



Day 1:
2. Virtual MEL

Virtual MEL



- *Needs for virtual MEL materials during the pandemic*
- *The Virtual MEL had been developed and pilot-tested during the fall 2020 and the spring 2021.*
- *All Virtual MEL materials (8 pcMELs and 4 baMELs) are currently open to public and available for instructional uses*

Google-based Virtual MEL Platform

2. Climate Change Model Plausibility Ratings

* Required

First Name *

Your answer

Last Name *

Your answer

Teacher *

Your answer

Period *

Your answer

Please work on this individually. Read the following information carefully.

Humans create models to help explain things. Below are two models. These provide different explanations for why global temperatures have increased over the past 100 years and average sea levels have increased over the past 50 years.

Plausibility is a judgment we make about the potential truthfulness of one model compared to another. The judgment may be tentative (not certain). You do not have to be committed to that decision. Carefully read the text for each model, and rate the plausibility of each.

Model A: Climate change is caused by humans who are releasing gases into the atmosphere.
A GEOSCIENTIST who supports this model makes the following argument:
A few gases in Earth's atmosphere prevent some of Earth's energy from escaping out into space. Human activities are increasing the amount of these gases in the atmosphere. Therefore, humans are causing climate change.

Rate the plausibility of Model A *

1 2 3 4 5 6 7 8 9 10

Greatly Implausible (or even impossible) ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Highly Plausible

Model B: Climate change is caused by increasing amounts of energy released from the Sun.
A GEOSCIENTIST who supports this model makes the following argument:
The Sun is the main source of energy for planet Earth. Scientists have shown that for thousands of years Earth's average temperature increases when the Sun releases more energy. Therefore, the Sun is causing climate change.

Rate the plausibility of Model B *

1 2 3 4 5 6 7 8 9 10

Greatly Implausible (or even impossible) ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ Highly Plausible

Google Forms

- Plausibility Ranking Task
- Model Plausibility Ratings
- Explanation Task



Google-based Virtual MEL Platform

Home Page

This document contains additional
Change pre-constructed MEL diagram
to the left to move to the pages for

[Evidence #1](#): Atmospheric greenhouse
Human activities have led to greater
rising during these past 50 years.

[Evidence #2](#): Solar activity has decreased
received less of the Sun's energy. Earth

[Evidence #3](#): Satellites are measuring
gases.

[Evidence #4](#): Increases and decreases
decreases in solar activity before the

Evidence #1

Atmospheric greenhouse gas concentrations have been rising for the past 50 years. Human activities have led to greater releases of greenhouse gases. Temperatures have also been rising during these past 50 years.

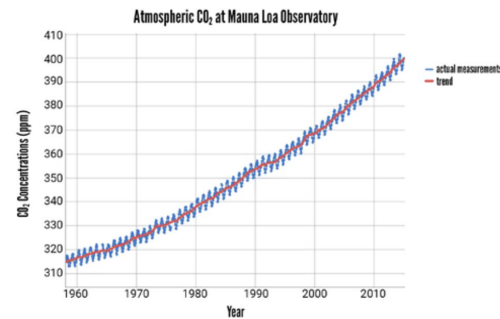


Figure 1. Carbon dioxide levels in the atmosphere. Credit: Wright Senere

The symbol for carbon dioxide is CO₂. These levels have been increasing (Figure 1). CO₂ in the atmosphere absorbs infrared energy emitted by Earth. People call CO₂ a greenhouse gas because it keeps some of Earth's energy from escaping to space.

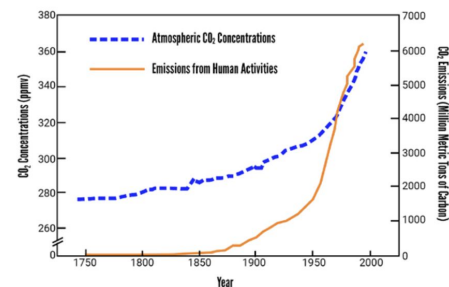


Figure 2. CO₂ released by human activities. Credit: Wright Senere

Google Documents

- Evidence Texts



Google-based Virtual MEL Platform

Types of Arrows

Supports



Strongly Supports



Contradicts



Has nothing to do with



Evidence #1

Atmospheric greenhouse gas concentrations have been rising for the past 50 years. Human activities have led to greater releases of greenhouse gases. Temperatures have also been rising during these past 50 years.

