



LOST on the MOON



Standards:

KS Science Standard: 5.2.2

The student will develop understandings of the similarities, differences, and relationships in science and technology by evaluating benefits, risks, limitations and trade-offs of technological solutions.

MO Science Strand: 8.3.A

People, alone or in groups, are always making discoveries about nature and inventing new ways to solve problems and get work done.

Grade Level: 5-8

Duration: 45 minutes

Overview: Through analysis of a list of materials needed in space, students develop problem solving skills, communication skills, and demonstrate the importance of working as a team. Discussion and debate of the pros and cons of each item on the list will lead to a better understanding of the characteristics of the moon.

Materials & Preparation:

(Per Student)

- ♦ A Lost on the Moon worksheet
- ♦ A Pen or other permanent writing utensil

(Per group)

- ♦ One Lost on the Moon worksheet labeled group effort

Background:

The moon has no weather, no wind, no rain, and no air. It's gravitational pull is 1/6th that of Earth's, and it cannot hold on to the gases needed to cause it to have an atmosphere. Therefore, it has no protection from meteorites, extremes in temperature, or the sun's rays. On the light side of the moon temperatures can reach 280° F while on the side not facing the sun (the dark side) temperatures get down to -148°F. The soil on the moon consists of rock fragments, pulverized rock, and tiny pieces of glass. The two types of rock found on the moon are basalt which is hardened lava and breccia which is pieces of rock and soil that have been melted together.

Also, stress to students that scientists spend a lot of time working together between peer review journals, conferences, and experiments to come up with solutions to their problems.

Procedure:

1. Pass out a copy of the LOST on the MOON worksheet to each student. Place the paper FACE-DOWN on their desk.
2. Ask the students to turn their sheet over and read with them the two paragraphs at the top of the sheet. Make sure you explain that they will use the numbers 1-15 **only once**, and that each item must have a number next to it.
3. Give the class 10 minutes to answer this as individuals. All students need to have this completed in the time allotted. Give a two minute warning and notify students of the need to have a number beside every item.



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Procedure: continued

4. Place the students in mixed ability groups of five to seven and have them discuss and give reasons for their choices. Then instruct the group to fill out a new “Lost on the Moon” worksheet as a group with everyone agreeing on the number placed beside each item. Instruct students to support their choices with knowledge of space and the moon’s characteristics.
5. Upon completion of the individual and group tasks, use a dry-erase board or other large paper visible to every student and guide them through a voting process to determine one set of agreed upon results for the entire class. You may wish to use a point system by asking how many groups gave this a one, a two, etc. And choose the most given answer. However, you can also let them argue it out (supporting their argument with evidence or knowledge) and try to reach a consensus that way. Choose the method that works best for you as a teacher. For counting points, have each group take the difference between the number they assigned an item and the number NASA assigned that item. The lower their score the better.
6. (Hopefully, the group score will be lower than any one individual’s score.) Remember the difference between the ranking given as the answer and the ranking the students gave it is how each group receives a score. The important points are that students rank oxygen #1, Water #2 and realize that matches, and the compass should be #14 or #15. Answers and explanations vary slightly depending on which version of this activity you use.
7. Use the Explanations page provided and go over the class choices, reading the accompanying explanations as to why that object had that number. The objects are listed in the order they should have been chosen. However, you may allow students to defend their choices, and if they are reasonable, allow them.

Reflections & Discussion:

- After you have gone over the explanations, discuss some of the differences between working as an individual and as team.
- Which method do the students think was more effective, overall?
- Which was easier?
- What were some of the problems encountered when working with 5-6 other people?
- Which method of problem solving do most scientists use? Explain why.

Extensions:

If possible, you could show the clip from Apollo 13 where the astronauts have limited resources and have to make due with the supplies they have. Then use this as a way to reflect on team work and problem solving. You could also use this as a real life example of scientists working in teams and the importance of being a creative problem solver.

