

# Understanding by Design

## Desired Results

### Established Goals:

Earth is a very unique planet that has many factors that contribute to life. Based on our current technology, humans are unable to create the factors for life on other planets or visit possible planets outside of our solar system. Students should understand their learning styles and self assess their work.

### Enduring Understandings:

The planet's structure, composition, and position from the Sun gives key insights to what makes a planet hospitable or inhospitable.

### Essential Questions:

Why are the terrestrial planets composed primarily of rock compared to the gaseous outer planets?

Which, if any, of the terrestrial planets experience tectonic/geological activity? Why or why not?

Compare and contrast the atmospheric conditions of the four terrestrial planets.

What is the purpose of a planetary magnetosphere and which terrestrial planets possess one? Why or why not?

Which of the terrestrial planets have moons? Why or why not?

How do the following mechanisms allow Earth to harbor life: natural satellite, magnetic field, gravity, stratosphere, and photosynthesis.

Being good stewards of the planet is important.

Consider what has happened to Venus and what that means for the Earth's future if we do not control carbon dioxide.

Technology needs to be improved, as the human race depends upon it for more than for daily living.

With our current technology, are humans capable of terraforming any planet in our solar system?

Can we find another solar system to live in based on our current technology?

What system will inevitably fail and require humans to leave Earth.

**Students will know...**

The student knows that planets of different size, composition, and surface features orbit around the Sun. The student is expected to: compare and contrast the factors essential to life on Earth such as temperature, water, mass, and gasses to conditions on other planets; compare the planets in terms of orbit, size, composition, rotation, atmosphere, natural satellites, and geological activity; relate the role of Newton's law of universal gravitation to the motion of the planets around the Sun and to the motion of natural and artificial satellites around the planets; and explore the origins and significance of small solar system bodies, including asteroids, comets, and Kuiper belt objects.

**Students will be able to...**

Students will be able to describe how Earth's atmosphere changed from carbon dioxide rich to oxygen rich and how that differs from all other terrestrial planets.

Students will create a comparison chart regarding size, surface, composition, and atmosphere of the terrestrial planets.

Students will use the Goldilocks Zone equations to determine the habitable zone of our solar system.

Students will create a display of how earth harbors life through descriptions of each of the following mechanisms: a natural satellite, magnetic field, gravity, stratosphere, and photosynthesis.

Students will work in groups on understanding one conservation effort/program and share their findings with other groups in the class.

**Assessment Evidence:**  
Teacher and School Driven  
How will we know if students have learned?

<u>Formative Assessments:</u>	<u>Summative</u>
<p>Note organizer to gather details regarding each of the four planets.</p> <p>Venn diagram to pull out important details to assist with blog posts over terrestrial planet environments.</p> <p>Organizational chart for planets based on order, size, and distance from the Sun.</p>	<p><b>Summary in GRASPS form</b></p> <p>Students will create a display of how Earth harbors life through descriptions of one of the following mechanisms: a natural satellite, magnetic field, gravity, stratosphere, and photosynthesis.</p> <p><b>Goal(s):</b> The goal is to understand the mechanisms responsible for life on any planet.  <b>Role:</b> Your job is to research, gather, and disseminate information in a concise, easy to read manner, with a visual representation.  <b>Audience:</b> The target audience is your fellow classmates and teacher.  <b>Situation:</b> You will select one partner and will be given a mechanism that allows for life on Earth.  <b>Performance:</b> You and your partner will create a display that illustrates how your given mechanisms are responsible for aiding in the environment that allows for life on Earth.  <b>Standards:</b> The criteria for success will be measured by a rubric with a component requiring a presentation.</p>
<p><b>Key Criteria</b> to reflect performance task</p> <p>Mechanism For Life Rubric</p>	<p><b>Other Evidence (essay, work sample)</b></p> <p>Create a blog post regarding the environmental drawbacks/benefits of each terrestrial planet.</p> <p>Create a blog post using an infographic that represents the habitable zone.</p>

## **Learning Plan Activities:**

(Teacher Driven)

How will students engage in learning?

Consider the **WHERE TO** elements  
These questions are/can be directed as....  
What the teacher and/or the student do in regards to the **WHERE TO**.

**What are the students learning?** At the start of the unit, the teacher will go over the learning objectives for the whole unit. These will be posted on the wall, so the students will be constantly reminded of what they need to learn. The rubric for the end project will also be in large print for the students to see.

**How will I get their attention?** Start with a video illustrating the death of the Sun.

<https://cdn.jwplayer.com/previews/s66xZGHP>

Have students work in teams of three to come up with ways to save our planet or leave.

**Equip students to understand the content requires prior knowledge to be successfully obtained.** Students must understand how gravity, and magnetism works. Students should have the opportunity to refresh these skills through an interactive Phet lab.