Model A

Climate change is caused by humans who are releasing gases into the atmosphere.

Evidence #3

Satellites are measuring more of Earth's energy being absorbed by greenhouse gases.

Evidence #2

Solar activity has decreased since 1970. Lower activity means that Earth has received less of the Sun's energy. But, Earth's temperature has continued to rise.

Model B

Our current climate change is caused by increasing amounts of energy released from the Sun.

Evidence #4

Increases and decreases in global temperatures closely matched increases and decreases in solar activity before the industrial revolution.

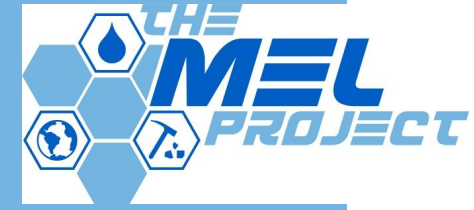
Google Slides

- Model-evidence linking task
- pcMEL & baMEL
- Individual & Group work

Click [here](#) for evidence texts



Model-Evidence Linking for pcMEL



Types of Arrows

Supports



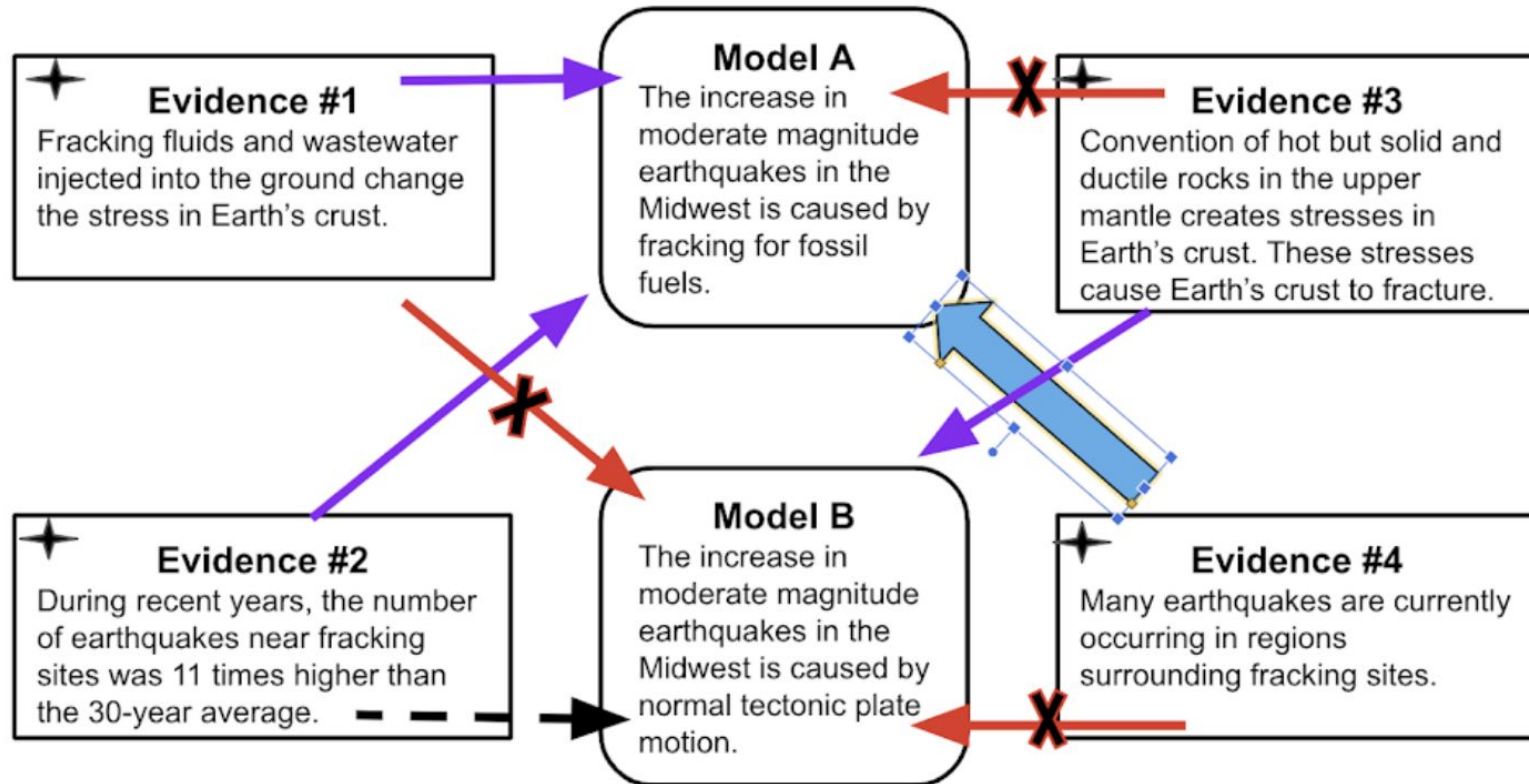
Strongly Supports



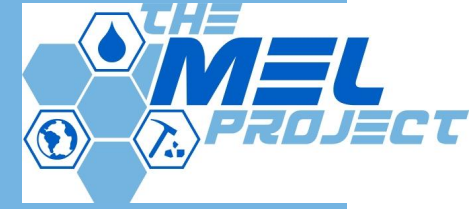
Contradicts



Has nothing to do with



Model-Evidence Linking for baMEL



Scientists expect that the scientific principles we use on and around Earth also work elsewhere in the Universe. Observations of phenomena around the Universe show that this is true.

Models of the Universe predict how much we should see of the lightest elements. Our observations of hydrogen, helium, and other light elements match these predictions.

On average we observe about the same distribution of galaxies in any area of space. We would also make this observation from any other location in space.

Astronomers observe a uniform glow in the background of the sky no matter where we look.

Types of Arrows

Supports



Strongly Supports



Contradicts



Has nothing to do with



Evidence #1

Scientists expect that the scientific principles we use on and around Earth also work elsewhere in the Universe. Observations of phenomena around the Universe show that this is true.

Model A

Space, time, and matter came into existence a finite time ago in a hot dense state. It has been expanding and cooling ever since.

Evidence #2

Models of the Universe predict how much we should see of the lightest elements. Our observations of hydrogen, helium, and other light elements match these predictions.

