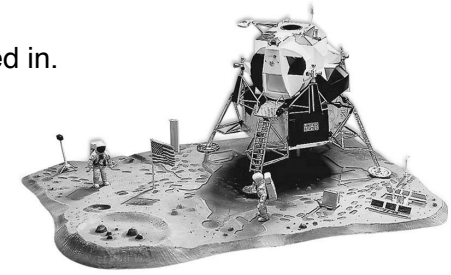
THE UNIVERSE FINAL FREE INQUIRY PROJECT

Big Idea: The formation of the universe can be explained by the Big Bang theory.



Task: to deeply investigate a topic in Astronomy that you are personally interested in.

- ➢ This is an **individual** investigation.

Steps:

1. Choose a <u>Subject</u>. Choose a subject in Astronomy that **<u>interests</u>** you:

Exploring the Solar System

- ➢ *The Sun*
  Formation, Structure, Flares, Sunspots
- ➢ *The Moon*
  Formation, Structure, Surface, Tides
- ➢ *Lagrange Points*
- ➢ *Other Planet-Moons System*
  eg. Mars-Phobos-Deimos
- ➢ *The Solar System*
  Planets: Mercury, Venus, Mars, Jupiter, Saturn, Uranus, Neptune
  Dwarf Planets: Pluto, Ceres, Eris…
  Moons: Europa, Io, Enceladus, Titan…
- ➢ *The Asteroid Belt*
- ➢ *Kuiper Belt*
- ➢ *Oort Cloud*
- ➢ *Comets / Meteors / Asteroids*
- ➢ *Should we invest in planetary protection from impacts?*
- ➢ *Where should we colonize?*
- ➢ *How do astronauts survive long deep space voyages?*

Exploring the Universe

- ➢ *Types of Stars (Giants/Dwarfs)*
- ➢ *Constellations*
- ➢ *Exoplanets (Super-Earths?)*
- ➢ *Supernovas vs Hypernovas*
- ➢ *Types of Galaxies*
- ➢ *Nebulae*
- ➢ *Black Holes*
- ➢ *Quasars / Pulsars*
- ➢ *Worm Holes*
- ➢ *Dark Matter / Dark Energy*
- ➢ ***The Big Bang Theory***
- ➢ *The Expanding Universe*
- ➢ *Heat Death of the Universe*
- ➢ *Big Crunch vs Big Rip*
- ➢ *The Multiverse Hypothesis*
- ➢ *Time Dilation*
- ➢ *What is Gravity?*
- ➢ *Are we alone in the Universe?*
- ➢ *Drake Equation*
- ➢ *Fermi Paradox*
- ➢ *Can we go faster the light speed?*
- ➢ *What was before the Big Bang?*
- ➢ *What is beyond the Universe?*
- ➢ *What is nothing?*

Human Space Exploration

- ➢ *Telescopes:*
  Hubble, James Webb, Spitzer, Kepler, Chandra, Herschel, Arecibo, VLA…
- ➢ *Human Spacecraft:*
  Rockets, Space Shuttle, International Space Station (ISS), Soyuz, Space Launch System (SLS), Orion, Dragon…
- ➢ *Satellites and Probes*
  Sputnik, Voyager, Cassini, New Horizons, Rosetta, Juno…
- ➢ *Moon Landing*
  Apollo 11, Luna, Chang'e…
- ➢ *Mars Rovers*
  Spirit, Opportunity, Curiosity…
- ➢ *Space Exploration Disasters:*
  Apollo 1, Apollo 13, SS Challenger, SS Columbia…
  Private Spacecraft:
  SpaceX, Virgin Galactic, Blue Origin, Orbital Sciences Corp
- ➢ *Future Technologies*
  Space Elevator, Asteroid Mining, Solar Sails, Robots, FTL drives,
- ➢ *Should we invest in space exploration?*

2. Ask an <u>Essential Question</u> that will direct your research:

- A question you do not already know the answer to.
- Is appropriately challenging. Not a simple question. Not a *Yes* or *No* question.
- How…" or "Why…" or "To what extent…" or "What is the relationship between…"

Essential question:

Explain <u>why</u> this essential question is of personal significance to you.

Teacher approval: _____

3. <u>Research</u> your Subject and answer your Driving Question:

Record your findings using proper APA format in a Reference list and in-text citations.

4. Design and Build a <u>Visual Product</u>: that answers your essential question

- Movie – Play – Poster – Model – Presentation – Artwork – Vlog -

Product Type:

Teacher approval: _____

5. Presentation:

You will be sharing your product in a **gallery walk/share** on the last day of classes, **August 2nd.**

6. Self-Assessment.

Below, self-assess your Project and indicate your level. Submit this sheet with your project.

Self	Level	Level descriptor **Criterion A: Knowing and understanding**
	0	The student **does not** reach a standard described by any of the descriptors below.
	1-2	• **state** scientific knowledge • apply scientific knowledge and understanding to **suggest solutions** to problems set in **familiar situations** • **interpret** information to make **judgments**
	3-4	• **outline** scientific knowledge • apply scientific knowledge and understanding to **solve problems** set in **familiar situations** • **interpret** information to make **scientifically supported judgments**
	5-6	• **describe** scientific knowledge • apply scientific knowledge and understanding to **solve problems** set in **familiar situations** and **suggest solutions** to problems set in **unfamiliar situations** • **analyse** information to make **scientifically supported judgments**
	7-8	• **explain** scientific knowledge • apply scientific knowledge and understanding to **solve problems** set in **familiar and unfamiliar situations** • **analyse** and **evaluate** information to make **scientifically supported judgments**

Assessment Rubric:

Explain WHY you gave yourself this level: *(use other paper for more space…)*

Self	Level	Level descriptor **Criterion D: Reflecting on the impacts of science**
	0	The student **does not** reach a standard described by any of the descriptors below.
	1-2	• **outline** the ways in which science is used to address a specific problem or issue • **outline** the implications of using science to solve a specific problem or issue, interacting with a factor • **apply** scientific language to communicate understanding but does so **with limited success** • document sources, with **limited success**
	3-4	• **summarize** the ways in which science is used to address a specific problem or issue • **describe** the implications of using science to solve a specific problem or issue, interacting with a factor • **sometimes apply** scientific language to communicate understanding • **sometimes** document sources correctly

	5-6	• **describe** the ways in which science is used to address a specific problem or issue • **discuss** the implications of using science to solve a specific problem or issue, interacting with a factor • **usually apply** scientific language to communicate understanding **clearly and precisely** • **usually** document sources correctly
	7-8	• **explain** the ways in which science is used to address a specific problem or issue • **discuss and evaluate** the implications of using science to solve a specific problem or issue, interacting with a factor • **consistently apply** scientific language to communicate understanding **clearly and precisely** • document sources **completely**

Explain WHY you gave yourself this level: