**Science Stage 4 – space conspiracy theories** 

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## Overview

**Stage and Learning Area**: Science Stage 4 – Earth and Space

**Description**: this lesson sequence is designed to support the development of literacy and critical thinking skills in the context of the Stage 4 Science course. The objective is to focus student learning on skill development rather than content driving the learning process.

Two space conspiracy theories have been chosen to help students engage in the topic –Flat Earth and the Moon Landing. Students will engage with evidence used by the conspiracy theories and apply a scientific lens to assess the strength of the claims made in the conspiracy theory.

Critical thinking skills will be central to student learning while they discern fact from fiction. By encouraging and developing strong research skills, students will explore each conspiracy theory and assess the evidence used to support its standpoint.

Professional judgement will be required to keep the learning focused on scientific thinking and not to single out different viewpoints on the subject.

Students should be encouraged to be unbiased in their research, develop ideas based on strong rigour, and provide clear reasoning behind their thought processes when unpacking the presented conspiracy theories.

**Duration**: while timing will vary based on the mode of delivery, differentiation strategies used and class or school context, this series of activities should take approximately 3 hours.

## Information for teachers

### Introduction

The primary objective of each sequence is to highlight the importance of critical thinking and how to make informed opinions. Each learning activity should also emphasise scientific thinking and reasoning and evaluate how this may differ from the thinking used in non-scientific scenarios by the general public.

This learning sequence is designed to build skills gradually throughout the task. Teachers may wish to modify the task or focus on specific sections based on their class context, student ability and current mastery of content.

### Outcomes

A student:

* describes the dynamic nature of models, theories and laws in developing scientific understanding of the Earth and solar system **SC4-12ES**
* appreciates the importance of science in their lives and the role of scientific inquiry in increasing understanding of the world around them **SC4-1VA**
* processes and analyses data from a first-hand investigation and secondary sources to identify trends, patterns and relationships, and draw conclusions **SC4-7WS**
* presents science ideas, findings and information to a given audience using appropriate scientific language, text types and representations **SC4-9WS**

[Science Years 7–10 Syllabus (2018)](https://educationstandards.nsw.edu.au/wps/portal/nesa/k-10/learning-areas/science/science-7-10-2018)  © NSW Education Standards Authority (NESA) for and on behalf of the Crown in right of the State of New South Wales, 2018.

### Learning intentions and success criteria

Students:

* describe the dynamic nature of theories on the structure of the Earth.

Students can:

* + analyse models of the Earth and the evidence supporting them
	+ draw conclusions and justify their reasoning
	+ evaluate strengths and limitations of an argument.

**Differentiation consideration**: learning intentions should not be differentiated. All students need access to the same core content, big ideas and concepts. Differentiation should be evident in the success criteria, or the activities/support needed to achieve the success criteria (Wiliam and Leahy 2015). Teachers may co-construct the success criteria with students or adjust them to suit their class context, for example, using the strategies and resources for curriculum planning on the [Planning, programming and assessing 7–12](https://education.nsw.gov.au/teaching-and-learning/curriculum/planning-programming-and-assessing-k-12/planning-programming-and-assessing-7-12) webpage.

## Teaching and learning activities

The questions and sequence provided can be adjusted for your students’ learning needs. It can be delivered in smaller lessons, and teacher notes have been inserted for suggested learning breaks and optional activities that could be used to conclude each section.

Printable versions of the learning activities without teacher notes can be found in the appendix.

No sample answers have been provided for the student questions. The questions are designed for students to express their ideas and reasoning. As a result, students will present a wide range of answers depending on their ability, beliefs and prior understanding.

All activities could be completed in small groups, pairs or individually. Constructive dialogue will help students rationalise their thinking and discuss different viewpoints. These rich discussions will help students develop their critical thinking skills.

This resource would be best used as a formative task. Feedback given should focus on their ability to construct claims based on the strength of available evidence and supported with clear reasoning.