Evidence #3

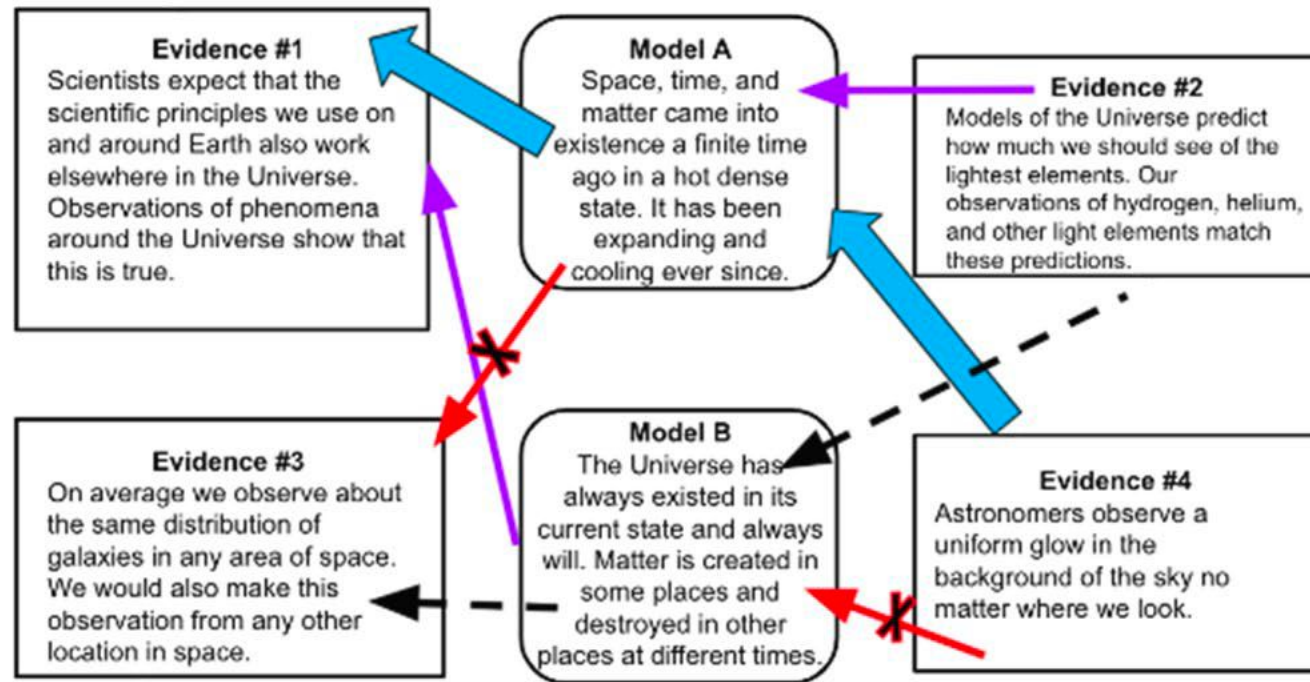
On average we observe about the same distribution of galaxies in any area of space. We would also make this observation from any other location in space.

