Exploring Earth's Sustainability and the Quest for a New Home: A Science Adventure for 14-Year-Olds

Introduction (5 minutes)

Welcome to this exciting science adventure! In this worksheet, we will explore the factors that make Earth habitable and the search for exoplanets that could potentially sustain life. Read the introduction and answer the following questions:

1. What do you think makes Earth a unique planet?

2. Why is it important to search for exoplanets?

Earth's Unique Features (15 minutes)

Earth is a unique planet that supports a diverse range of life forms. What makes our planet so special? Read about Earth's unique features and answer the following questions:

1. What is the Goldilocks zone, and why is it important for life to exist?

2. What is the perfect balance of gases in Earth's atmosphere?

3. Why is water essential for life as we know it?

The Search for Exoplanets (20 minutes)

The search for exoplanets is an ongoing and rapidly evolving field. Scientists use a variety of methods to detect exoplanets. Read about the different methods and answer the following questions:

1. What is the transit method, and how does it work?
2. What is the radial velocity method, and how does it work?
3. What is direct imaging, and how does it work?

Case Study: Kepler-452b (15 minutes)

Kepler-452b is an exoplanet that is often referred to as "Earth's older cousin." Read about Kepler-452b and answer the following questions:

1. What are the similarities between Kepler-452b and Earth?
2. What are the differences between Kepler-452b and Earth?

Design an Exoplanet (25 minutes)

Now it's your turn to design an exoplanet! Consider the factors that make Earth habitable and think about what features your exoplanet would need to support life. Use the following questions to guide your design:

1. What type of star would your exoplanet orbit?
2. What would be the atmosphere like on your exoplanet?
3. How would your exoplanet's distance from its star affect its temperature?

Conclusion and Reflection (10 minutes)

Individual Reflection:

1. What do you think is the most important factor in making a planet habitable?
2. Do you think humans will ever find an exoplanet that is identical to Earth?

Activities and Questions (20 minutes)

Answer the following questions and complete the activities:

1. What is the Goldilocks zone, and why is it important for life to exist?
2. How do scientists detect exoplanets, and what are the most promising methods?
3. What are the necessary conditions for life to exist on an exoplanet?

Design an Exoplanet (25 minutes)

Design an exoplanet that could potentially sustain life. Consider the factors that make Earth habitable and think about what features your exoplanet would need to support life.

[Space for design]

Glossary (10 minutes)

Read the glossary and answer the following questions:

1. What is an exoplanet?
2. What is habitability?
3. What is the Goldilocks zone?

Resources (10 minutes)

Explore the following resources and answer the following questions:

1. What is the National Geographic's Interactive Exoplanet Guide?
2. What is NASA's Climate Change Website?

3. What is the Kepler Space Telescope Dataset?

Assessment and Evaluation (20 minutes)

Complete the following assessment and evaluation activities:

1. Complete the activities and questions throughout the worksheet.
2. Design an exoplanet that could potentially sustain life.
3. Write a short story about a human colony on an exoplanet.

Short Story (25 minutes)

Write a short story about a human colony on an exoplanet. What challenges would the colonists face, and how would they overcome them?

[Space for short story]