<https://phet.colorado.edu/en/simulations/gravity-and-orbits>

**Revise or plan for the problems.** After years of teaching this unit many students mistakenly think all sources of information are valid and that they have the expertise to understand how cosmology, astrophysics, astrochemistry, or planetary geology works. The concept of reliable sources are not taught at the beginning of the year and by this unit most students understand the difference. However, when students try to understand if terraforming would be possible, they seem to forget aspects that make a valid source. To assist them I require the students to first list the company and write of the article and **vet** them as a source. This has been a successful way to ensure the students use valid scientific sources.

**Evaluate and reflect on their learning.** After each project the students complete a self-reflection.

## **Resources**

Vocabulary:

<https://quizlet.com/760241208/planet-key-words-inner-flash-cards/>

## **Mercury Resources:**

<https://www.britannica.com/place/Mercury-planet/Basic-astronomical-data>

<https://luna1.diviner.ucla.edu/~jpierre/mercury/posters.html>

Mercury Overview with 3D modeling:

<https://www.skymarvels.com/infopages/mercuryinfo.htm>

Nasa Summary:

<https://solarsystem.nasa.gov/solar-system/our-solar-system/overview/>

Nasa Kids Summary:

<https://spaceplace.nasa.gov/all-about-mercury/en>

Crash Course Astronomy - Mercury

<https://youtu.be/P3GkZe3nRQ0>

## **Venus Resources:**

Summary Venus:

<https://www.britannica.com/place/Venus-planet>

Venus Overview with 3D modeling:

<https://www.skymarvels.com/infopages/venusinfo.htm>

Nasa Summary:

<https://solarsystem.nasa.gov/planets/venus/overview/>

Nasa Kids Summary:

<https://spaceplace.nasa.gov/all-about-venus/en/>

Crash Course Astronomy - Venus

Tailor learning will be accomplished using the individual students IEP. The students will have the freedom to select their learning materials using blended learning as their mechanism for learning.

Organize the sequence of learning? Students will need to be guided through questions to build up to the final understanding of what is needed for learners to determine the requirements for life.

<https://youtu.be/ZFUgy3crCYY>

### **Earth Resources:**

Summary Earth:

<https://www.britannica.com/summary/Earth>

[Links to an external site.](#)

Earth Overview with 3D modeling:

<https://www.skymarvels.com/infopages/earthinfo.htm>

[Links to an external site.](#)

Nasa Summary:

<https://solarsystem.nasa.gov/planets/earth/overview/>

Nasa Kids Summary:

<https://spaceplace.nasa.gov/all-about-earth/en/>

Kids:

[https://astronomy.com/observing/astro-for-kids/2008/03/earth#:~:text=Earth%20is%20the%20third%20planet.on%20its%20axis%20one%20time.&text=Size%3A%20Earth%20has%20a%20diameter,\(150%20million%20km\)%20away](https://astronomy.com/observing/astro-for-kids/2008/03/earth#:~:text=Earth%20is%20the%20third%20planet.on%20its%20axis%20one%20time.&text=Size%3A%20Earth%20has%20a%20diameter,(150%20million%20km)%20away)

Crash Course Astronomy - Earth

<https://youtu.be/w-9gDALvMF4>

### **Mars Resources:**

Summary Mars:

<https://www.britannica.com/place/Mars-planet>

Mars Overview with 3D modeling:

<https://www.skymarvels.com/infopages/marsinfo.htm>

Nasa Summary:

<https://solarsystem.nasa.gov/planets/mars/overview/>

Nasa Kids Summary:

<https://spaceplace.nasa.gov/all-about-mars/en/>

Crash Course Astronomy - Mars

<https://youtu.be/l-88YWx71gE>

## Reflection

Were the lessons successful? TBD upon implementation

How do you know?

If the student can tell me the factors required for life and why these are difficult to find in the solar system then I have succeeded in the main objective.

What would you do differently next time? TBD upon implementation

Intervention (What will we do if students don't learn it?)

One on one session either in class or tutorials. The goal is to complete this in class. Build in time during the unit to allow for one on one contact with students that are struggling during standard class time.

Have a trusted student mentor them on the concept. If the student is struggling and the teacher has set aside for help is insufficient then set up scaffolding to ensure the student receives more support.

Get parents involved with support not punishment. Never wait till the student is failing to add the parents into the loop. Be proactive and make the parents aware right away their child is struggling on a concept.

Set an expectation that completion of work is required. I have always set the expectation that work is required and that a minimum of a 70 is also required for the assignment to be submitted successfully. I will not take work that is not finished or lacks the required effort.

Enrichment (What will we do if students don't learn it?)

Assess their learning style. The students may require to be taught in a different way. A teacher should not limit the student to just one of the four learning styles.

Allow for choice in how they learn the material. Give them options on what to learn and when. Let the student know the required objectives to prove they have learned the content, but do not strangle their learning with rigid learning materials.

Be patient and consistent - encourage the system of "Not Yet" (Dewek 2016). Some students need more time and need to know that failing is learning and should not be feared.