

To Infinity and Beyond Assessment

For To Infinity and Beyond, we looked at space science through storytelling and how society and technology can impact scientific progress resulting in science ideas changing over time.

Step 1: You will select a story from the choices below and one of its listed science ideas to research to see how that idea has changed over time. Do this by highlighting your selected story.

Story Choices & Their Science Ideas

			
<u>The Story of Speculoos-3b (Article)</u>	<u>The Martian (Movie)</u>	Hidden Figures (<u>Movie</u> & <u>Picture Book</u>)	<u>Interstellar (Movie)</u>
Science Idea: There are many different types of stars which differ in size and temperature.	Science Idea: How will humans survive on Mars?	Science Idea: Humans can safely orbit around the Earth.	Science Idea: How will humans do interstellar space travel? (aka travel beyond our solar system.)
Stars begin life as a stellar nebula, which is a clump of dust and gas and over hundreds of thousands of years, gravity pulls this matter inward, causing it to spin and heat up. Once the core is millions of degrees, nuclear fusion starts,	Mars is one of the two closest planets to Earth so it makes sense that it will be the first planet that humans will travel to. However, that is not without its challenges. Although Mars might have	Although we now know that humans can safely survive space, back in the 1950s and 1960s we had no idea if humans could survive gravitational forces of take off and reentry and microgravity. So it was a really scary thing to send	If humans don't make this planet uninhabitable by using all its resources, our sun will eventually run out of hydrogen to burn and begin to die. Humans will need to leave this planet for our long term survival. However, even though

which is when two hydrogen atoms (atomic number 1) fuse together to form helium (atomic number 2). This fusion releases a lot of energy, resulting in the formation of a star. Stars make up 90% of the objects in the universe and if planets orbit the star, it is also a sun. Stars are classified by size, brightness, and temperature. Stars will eventually use up their fuel, which is hydrogen. As it does this, it will go through its life cycle. When the star starts to die, it expands, cools, and changes colours. Depending on the size of the star, it will either form a planetary nebula or go supernova, which is a violent explosion. A star that supernovas can either become a neutron star or black hole.	supported life in the past, it currently is barren (lifeless). Mars currently has less than 1% atmospheric pressure than Earth because the lack of a magnetic field, meant that solar storms could strip away the atmosphere. Of the remaining atmosphere, it is 96% carbon dioxide with only trace amounts of oxygen and water, two things humans need to survive. There is water elsewhere on the planet, but it is all frozen. Although Martian soil does have some necessary elements for plant life, it tends to be rocky and lacks organic matter, which is the building blocks for plants to grow. Humans will need a lot of artificial support in order to survive on Mars to study it.	humans into space for the first time. The Russians were the first to send a man into space, Yuri Gagarin, who managed to orbit (go around the Earth) before returning. At the same time, the Americans were able to send a man into space, but were not able to complete an orbit. Getting an object or human to orbit space is challenging because enough force is needed to escape Earth's gravity, but not too much that it continues into space. The other challenge of sending something into orbit is getting it to return to Earth because it needs to be slowed down at the right time and amount to re-enter Earth instead of going into outer space.	some planets (Mars) and moons (Europa and Enceladus) might have the possibility of life, it doesn't have conditions that can support human life. So for humans to survive, humans will need to leave our solar system. Interstellar space travel is challenging because the distance that we need to travel would easily outspan an individual's lifespan. For example, our first man-made object that left our solar system to explore interstellar space was launched in 1977 and only reached interstellar space in 2012. That's 35 years! For interstellar human space travel to be possible, we will need to be able to travel faster, have nuclear fusion propulsion or antimatter, and will likely need some type of cryogenic sleep (low-temperature freezing of humans) and/or wormholes (a tunnel between two points in space-time, basically acting as a shortcut).
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Step 2: Watch or read the story you selected.

Step 3: Identify from the list below, which common features have influenced the development of your science idea. Highlight the ones that you think are present in your story.

Observing new patterns and/or interactions	Linking new evidence to existing models, theories, and/or ideas to strengthen understanding	Changing of scientific ideas in response to new evidence	Development of new science ideas in response to different perspectives	Competition
Societal and cultural factors	Development of new technology	Response to human needs	Collaboration	Curiosity

Step 4: Explain why the presence of **at least 2 features** was significant in the development of the science idea. Use evidence from the story to support each feature. You may add extra rows if you want to discuss more features. If you are doing extra rows, you can also identify features that are absent, just change the colour of the row to yellow.

In the box below, copy the feature you will be writing about.	In the box below, provide the evidence in the story that shows the feature.	In the box below, link how that influenced the development of that science idea.

Step 5: In the box below, discuss how **at least two features** interacted to contribute to the development of the science idea.

Extra space if needed for Step 4 or 5.