

EDUCATOR *GUIDE* | Activity 3

Hazards in Space (45 min)

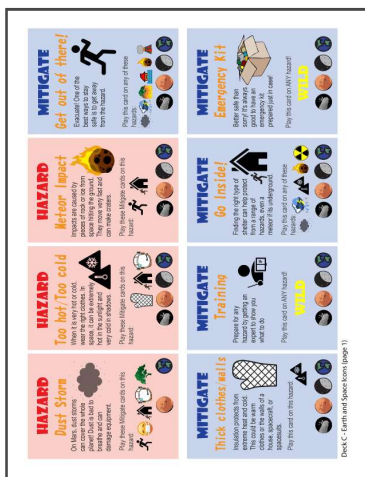
Overview

In this activity, youth will learn that hazards also exist in space, and that some are the same as they are on Earth, and some are different. Youth also learn about hazards that are the same or different between the Moon, Mars, and asteroids. Humans have developed ways to mitigate some space hazards. Youth match mitigation strategies with hazards in the same collaborative card game as activity 1, with different cards.

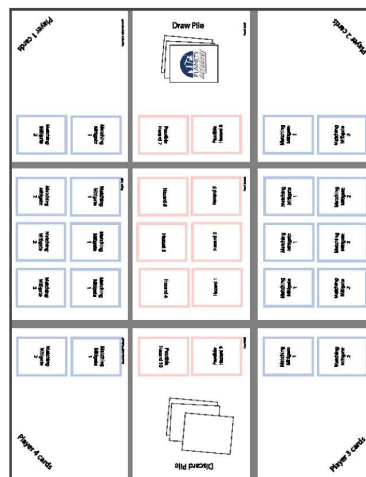
Youth will learn:

- » Hazards can be the same or different between the Earth and space.
- » Hazards can be the same or different between the Moon, Mars, and asteroids.
- » Humans have developed ways to mitigate some hazards in space.

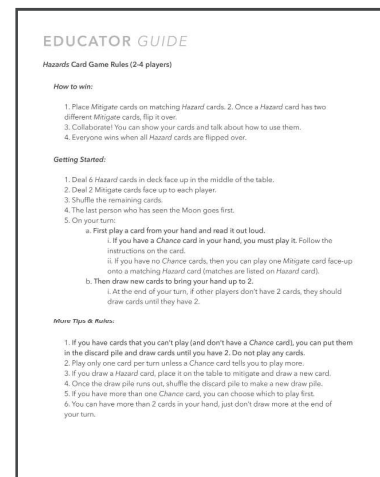
In this activity



Hazards Cards
(Decks C & D)



Mitigate Hazards
Playmat



Hazards Card
Game Rules

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Educator Preparation (30 min)

» For each group of 3 or 4 youth:

1. Set out the Mitigate Hazards Playmat from the last activity.
2. For each card deck from the last activity, sort out Deck C – Earth and Space Icons (17 cards).
3. Print Deck D – Space Icons (in color if possible) (17 cards).
4. Cut the cards with a paper cutter
5. Combine Decks C and D to make individual stacks of 35 cards per deck.
6. Set out the *Hazards* Card Game rules sheets from the last activity for each group.
7. Optional: Consider laminating the self-printed cards or using card protectors to preserve materials for future use.
8. Optional: Consider including blank cards for youth to make up their own hazard and mitigate scenarios.
9. Have the Educator Background section of this guide (pp. 18-28) on-hand for youth questions.

Introduction (5 min)

» Lead a discussion using the following questions to introduce the idea that humans must mitigate hazards to explore space.

1. What do you think might be some hazards that NASA missions must mitigate in space in order to explore? *Accept all answers. Some examples are no air, no food, no water, and space radiation.*



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- a. Choose the example stated that is the most relatable to your group of youth.
2. What are some things you think NASA has done or could do to mitigate these hazards? *Accept all answers. Mitigation strategies for examples stated above are bringing or growing food, re-using water, and using space suits and spacecrafts that keep out or shield radiation and keep in air brought from Earth.*
3. Do you think that visiting different places in space like the Moon and Mars would have different hazards to mitigate? *"Let's see!"*

Getting to Know the Cards (10 min)

1. Distribute card decks C (Earth and Space Icons) and D (Space Icons) to groups of 3-4.
Note: There are not enough cards to accommodate more than 4 players in a group for the next activity.
2. Have youth identify 1 card they would like to know more about. Ask for one or two volunteers to share a card, then read the corresponding section of the Educator Guide Background section. Explain to youth that you will come around during game play to answer remaining questions.
3. Have youth sort through the Hazard cards and pull 1 card that they believe is most dangerous. Ask for one or two volunteers to share a card and explain why they chose it.
4. Have youth sort through the Mitigate cards and pull out 1 card that they believe is most useful. Ask for one or two volunteers to share a card and explain why they chose it.

Hazards in Space (20 min)

Set-up and play the same collaborative card game that allows students to choose how to best mitigate hazards in space.

1. Review game and cards. Explain that the rules of the game are the same and that only the

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cards have changed. NASA missions must mitigate hazards when they explore space.

Tip: If groups finished late in Activity 1, remove a couple hazard cards. If groups struggled or became frustrated in Activity 1, remove a couple chance cards that have negative effects. Read the cards carefully, some chances are helpful.

2. Optional: Have youth check and remove all the cards that have the Earth icon only.

3. Play the game! Rules can be handed out again for youth who missed the previous activity, or as reminders for situations like having cards that can't be played, especially if you removed cards to make the game shorter (see Educator Tip box above).

4. Circle around to all groups. Ask which cards they want to know more about and read or point out the information in the educator background section of this guide.

Reflect (10 min)

Lead a discussion to reflect on hazards in space and how humans have developed ways to mitigate them. Use 2 or 3 of the following questions to guide the discussion:

- » Are there examples of hazards that exist in multiple locations in space?
According to the cards, No food/water/air, Space Radiation, and Low gravity are all hazards that exist on the Moon, Mars, and asteroids. Mars might have more gravity than an asteroid but it's still 1/3rd of Earth's.
- » Are there examples of space hazards that are only in some places that we want to visit and not others? Yes, examples from the cards include: Poison Soil (Mars), Scratchy Soil or Regolith (Moon), and Micro-impact (Moon and asteroid).
- » Are there hazards that are only a problem in space and never on Earth?
No actually, there are lots of places on Earth with "space hazards": There is no fresh water to drink in dry deserts or salt oceans. There is no air to breathe any place underwater. Lots of places and people don't have food to eat. Some radiation reaches



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us here too and gives us sunburns. Some places on Earth have contaminated or poisonous soil. Volcanoes spew out scratchy soil in the form of ash. Airplane pilots have to get used to differences in gravity when they fly. The big difference is that no place in space has its own air or food, and water we've found on planetary surfaces isn't drinkable or even liquid. All of the soil on Mars is poisonous and all of the dust on the moon is scratchy. Gravity is different in space everywhere you go for the entire time you're there.

- » *Are some mitigation strategies that we use on Earth the same as what we use to mitigate hazards in space? Yes, some examples from the cards include: Get out of there (evacuate), Go inside, Filters, Engineering, Thick clothes/walls (Insulation), Emergency Kit, and Training.*
- » *Are there mitigations that are different between Earth and Space? Again, not really. There are things that must be done in space more often than here on Earth to survive like shielding from radiation, taking vitamins, growing your own food, using robots, re-using water, using what's around (local resources), and exercising. We often do these things here on Earth though. Advances in space exploration have also helped drive better living here on Earth.*
- » *What do you think would be harder to mitigate in real life, hazards on Earth or hazards in space? Accept all opinions.*