Model B

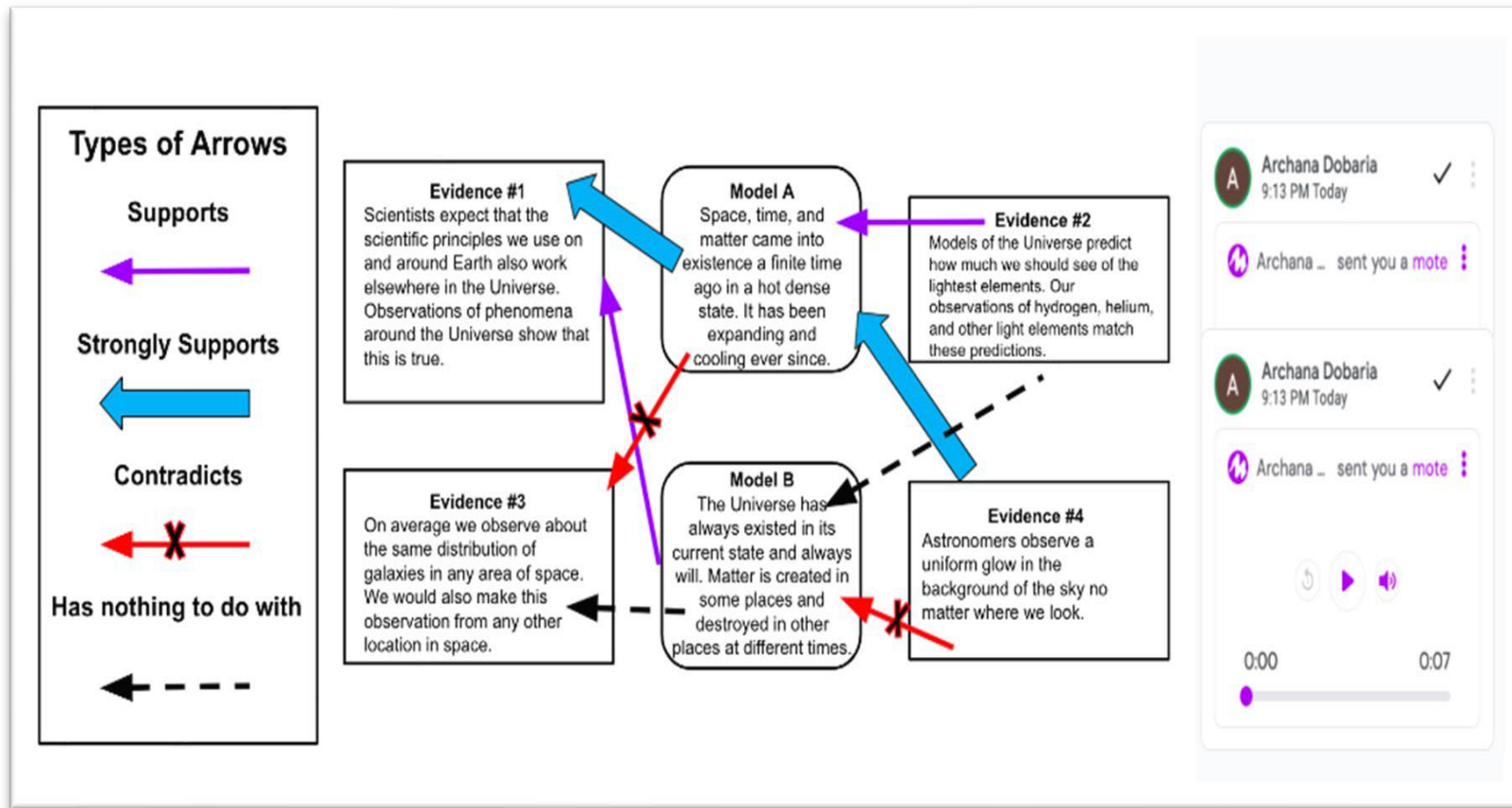
The Universe has always existed in its current state and always will. Matter is created in some places and destroyed in other places at different times.

