



STEM Project 1 - Background Research

Dust: Earth & Beyond

The Challenge

To address dust issues encountered on the Moon, Mars and Earth

Dust is defined in the Oxford dictionary as "Fine, dry powder consisting of tiny particles of earth or waste matter lying on the ground or on surfaces or carried in the air." (<https://www.lexico.com/en/definition/dust>)

Dust is an issue that causes problems on many scales. We're all familiar with household dust coating furniture and fittings, causing allergies and creating a nuisance in our homes but have you ever thought about problems it may cause in industry or even when we explore our solar system? This STEM project will examine dust issues in three areas - on Earth, on the Moon and on the planet Mars, and how these issues may be overcome.

No matter whether the dust is on the Moon, Mars or here on Earth, dust can pose a risk to human health, especially when inhaled. It can also have an effect on plants and other organisms (both positive and negative) and potentially prevent equipment from working properly.



Left - Astronaut Eugene A. Cernan, Apollo 17 commander, pictured coated in lunar dust after walking on the Moon.

Image credit: NASA

images-assets.nasa.gov/image/AS17-145-22224/AS17-145-22224~orig.jpg





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Find Out More and Get Thinking

In this section of the project, you need to find out some background information about the issue of dust and how it affects exploration of the Moon and Mars, as well as life on Earth. In this booklet there are some stimulus questions that you will need to do some research to answer.

Whether we're examining dust on the Moon, Mars or Earth, there are three main strategies to try:

1. Prevent the dust being made in the first place.
2. Stop the dust from spreading.
3. Protect living things from the dust.

Included on the next page is a worksheet that may help you to organise your research findings.

Some tips for researching on the internet:

- *Make sure you fully understand what it is you are trying to find out before you start your research.*
 - *You need to understand what all of the words in a question or statement mean so look them up if you don't.*
 - *If you're still stuck ask your peers or your teacher.*
- *Try to use websites that are written by trusted sources.*
 - *Those ending in .gov, .org or .edu are usually reliable.*
- *Always find your information on more than one reliable website or source. If it only appears on one website, how do you know that the information can be trusted?*
 - *Wikipedia can be edited by anyone (even you!) so it may be a good starting point but cross check any information you get from there!*





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Background Information

Use the suggested websites to answer the following questions. If you use another website, record it next to the question numbers at the end of this section. Copy and paste the full URL and the date you used it.



Dust storm - Mungerannie, South Australia.
Image credit: Flickr user Sydney Oats <https://flic.kr/p/7GNx1K>

1. What is *dust*? Where does *dust* come from?

Suggested sites:

- <https://youtu.be/P21a5Uty-uc>
- <https://www.lexico.com/en/definition/dust>
- <https://en.wikipedia.org/wiki/Dust>
- <https://www.conserve-energy-future.com/causes-and-effects-of-particulate-matter.php>

2. What do the terms '*particulate matter*', '*PM10*' and '*PM2.5*' mean when we're talking about dust?

Suggested sites:

- <https://www3.epa.gov/region1/eco/uep/particulatematter.html>
- <http://www.npi.gov.au/resource/particulate-matter-pm10-and-pm25>





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3. What was the *Apollo Program*?

Suggested site:

- <https://www.nasa.gov/audience/forstudents/5-8/features/nasa-knows/what-was-apollo-program-58.html>

4. Why was *lunar dust* an *issue* for the *Apollo astronauts* when visiting the *Moon*?

Suggested sites:

- <https://www.youtube.com/watch?v=EFqpgmZAZgo>
- https://en.wikipedia.org/wiki/Adverse_health_effects_from_lunar_dust_exposure
- <http://blogs.discovermagazine.com/d-brief/2018/03/02/lunar-dust/#.XbEe95B59PZ>

5. How did the *Apollo moon missions* try and *prevent lunar dust* being brought *into the landing module*?

Suggested site:

- <https://www.wired.com/story/moondust-nasa-lunar-ambitions/>





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6. Who was the **Australian scientist** who invented the **dust monitor** to put on the **Moon**? Find out more about him.

Suggested sites:

- <https://www.wired.com/story/moondust-nasa-lunar-ambitions/>
- <https://www.brianjobrien.com/>

7. What happened to the **Opportunity rover** on **Mars** to cause it to **stop communicating** with Earth?

Suggested sites:

- <https://www.jpl.nasa.gov/news/news.php?feature=7334>
- <https://www.youtube.com/watch?v=LkAHm4KpcJY>

8. What do we currently know about the **dust storms** on **Mars**? What **research** is currently being done?

Suggested sites:

- https://www.youtube.com/watch?v=JKBk_Kfucs4
- <https://www.youtube.com/watch?v=I4DnVKx8IDM>





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9. How far can dust on *Earth* travel?

Suggested site:

- <https://youtu.be/ygulQJoIe2Y>

10. How does dust affect human health?

Suggested sites:

- https://healthywa.wa.gov.au/Articles/F_I/Health-effects-of-dust
- <https://www2.health.vic.gov.au/public-health/environmental-health/climate-weather-and-public-health/airborne-dust>

11. What are dust levels like in Western Australia?

Suggested sites:

- <https://www.der.wa.gov.au/your-environment/air/air-quality-data>
- <https://www.der.wa.gov.au/your-environment/air/air-quality-index>





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12. What *happens* during a large *dust storm*? Do we get *dust storms* in *Australia*?

Suggested sites:

- <https://www.kidsnews.com.au/weather/grey-dust-storm-the-length-of-nsw-blankets-canberra-and-then-sydney-as-it-heads-towards-the-sea/news-story/8ba4a0c0efa994761eef89fb3a4d453b>
- https://en.wikipedia.org/wiki/2009_Australian_dust_storm
- https://commons.wikimedia.org/wiki/File:Sydney_Dust_Storm_6am.JPG
- <https://commons.wikimedia.org/wiki/File:SHB-Red-Dust.jpg#filelinks>
- <https://www.youtube.com/watch?v=ADpq0hjbbCA>
- https://www.youtube.com/watch?v=hOQC7x0_6oA

13. What *effect* does *dust* and *particulate matter* have on the *environment*, particularly *plants*?

Suggested sites:

- <https://foobot.io/guides/environmental-impact-of-particle-pollution.php>
- https://www.nasa.gov/vision/earth/environment/aerosol_carbon.html





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14. What are some of the different ways that dust levels can be monitored?

Suggested sites:

- <https://youtu.be/DBkzCCfrQXE>
- [https://d3n8a8pro7vhmx.cloudfront.net/edonsw/pages/688/attachments/original/1430710667/Technical - Air Quality.pdf?1430710667](https://d3n8a8pro7vhmx.cloudfront.net/edonsw/pages/688/attachments/original/1430710667/Technical_-_Air_Quality.pdf?1430710667)
- <https://www.qld.gov.au/environment/pollution/monitoring/air/air-monitoring/measuring>

Other websites used

Question	Website URL & date
1	
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