**Inclusivity**

Consider the accessibility needs of students when preparing resources and activities. Ensure all text, tables and images are compatible with screen reading software for students with a vision impairment.

Ensure closed captions have been switched on and are accurate before use when showing the videos to your class.

### Activity 1: Flat Earth

**Teacher note:** the structure of this sequence will begin by using the Flat Earth theory to explain some natural phenomena. Students should be directed to include their reasoning in response to each question. The [CER-Resource-Sheet [PDF 70](https://blossoms.mit.edu/sites/default/files/video/download/CER-Resource-Sheet.pdf)KB] resource may assist your students in using a C-E-R structure in texts they produce.

Students can reference the diagram below to help with the structure of their written work. Students should annotate their written work and highlight the claim they made, the evidence used and their reasoning. The video ‘[Evaluating a source’s reasoning and evidence | Reading | Khan Academy](https://www.youtube.com/watch?v=v4HhzvSgUpU) (7:21)’ may assist students in recognising these components in their writing.

Additional support can be found on the Department of Education’s [Stage 4 reading - Evaluating sources](https://education.nsw.gov.au/teaching-and-learning/curriculum/literacy-and-numeracy/teaching-and-learning-resources/literacy/teaching-strategies/stage-4/reading/stage-4-evaluating-sources) webpage.

Figure – C-E-R unpacked

### Activity 2: exploring the Flat Earth Theory

A common representation used by Flat Earth theorists is shown below. It represents the Earth as a flat disk, with a giant wall of ice around the circumference. An indestructible dome is claimed to be attached to the rim, making it a closed system.

Figure 1 – representation of flat Earth



‘[Flat earth](https://commons.wikimedia.org/wiki/File%3AFlat_earth.png)’ by [Trekky0623](https://en.wikipedia.org/wiki/User%3ATrekky0623) is licensed under [CC BY-SA 4.0](https://creativecommons.org/licenses/by-sa/4.0/).

**Question 1:** Do you think this model is a plausible representation of the Earth? Why?

**Question 2:** Table 1 lists some observable natural phenomena. How would the Flat Earth model explain these observations?

Table – Flat Earth explanations of natural phenomena

|  |  |
| --- | --- |
| Observation  | Explanation using the Flat Earth theory |
| Day and night |  |
| The seasons |  |
| Phases of the Moon |  |
| Solar and Lunar eclipse  |  |
| Movement of the planets in the sky |  |

**Teacher note:** a suggested break in the sequence could be inserted at this point. After completing the table, students could present their findings or a class discussion to explain each of the observations using the Flat Earth theory. Collecting student responses in their preferred communication mode could be helpful at this point as the activity is revisited in question 7.

Watch the following video by ABC news on the Flat Earth international conference: ‘[Inside a Flat Earth convention, where nearly everyone believes Earth isn’t round](https://www.youtube.com/watch?v=1gHbwT_R9t0)  (7:06)’

**Question 3:** Why do many people believe in the Flat Earth theory?

**Question 4:** Research and explore the evidence used to support the Flat Earth theory. List 3 pieces of evidence commonly proposed to support the Flat Earth theory.

1.

2.

3.

**Question 5:** For one piece of evidence indicated in question 4, apply the C.R.A.A.P test to evaluate its credibility. The scaffold below can be used to help you apply the C.R.A.A.P test.

|  |  |
| --- | --- |
| C.R.A.A.P test | Evaluation |
| CurrencyThe information found is the most recent. |  |
| RelevanceHow does the topic relate to the information given in a source? |  |
| AuthorityWho is the author, publisher, or sponsor before they can trust the information? |  |
| Accuracy Emphasising the trustworthiness of sources. It must be verifiable from another source or common knowledge. |  |
| Purpose The questions that arise when looking for the purpose range from informing, teaching, selling, entertaining, research or even self-gaining purposes. Also, the author’s intentions should be clear. |  |

The video ‘[How Library Stuff Works: How to Evaluate Resources (the CRAAP Test)](https://www.youtube.com/watch?v=_M1-aMCJHFg) (2:09)’ may be helpful.