* Adapted from Crash Landing! By Suzanne Chippindale which was adapted from the The Space Age Activity Guide, ©1992.

*Adapted answers from www.nasa.perbang.dk/ activity Lost on the Moon.



LOST on the MOON



Name: _____

LOST ON THE MOON

Your spaceship has just crash-landed on the moon. You were scheduled to rendezvous with the mother ship 200 miles away on the lighted surface of the moon, but the rough landing has ruined your ship and destroyed all the equipment on board, except for the 15 items listed below.

Your crew's survival depends on reaching the mother ship, so you must choose the most critical items available for the 200 mile trip. Your task is to rank the 15 items by their importance to your survival. Place the number one by the most important item, and so on through number fifteen, the least important. Every item must have a different number placed next to it.

- _____ Box of matches
- _____ Food concentrate
- _____ Fifty feet of nylon rope
- _____ First-Aid kit containing injection needles
- _____ Solar powered portable heating unit
- _____ Two .45 caliber pistols
- _____ One case of dehydrated milk
- _____ Two 100 pound tanks of oxygen
- _____ Topographic map of the moon
- _____ Self inflating life raft
- _____ Solar-powered FM receiver-transmitter
- _____ Parachute silk
- _____ Magnetic compass
- _____ Five gallons of water
- _____ Signal flares





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Explanations of the importance of each item:

1. **OXYGEN**– As oxygen is the source of life, the tanks of oxygen are by far the most important item. The 100 pound weight of each of the tanks should not influence your decision, since they will only weigh about 1/6 of that amount on the moon (17 pounds).
2. **WATER**–After oxygen, water is definitely the next key to survival. The 5 gallons should be plenty to make the 200 mile journey to the mother ship.
3. **STELLAR MAP**– The map will allow you to navigate using the stars.
4. **FIFTY-FEET OF NYLON ROPE**- Nylon rope has many uses, mostly that of tying people together as in mountain climbing. This would save someone from falling into a crater, or from floating off into space.
5. **PARACHUTE SILK**– Although it seems a bit strange at first, the parachute silk provides an essential protection against the harmful rays coming from the sun. The temperature on the moon is greater than on Earth, and so protection from the sun is vital.
6. **TWO .45 CALIBER PISTOLS**– The pistols also seem a weird choice, but the bullets contain oxygen and WILL fire in space. They can be used for propulsion in space to cover larger distances.
7. **SELF-INFLATING LIFE RAFT**- The life raft will inflate in space, since it uses an enclosed carbon dioxide cartridge. This could be used to transport an injured person, or to use in association with the pistols to propel the raft as a form of transportation.
8. **FOOD CONCENTRATE**- Food is a luxury for a 200 mile trip. It is nice to have, but not the necessity that oxygen and water are. The human body can go for much longer without food than water, making it a more expendable item.
9. **SOLAR POWERED FM RECEIVER**- Used for communication with the mothership once there is a line of sight.
10. **SIGNAL FLARES**- Signal flares do not light up in space the way they would on Earth. They could also be used for propulsion, but are not as useful as the pistols for this purpose.
11. **FIRST AID KIT WITH INJECTION NEEDLES**- The first-aid kit has some uses, such as wrappings, bandages, and alcohol swabs. However, the injection needles are useless since they rely upon air to push the liquid through the needle. The vacuum of space does not provide the necessary resistance.
12. **DEHYDRATED MILK**- You would have to waste water to utilize as a liquid, so the milk does not count as a consumable liquid. However, if there was a child in the group, it might prove useful as a calcium source.
13. **SOLAR-POWERED HEATING UNIT**- Although this item would certainly work on the moon, it would be completely useless for the trip. With the extreme temperatures of heat on the light side of the moon, there would be no reason to have a heating unit.
14. **MAGNETIC COMPASS**- Since the moon does not have magnetic poles the way Earth does, the compass would be completely useless on the moon.
15. **BOX OF MATCHES**– By far the most useless item since there is no oxygen to spark or support the fire.