

Lunar Mining Diorama: Exploring Sustainable Resource Extraction

Project Objective:

To create a diorama that depicts a lunar mining operation and explores the concept of sustainable resource extraction on the Moon, aligning with the Sustainable Development Goals (SDGs).

Learning Outcomes:

- Gain understanding of lunar mining operations and the importance of sustainability
- Develop creativity and craftsmanship through diorama design and construction
- Foster critical thinking about the environmental impact of resource extraction on the Moon
- Promote awareness of global issues and encourage action towards achieving sustainable development goals through lunar mining endeavors

Materials Needed:

- Shoeboxes or other small containers for dioramas
- Craft supplies such as construction paper, markers, glue, scissors
- Small figurines or toy vehicles for lunar mining operation
- Modeling clay or playdough for creating lunar landscape
- Optional: LED lights for simulating lunar lighting effects

Sustainable Development Goals

SDGs Connection to Project

The United Nations Sustainable Development Goals (SDGs) are seventeen international goals aimed at improving the quality of life, preserving the environment, and promoting sustainable development for 2030. The goals are complementary as all of the components contribute to a holistic approach towards making the world a better place for everyone in the long run.

Exploration and mining in space are activities that have the potential to benefit humanity and the planet, and also cause harm. For example, innovation in space technology can assist with climate prediction and adaptation, however human actions in space may cause harm or raise new challenges to the planet (ie: greenhouse gas emissions, pollution, and social unrest).

In this activity, connecting the SDGs to the project will incorporate the lens of sustainability into the future of space.

[Sustainable Development Goals](https://sdgs.un.org)

<https://sdgs.un.org>

SUSTAINABLE DEVELOPMENT GOALS



Sustainable Development Goals

SDGs Connection to Project



Industry, Innovation, and Infrastructure. By exploring sustainable resource extraction and innovative technologies for lunar mining, the activity aligns with the goal of promoting inclusive and sustainable practices in industry.



Sustainable Cities and Communities. This activity encourages thinking about sustainable practices for habitation and resource extraction, which relates to building sustainable communities, even in extraterrestrial environments.



Responsible Consumption and Production. By considering sustainability in resource usages and discussing ways to minimize negative environmental impact, this activity targets responsible consumption and production patterns.



Climate Action. Discussing sustainable practices and environmental impacts of resource extraction ties into the broader goal of sharing feelings, thoughts, and ideas for climate action, adaptation and innovation.



Partnerships for the Goals. This activity fosters collaboration and partnership by encouraging students to explore these complex issues together and develop innovative solutions.

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Project Steps:

Introduction to Lunar Mining & Sustainability (Whole Class)

Introduce students to the concept of lunar mining and the importance of sustainability in resource extraction. Encourage students to consider the environmental impact of mining operations on the Moon and long-term sustainability.

Research (Individual or Group)

Assign students to research different aspects of lunar mining, including the types of resources that could be mined, potential extraction methods, and environmental considerations. Encourage students to think about how these mining operations could support sustainable development goals such as clean energy, economic growth, and environmental protection.

Diorama Design (Individual or Group)

Provide students with shoeboxes or small containers to serve as the base for their dioramas (bonus for using recycled materials). Use craft supplies and modeling materials to create a realistic lunar landscape, including craters, rocks, and lunar soil. Students can also design and construct miniature mining equipment, vehicles, and facilities to depict a sustainable mining operation on the Moon.

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Project Steps:

Presentation & Reflection (Individual or Group)

Students will present their dioramas and share their ideas and sustainable practices for lunar mining. This could include incorporating renewable energy sources such as solar panels, implementing waste recycling systems, and/or designing habitats that minimize impact on the lunar environment. Students can use labels or captions to explain the sustainable features of their dioramas.

Students will present their dioramas to the class, explaining the elements they included and how they promote sustainability in lunar mining. Encourage peer feedback and discussion about the different approaches to sustainable resource extraction depicted in the dioramas. Finally, facilitate a reflection session where students consider the challenges and opportunities of sustainable lunar mining and discuss potential solutions for addressing environmental concerns.

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Learning Resources



Lunar Mining

https://ntrs.nasa.gov/api/citations/20230012983/downloads/Lunar%20Mining-Responsible%20ISRU_Draft2.pdf



Waste Management for Lunar Resources Activities

<https://www.liebertpub.com/doi/full/10.1089/space.2021.0012>



Lunar In Situ Resource Utilization Techniques

<https://spj.science.org/doi/10.34133/space.0037>



Sustainable In Situ Resource Utilization on the Moon

<https://www.sciencedirect.com/science/article/abs/pii/S0032063319301862>

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Learning Resources



Environmental Impacts of Space
Mining vs Terrestrial Mining
<https://newspaceeconomy.ca/2023/10/26/environmental-impacts-of-space-mining-vs-terrestrial-mining/>



Mining in Space
<https://www.pnas.org/doi/10.1073/pnas.2221345120>