**Teacher note:** a suggested break in the sequence could be inserted at this point. Students could share/present their evidence sets with the class or on the whiteboard, using their preferred communication mode. The classroom teacher could collate the collective evidence found by students to lead a classroom discussion.

For questions 6, small groups of students can be allocated one of the videos to discuss in small groups. They can join another group which watched the same video and refine their answers. These groups can than share their collective answers with the class.

**Question 6:**

Watch the **2** videos below.

1. ‘[Flat Earther Tries to Convert Phillip and Holly | This Morning](https://www.youtube.com/watch?v=wClJlarfyhE) (12:34)’
2. ‘[Neil Tyson Demonstrates Absurdity of “Flat Earth”](https://www.youtube.com/watch?v=hLPPE3_DVCw) (8:59)’

In your opinion, which video presented a stronger convincing argument and why?

**Question 7:**

**Teacher note:** any student responses collected or recorded from question 2 could be used to complete the second column in Table 2.

In question 2, you used the Flat Earth theory to explain one of the phenomena listed in Table 2. For the same phenomena(s) chosen in question 2, use the Earth as a sphere to explain the observation.

Table – comparing Flat Earth theory to the Earth as a sphere

|  |  |  |
| --- | --- | --- |
| Observation  | Explanation using the Flat Earth theory | Explanation using the Earth as a Sphere |
| Day and Night |  |  |
| The Seasons |  |  |
| Phases of the Moon |  |  |
| Solar and Lunar eclipse  |  |  |
| Movement of the planets in the sky |  |  |

**Extension:**

Research and conduct some simple experiments or create models to compare the Flat Earth theory and the Earth as a sphere. The links below may help direct your research:

* [3 Ways to Prove the Earth Is Round](https://www.wikihow.com/Prove-the-Earth-Is-Round?msclkid=62c4b2b6d0bd11ec998f7487fc158335)
* [7 DIY experiments you and rapper B.o.B can do to prove Earth is round](https://www.pbs.org/newshour/science/7-diy-experiments-b-o-b-the-earth-is-round?msclkid=62c5340cd0bd11ec99b40ce56a62ac57)

**Teacher note:** students can present their findings in different ways, such as posters or short internet-styled clips. Also, remind students to use the C.R.A.A.P test when conducting their research.

**Reflection:** What are the key elements in scientific inquiry and thinking when seeking answers or explanations?

### Activity 3: the Moon landing

People who believe the Moon landings were hoaxes say that the United States lacked the technology necessary to transport humans to the Moon and back. They claim that NASA faked the landings to make people believe the United States had fulfilled President John F. Kennedy’s promise to land a man on the Moon before 1970.

The YouTube video ‘[Apollo 11: Landing on the Moon (2:36)](https://www.youtube.com/watch?v=nOcDftgR5UQ)’ is footage of the Moon landing. Complete the table below after watching the video and record some questions about it.

Figure – Apollo 11 Moon landing



‘[Apollo 11 Moon Landing 20 July 1969](https://www.flickr.com/photos/13476480%40N07/48364887671/in/album-72157709856449102/)’ by [manhhai](https://www.flickr.com/photos/13476480%40N07/) is licensed under [CC BY 2.0](https://creativecommons.org/licenses/by/2.0/).

Table – see-think-wonder

|  |  |  |
| --- | --- | --- |
| What do you see? | What do you think about that? | What does it make you wonder? |
|  |  |  |
|  |  |  |
|  |  |  |

**Teacher note:** for more information on using see-think-wonder, please refer to the following website: [See, Think, Wonder | Project Zero (harvard.edu)](http://pz.harvard.edu/resources/see-think-wonder).

Watch the video ‘[Was the Moon Landing Faked? | This Morning](https://www.youtube.com/watch?v=cnc_X-oDWsE) (6:04)’ and/or ‘[Inside the moon landing conspiracy: Was it real or fake? | 60 Minutes Australia](https://www.youtube.com/watch?v=F1a3zdLLzxA) (13:09)’.