Evidence #4

Astronomers observe a uniform glow in the background of the sky no matter where we look.



Facilitating Asynchronous Group Work



The use MOTE

Google extension

- Voice comment
- Threaded comment

Access to Public Folder



The Model-Evidence Link
Diagrams Project



Model-Evidence Link Diagrams Project

Model-Evidence Link Diagrams Project

About

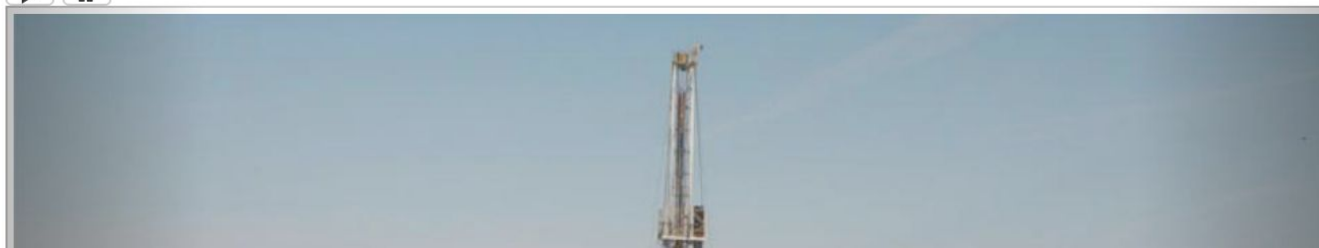
Teaching
Resources

Professional
Development

Model-Evidence Link Diagrams Project

The purpose of our project is to promote students' scientific thinking when confronted with controversial and/or complex Earth and space science topics. We do this by using an instructional scaffold called the model-evidence link (MEL) diagram. We are currently adapting this scaffold to enable students to build their own MEL diagram, which we call the build-a-MEL (baMEL). Topics for MEL and baMEL activities include: climate change, earthquakes and fracking, wetlands use, formation of the moon, extreme weather, fossils and Earth's past, freshwater availability, and origins of the universe.

<https://serc.carleton.edu/mel/index.html>



What's Next?

Plausibility Ranking Task and pcMEL

