

Lesson Update and CRT Addendum	
Lesson/Activity Title: Exploring the Moon: Lunar Biosphere	ID: 19-702
Product Number: EG-1997-10-116-HQ	Grade: MS
URL for Lesson: https://www.nasa.gov/pdf/180588main_ETM.Lunar.Biospheres.pdf	
Subject: Biosphere, ecosystems, science careers, photosynthesis, graphing and data analysis	
Summary: This activity challenges students to create a working model of a lunar biosphere that is a balanced, self-enclosed living system able to run efficiently over a long period of time.	
Materials for lesson: (1) Cardboard or heavy-weight paper, (2) Cinder, gravel, sand silt, clay, (3) Data and Observation Sheets, (4) Fertilizer, (5) Lamp, (6) Markers or crayons, (7) Measuring cups & spoons, (8) String, (9) Something to use as the frame: wooden, chopsticks, other kinds of sticks, (10) vermiculite, (11) Plastic tape, (12) Plastic drinking straws, hangers, (13) Plastic 2-liter bottle, (14) Seedlings and animals (15) Team Member Information Sheets, (16) Water.	

Review and Recommendations	
ALIGNMENT TO STANDARDS	
NGSS	ETS1; LS2
Common Core State Standards in Mathematics	
CULTURAL RESPONSIVE TEACHING (CRT) RECOMMENDATIONS	
5E Lesson/Description	
1. Engage	The nature of the abiotic and biotic components should be discussed. Students designing the hanging mobile “Biosphere” to assess prior knowledge will promote curiosity and elicit prior knowledge of students. Discuss the different variables one may encounter on the moon that are different than on Earth. Plants have been grown on the ISS, share videos/pictures with students of those. Ask if students have ever seen hydroponics or different growing techniques. Share what you can find about them. Ask a local grower to come in and share with the students what and how they grow.
2. Explore	In regard to the describing and discussing aspects, the learners could have been asked to provide such language engagements for their native peers or for other ELLs.

	<p>This would also help in translating the language of science into a format that is less intimidating. This approach might also support a more in-depth understanding of the science and processes involved in the lesson.</p> <p>Let students research and decide which plants to grow or animals to include and compare to see what creates the best results.</p>
<p>3. Explain</p>	<p>Through discussions and narratives, students can share their personal relationship with the content of this lesson. Have students share their finished projects and how they overcame any problems that came up.</p>
<p>4. Expand/Enhance</p>	<p>Take a trip to a farm or greenhouse. Create an analogue of conditions on the moon (as closely as possible) and have students start from there to design working biospheres. Using what they learned. Challenge students to use as many resources that would be available in situ on the moon as possible.</p>
<p>5. Evaluate</p>	<p>A pre and post-test might help to know with more confidence what was learned. The lesson has a somewhat open-ended approach and mixtures of questions and mixed-modality response types might be considered (i.e. drawings for younger learners). There might be set points where the student can get feedback as to the status of their model project's development. With established milestones, the student can have an advanced knowledge as to where they should be in regard to the lesson's progression. However, instead of have a scoring of the progress; it would be points where personal reflection and sharing can be carried out.</p>

Additional Resources:

<https://www.nasa.gov/audience/foreducators/topnav/materials/listbytype/Exploring.the.Moon.html>