**Question 1:** Evaluate the strengths and limitations of both sides of the argument regarding the moon landing. You may need to conduct further research to help construct your opinion.

**Question 2:** What is the difference between the scientific method of providing explanations and general opinions based on internet research?

**Teacher note:** students can also be directed to find and evaluate other conspiracy theories related to space. These could include Area 51, Roswell landings or UFO sightings.

## Student resources

#### Resource 1 – activity 2: exploring the Flat Earth Theory worksheet

A common representation used by Flat Earth theorists is shown below. It represents the Earth as a flat disk, with a giant wall of ice around the circumference. An indestructible dome is claimed to be attached to the rim, making it a closed system.

Figure 1 – representation of flat Earth



‘[Flat earth](https://commons.wikimedia.org/wiki/File%3AFlat_earth.png)’ by [Trekky0623](https://en.wikipedia.org/wiki/User%3ATrekky0623) is licensed under [CC BY-SA 4.0](https://creativecommons.org/licenses/by-sa/4.0/).

**Question 1:** Do you think this model is a plausible representation of the Earth? Why?

**Question 2:** Table 1 lists some observable natural phenomena. How would the Flat Earth model explain these observations?

Table – Flat Earth explanations of natural phenomena.

|  |  |
| --- | --- |
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Watch the following video by ABC news on the Flat Earth international conference [Inside a Flat Earth convention, where nearly everyone believes Earth isn’t round - YouTube](https://www.youtube.com/watch?v=1gHbwT_R9t0) (duration: 7:06)

 **Question 3:** Why do many people believe in the Flat Earth theory?

**Question 4:** Research and explore the evidence used to support the Flat Earth theory. List 3 pieces of evidence commonly proposed to support the Flat Earth theory.

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3.

**Question 5:** For one piece of evidence indicated in question 4, apply the C.R.A.A.P test to evaluate its credibility. The scaffold below can be used to help you apply the C.R.A.A.P test.

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| C.R.A.A.P test | Evaluation |
| CurrencyThe information found is the most recent. |  |
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| AuthorityWho is the author, publisher, or sponsor before they can trust the information? |  |
| Accuracy Emphasising the trustworthiness of sources. It must be verifiable from another source or common knowledge. |  |
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The video ‘[How Library Stuff Works: How to Evaluate Resources (the CRAAP Test)](https://www.youtube.com/watch?v=_M1-aMCJHFg) (2:09)’ may be helpful.

**Question 6:**

Watch the **2** videos below.

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2. ‘[Neil Tyson Demonstrates Absurdity of “Flat Earth”](https://www.youtube.com/watch?v=hLPPE3_DVCw) (8:59)’

In your opinion, which video presented a stronger convincing argument and why?

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In question 2, you used the Flat Earth theory to explain one of the phenomena listed in Table 2. For the same phenomena(s) chosen in question 2, use the Earth as a sphere to explain the observation.

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| Solar and Lunar eclipse  |  |  |
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**Extension:**

Research and conduct some simple experiments or create models to compare the Flat Earth theory and the Earth as a sphere. The links below may help direct your research;

* [3 Ways to Prove the Earth Is Round](https://www.wikihow.com/Prove-the-Earth-Is-Round?msclkid=62c4b2b6d0bd11ec998f7487fc158335)
* [7 DIY experiments you and rapper B.o.B can do to prove Earth is round](https://www.pbs.org/newshour/science/7-diy-experiments-b-o-b-the-earth-is-round?msclkid=62c5340cd0bd11ec99b40ce56a62ac57)

**Reflection:** What are the key elements in scientific inquiry and thinking when seeking answers or explanations?

### Resource 2 – activity 3: the Moon landing

People who believe the Moon landings were hoaxes say that the United States lacked the technology necessary to transport humans to the Moon and back. They claim that NASA faked the landings to make people believe the United States had fulfilled President John F. Kennedy’s promise to land a man on the Moon before 1970.

