Introduction to Orion the brand new spacecraft
Slide 3	How will Orion safely be launched into space?
Slide 4	The space launch system (SLS)
Slide 5	Gateway and the Lunar Lander
Slide 6	New high tech space suits
Slide 7-10	Learning more about jobs related to space travel
Slide 11	Inventing for a different kind of astronaut Activity 3.1 Character profiler and characters cards
Slide 12	Activity: 0.0 Moon Mission Invention Drawing Sheet

3.1 : Inventing for a different kind of astronaut (20 minutes)

- Split your class into groups of four students and ask them to sit together around a table
- Distribute the character profiler worksheet (there should be one per student)
- Give each table one copy of the character cards, they should cut up the cards and shuffle them.
- Each member of the group should then pick a card at random, they will place this card on their character profiler worksheet and begin to develop a personality for their astronaut
- This activity will help students with creative thinking and will ensure that the scientific skills and knowledge they have about space and the Artemis mission don't block free creative invention ideas!

Differentiation

Some students may benefit from working in a small group where they all work together on one character profiler worksheet.

Extension

Students that require an extra level of challenge can swap their astronaut with a partner. Can they invent something they think the astronaut might like to use in space?

Follow up

Encourage students to use their inventor's logs to record ideas, thoughts and sketches they have made so far.

0.0 Moon Mission Invention Drawing Sheet (20 - 40mins)

It's time to invent again! Students should try and focus on a totally new invention related to their new

learning.

Differentiation: Students make a video or audio recording to explain how they got their idea in their own words.

Extension activities: Students come up with their own invention ideas, draw them and explain how they think it can work and how it can be made. Students could also make a model of their invention. Students can create a poster for their invention or make a video about it. You could ask your students to write a story, or draw a comic strip about this character, their life and how the invention could change their life.

Now we're off to learn more about the Moon!

Pack 4 - Moon

- The approximate timing range for this unit is 40 minutes to 1 hour 20 minutes

Slide 1	Now it's time to focus a little more on the environment of the Moon
Slide 2	Facts about the Moon
Slide 3	How do the Moon and earth compare?
Slide 4	Welcome to the new frontier
Slide 5	The geological south pole of the Moon
Slide 6	The Shackleton Crater
Slide 7	Activity 4.1: What would your dream lunar base look like?
Slide 8	Activity 4.2: Unraveling the history of the Moon (no worksheet)
Slide 9	Activity 4.3: Moonday, Tuesday, Wednesday
Slide 10	Activity: 0.0 Moon Mission Invention Drawing Sheet

4.1 : What would your dream lunar base look like? (20 minutes)

- Distribute the lunar base worksheet.
- Ask your students to think about the information they have learnt about the Moon. There are lots of opportunities but there are also a huge amount of challenges. Ask them to recall the character they created in the last unit. What would their astronaut be looking for in terms of

lunar base design? They should feel free to be as creative as possible!

- Students can share their lunar base ideas through drawing, model making or an audio recording.

Differentiation

Small multi-attainment groups may work well for this activity. Some students may also benefit from a mini roleplay to anticipate some of the areas and objects they might require on their lunar base.

Extension

Students can pick an area or object and use paper to begin to create an informal prototype. This can be super simple!

Follow up

Students can vote on their favorite lunar base - this could even become a whole class “make”, the different areas of the base can be shared out within the class for everyone to contribute to making a model.

4.2: Unraveling the history of the Moon (5 minutes)

Note: this activity does not require a worksheet, it is screen based.

- This fun activity encourages the students to be as creative as possible in their interpretations of the Little Inventors craters - challenge students to go beyond obvious ideas!

4.3: Moonday, Tuesday, Wednesday (15 minutes)

- Distribute the Moonday, Tuesday, Wednesday worksheet.
- The tables are now turned and your students will be coming up with ideas of the sorts of things that you, their teacher, might need in space.
- Split the students into small groups so they can discuss their ideas before recording them on their worksheet.

Differentiation

Some students may prefer to work with their hands straight away and sketch or make models of some of the things they think you may need in space. Some students may benefit from having one area of the activity to focus on e.g. what sort of transport might you use on the Moon

Extension

Is there an element of this activity that the students would like to develop further? Students that finish the activity quickly can review each other's ideas.

