Science on the Moon: The life of Brian O'Brien Suggested follow-up Activities

This document outlines some ideas for follow-up activities to support learning of the themes from the talk 'Science on the Moon: The Life of Brian O'Brien' with WA Museum Assistant History Curator Joshua Kalmund. These ideas can be applied to many different year levels and implemented in a way that suits your class. We have also provided a detailed outline for one activity; 'Design Your Own Moon Base', linking to curriculum areas of science and design and innovation. It encourages students to consider Dr Brian O'Brien's work and innovation within the earlier years of space exploration, and how this innovative thinking is still being applied to current missions such as Artemis, and potentially sending more people to the Moon in the near future.

Some suggested activities to link to this talk:

1. Exploring Lunar Dust

Dr Brian O'Brien's experiments to the moon related to the damage that lunar dust can do. Another term for lunar dust is regolith, which was formed through bombardment of the moon's surface with micrometeoroids, breaking down the rocks on the surface into very tiny pieces. One of the objects referred to during the talk was lunar dust simulant, used in experiments on Earth as we do not have this same material here on Earth.

- Younger students- kinetic sand could be used as a fill in for regolith. Can students design a car that moves on the Moon without disturbing the lunar dust?
- Older students- 'How is regolith made?' using the NASA- designed science investigation. https://www.nasa.gov/pdf/146860main_Making_Regolith_Educator.pdf

2. How good is your astronaut memory?

One of Dr O'Brien's objects was an astronaut manual that housed all the information that astronauts were required to know, by memory, to set up experiments on the Moon. This required extraordinary memorisation skills- do your students have what it takes to set up an experiment on the moon by memory alone? A fun way to demonstrate this for students that can be adapted to all ages.

Students write a procedure to create a particular shape or character out of lego/ play dough. They then give this procedure to another student who has 5 minutes to read it and memorise

the steps. They then make the shape or character from memory alone, not always easy! To add in more of a challenge you can even come back to it after 30 minutes and see if they can still remember it, or even time them to complete the task in 2 minutes!

3. **What Would Represent you?**

This talk outlined Dr Brian O'Brien's achievements through exploring objects such as satellite models, astronaut manuals, computer tape, lunar dust simulant and lunar experiment replicas. Ask students to consider what stories collections of objects can tell. If you were to tell your own story using objects, what would you choose and why?

Activity Outline: Design your own Moon Base

Overview	Dr Brian O'Brien identified moon dust as a major threat to astronauts visiting the moon. With NASA planning the Artemis missions to return people to the moon for longer term trips, planning a safe place for humans to live there is critical. Students will work together to plan and build a model of a moon base suitable for people to live on the moon.
Year Level	Primary School
Learning Outcomes	Students will investigate the challenges of space exploration and complete a design challenge aimed at developing solutions to those problems. They will use research and investigation skills to learn about how scientists and engineers plan to meet these challenges in the near future.

CURRICULUM

Curriculum Links
Earth's surface changes over time as a result of natural processes and human activity (ACSSU075) With guidance, plan and conduct scientific investigations to find answers to questions, considering the safe use of appropriate materials and equipment (ACSIS065) Represent and communicate observations, ideas and findings using formal and informal representations (ACSIS071) Scientific knowledge is used to solve problems and inform personal and community decisions (ACSHE083) Sudden geological changes and extreme weather events can affect Earth's surface (ACSSU096)

BACKGROUND

The Artemis missions aim to return humans to the moon for long term missions as part of the plan to send people to Mars. These goals will require incredible feats of science and engineering to keep astronauts alive. This includes designing a place for astronauts to live.

In this activity, students will have to think about how they protect themselves and build their shelters under different external conditions. They'll start by considering scenarios on Earth before applying this to the challenges of life on the Moon.

The Activity

The lesson is broken down into several parts. Students can work in groups.

Part 1. Extreme Weather

Open a discussion with students about factors that affect choosing what you wear. For example, do they wear the same clothes when its 5 degrees outside vs when its 35 degrees outside? What about when it's raining? This starts students thinking about personal shelter from the weather. You can give an example of how you wear less covering in the heat, more in the cold and a raincoat if it's raining. Students consider how their clothing might change to cope with four differing weather scenarios.

Part 2. Extreme Earth

Upscale and discuss how regional climates affect designs for homes and other buildings. Discuss ideas with the students about how houses might be built differently depending on the climate before asking them to consider and draw a labelled diagram for how houses could be built differently to cope with four different kinds of location: a cold snowy area, a hot dry desert area, an area prone to heavy rain and floods and an area prone to high wind and storms. To extend this activity, encourage students to think about more complex challenges such as excess sand getting indoors in the desert or moisture induced mold in the flood prone areas.

Part 3. Extreme Outer Space

Take these ideas and consider the question- how we can apply these to living on the moon? Discuss what students think the environmental conditions are on the moon, how do they differ from Earth? The challenges students raise could include:

- No air
- No water
- No food
- Extreme cold

Are there aspects of design on Earth that we've already found that could apply to solving these challenges on the moon?

Part 4. Research

In addition to the environmental challenges to living on the moon that we've already thought about, ask students to consider additional issues such as:

- How do we dispose of our waste sustainably? (rubbish, sewerage)
- How can we power everything?
- How can we ensure that low gravity doesn't have any long-term health effects?
- How can we ensure that people don't get too isolated?

Students research how designers are currently thinking about coping with these challenges when designing for space exploration. This will inform their final design and build.

Part 5. Design

Students work in groups to design a moon base for humans, accounting for the environmental and additional challenges that were previously discussed. To give scope to this design, they can use the question- *How might we design a moon base for humans to live on the moon that will meet their needs and be sustainable?*

Part 6. Building

Each group turns their design into a model of their moon base complete with labels for the different parts, outlining how their base meets the environmental and additional needs for the design.

Conclusions/ student evaluation

Students present their model to the class explaining their design and how they addressed the various challenges in the design of their moon base.