The YouTube video ‘[Apollo 11: Landing on the Moon (2:36)](https://www.youtube.com/watch?v=nOcDftgR5UQ)’ is footage of the Moon landing. Complete the table below after watching the video and record some questions about it.

Figure 2 – Apollo 11 Moon landing



‘[Apollo 11 Moon Landing 20 July 1969](https://www.flickr.com/photos/13476480%40N07/48364887671/in/album-72157709856449102/)’ by [manhhai](https://www.flickr.com/photos/13476480%40N07/) is licensed under [CC BY 2.0](https://creativecommons.org/licenses/by/2.0/).

|  |  |  |
| --- | --- | --- |
| What do you see? | What do you think about that? | What does it make you wonder? |
|  |  |  |
|  |  |  |
|  |  |  |

Watch the video ‘[Was the Moon Landing Faked? | This Morning](https://www.youtube.com/watch?v=cnc_X-oDWsE) (6:04)’ and/or ‘[Inside the moon landing conspiracy: Was it real or fake? | 60 Minutes Australia](https://www.youtube.com/watch?v=F1a3zdLLzxA) (13:09)’.

**Question 1:** Evaluate the strengths and limitations of both sides of the argument regarding the moon landing. You may need to conduct further research to help construct your opinion.

**Question 2:** What is the difference between the scientific method of providing explanations and general opinions based on internet research?

## Support and alignment

**Resource evaluation and support**: all curriculum resources are prepared through a rigorous process. Resources are periodically reviewed as part of our ongoing evaluation plan to ensure currency, relevance and effectiveness. For additional support or advice, or to provide feedback, contact the Science Curriculum team by emailing Science7-12@det.nsw.edu.au.

**Differentiation:** further advice to support Aboriginal and Torres Strait Islander students, EALD students, students with a disability and/or additional needs and High Potential and gifted students can be found on the [Planning, programming and assessing 7-12](https://education.nsw.gov.au/teaching-and-learning/curriculum/planning-programming-and-assessing-k-12/planning-programming-and-assessing-7-12) webpage.

**Assessment**: further advice to support formative assessment is available on the [Planning, programming and assessing 7-12](https://education.nsw.gov.au/teaching-and-learning/curriculum/planning-programming-and-assessing-k-12/planning-programming-and-assessing-7-12) webpage.

**Professional learning**: relevant professional learning is available on the [Science statewide staffroom](https://education.nsw.gov.au/teaching-and-learning/curriculum/statewide-staffrooms)

**Related resources**: further resources to support Stage 4 Science can be found on the [Science Curriculum page](https://education.nsw.gov.au/teaching-and-learning/curriculum/science).

**Consulted with**: Literacy and Numeracy, Inclusive Education, Multicultural Education, and subject matter experts.

**Alignment to system priorities and/or needs**: [School Excellence Policy](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468), [School Success Model](https://education.nsw.gov.au/public-schools/school-success-model/school-success-model-explained).

**Alignment to the School Excellence Framework**: this resource supports the [School Excellence Framework](https://education.nsw.gov.au/policy-library/policies/pd-2016-0468) elements of curriculum (curriculum provision) and effective classroom practice (lesson planning, explicit teaching).

**Alignment to Australian Professional Teaching Standards**: this resource supports teachers to address [Australian Professional Teaching Standards](https://educationstandards.nsw.edu.au/wps/portal/nesa/teacher-accreditation/meeting-requirements/the-standards/proficient-teacher) 3.2.2, 3.3.2.

**Author**: Science 7-12 Curriculum Team

**Resource**: Learning Sequence

**Creation date**: 26 April 2023

## References

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NESA holds the only official and up-to-date versions of the NSW Curriculum and syllabus documents. Please visit the NSW Education Standards Authority (NESA) website <https://educationstandards.nsw.edu.au/> and the NSW Curriculum website [https://curriculum.nsw.edu.au/home](https://curriculum.nsw.edu.au/).

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### Further reading

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