Follow up

Encourage students to use their inventor's logs to record ideas, thoughts and sketches they have made so far.

0.0 Moon Mission Invention Drawing Sheet (20 - 40 mins)

Another opportunity for students to turn their ideas into an invention. Using the information covered in this unit can the students create a new invention or make an adaption to a previous invention?

Differentiation: Students make a video or audio recording to explain how they got their idea in their own words.

Extension activities: Students come up with their own invention ideas, draw them and explain how they think it can work and how it can be made. Students could also make a model of their invention. Students can create a poster for their invention or make a video about it. You could ask your students to write a story, or draw a comic strip about this character, their life and how the invention could change their life.

Part 5 - Challenge

- The approximate timing range for this unit is 30 minutes to 1 hour 10 minutes

Slide 1	Remind students of the challenge to create an invention that can improve life in space
Slide 2	Activity 5.1: Challenge cards
Slide 3	Activity 5.2: Mind Map
Slide 4	Activity 5.3: Mission Moon Activity Sheet
Slide 5	Final invention submission Activity 0.0 Moon Mission Invention Drawing Sheet Activity 5.5: Round Up!

5.1: Challenge cards (20-30 mins)

- The challenge cards are designed as quick fire creative catalysts to help students start inventing quickly.
- Students can work independently or in small groups on this activity.
- Hand out the challenge cards, there are a number of challenges in each pack, you may decide to only use two sets of cards in your class. They will need to be cut up and then distributed amongst the students.
- Students can decide how they wish to use the cards, they can share verbal ideas and then develop the ideas further as a group or they may wish to start sketching or prototyping using scrap materials straight away.

Differentiation

Some students may prefer to work with their hands straight away and sketch or make models of some of the things they think you may need in space. Some students may benefit from having one area of the activity to focus on e.g. what sort of transport might you use on the Moon

Extension

Is there an element of this activity that the students would like to develop further? Students that finish the activity quickly can review each other's ideas.

Follow up

Encourage students to use their inventor's logs to record ideas, thoughts and sketches they have

5.2: Moon Mind Map (10-20 mins)

This mind mapping activity encourages students to think in more depth about the different factors and challenges that are relevant to the Moon and space in order to develop a better idea for an invention before drawing it.

- Give students a Moon Mind Map activity sheet.
- Ask them to write down words that come to their minds when thinking about communication, food, emotions and exploration but also key challenges such as travel and gravity!
- You might want to get students to work in pairs or small groups to share their ideas.
- Ask students to repeat the process with the words they have written down to create another layer of words.
- Ask them to explore words they have written down — what idea does it give them for an invention?

Differentiation

Some students may benefit from working in a small group with an adult to support their idea generation. They may want to focus on a smaller area of the mind map

Extension

The mind map can be extended exponentially to generate even more ideas and associations between the words.

Follow up

Students can move on to the planning activity or some may want to get started sketching out their inventions.

5.3: Mission Moon Planning activity (10-20 mins)

- Give young people a Mission Moon activity sheet. Get them to think of a topic, a feature or challenge to do with the Moon and space. Ask them to fill in all the sections on the sheet, by

reflecting or even researching further by asking a partner or browsing on the internet where needed:

- What are the threats and problems?
- What information have they found out?
- What could be done differently?
- What could the future look like?
- Ask them to use all the information above to think up a way that can help improve life on the Moon

Differentiation

Some students may need additional support in this activity, they may need to focus on one area of the deep dive activity.

Extension

Students can browse the NASA site for more information about Artemis and the technology that is being developed to get astronauts back to the Moon

Follow up

Encourage students to use their inventor's logs to record ideas, thoughts and sketches they have

0.0: Moon Mission Invention Drawing Sheet (20-40 mins)

This is the final opportunity to invent as part of this project (we hope your students will continue to invent beyond this project!). As before, students should use the drawing sheet.

Ask your students to review their ideas/sketches and models they may have made so far and write up a list of all of the different themes that can be followed E.g. Helping loneliness/Ways to play and have fun/New ways to communicate/ travel etc.

It's now time to put all of the ideas and information together to create the final invention!

Students can draw more than one invention if they want.

Differentiation: Students make a video or audio recording to explain how they got their idea in their own words.

Extension activities: Students come up with their own invention ideas, draw them and explain how they think it can work and how it can be made. Students could also make a model of their invention. Students can create a poster for their invention or make a video about it. You could ask your students to write a story, or draw a comic strip about this character, their life and how the invention could change their life.

5.4: Round-up! (5-15 mins)

Gather all the student invention drawings in a gallery around the classroom / workspace. Get students to discuss their favorite ideas — what do they like and why? Encourage positive feedback throughout.

- What do they think of their invention?
- What are its strengths and weaknesses?
- How do they think their invention would work in real life?
- Can they imagine their invention being used by other people? What would they say?
- What other ideas or challenges can they think of?
- Why are inventions useful?
- How will they approach problems in the future?

Your class should choose 5 invention ideas in total to submit to Little Inventors. Invention drawings should be scanned if possible (rather than photographed) to be uploaded on misd.littleinventors.org for a chance to get picked as Little Inventors Team favorites, turned into animations or even get made into real objects.

Here's our criteria recommendations for being chosen (but feel free to create your own criteria!):

- Most fun
- Most detailed
- Most innovative
- Most likely to succeed in space
- Wild card - this could be an invention from a student that rarely gets picked in school or a student that is a little shy/needs a little confidence boost!

Part 6 - Prototyping

If the students have more time and want to take their ideas to the next level they can bring their inventions to life in 3D.

As an example/practise prototype there are step-by-step instructions included on how to make your very own cardboard astronaut helmet with artist Lottie Smith.

Watch the Helmet tutorial here via the Little Inventors youtube channel to learn how - <https://youtu.be/pOzqVExHnNw>

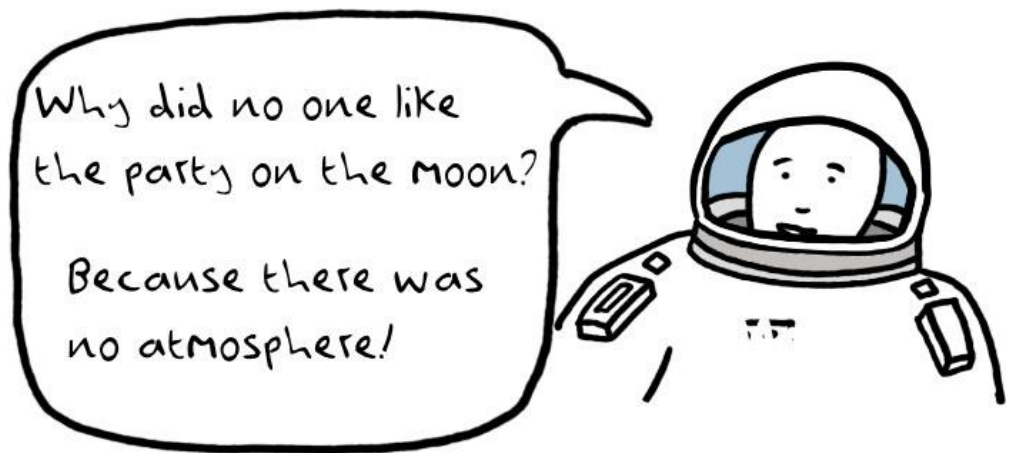
There are also written instructions included in the 'For Kids' section of the resource pack.

Extension

Students can create their own Artemis mission badge using the space provided in the Extensional Activities sheets and make this in cardboard or paper to add to their astronaut helmet.

Extension Activities

There is a whole host of extension activities included for students who have really enjoyed the activities and want to take their invention ideas further. These activities can take between 10 mins - 2 hours depending on how many of the activities they engage with. You can do these extra activities in class time or give to your students to complete at home.



Celebrate all of the hard work completed by the whole class. You may want to explore ideas of how you can showcase all of the inventions at your school. How about an invention exhibition? You could invite the school community to come and explore all of the fantastic ideas!

Top Tip: Give students extra invention sheets to come up with more invention ideas at home. These can be found in the 'For Kids' section of the resource pack.

They can also download more invention sheets for free on misd.littleinventors.org