IXL Science

Engineering Practices: Space Travel Lesson Plan

Grade 6, 7, or 8

Objective

Students will develop an engineering process plan to determine if humans can safely travel to and from one of the seven planets discovered in February 2017.

Standards

NGSS:

MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

Suggested resources

IXL skills

Skill Name	6th Grade	7th Grade	8th Grade
Engineering Practices: Going to the Moon!	Q.2	P.2	P.2

Sites, videos, and texts for students to explore:

- NASA press release: https://www.nasa.gov/press-release/nasa-telescope-reveals-largest-batch-of-earth-size-habitable-zone-planets-around
- NASA multimedia gallery: https://exoplanets.nasa.gov/trappist1/
- Interactive planet classification: https://www.planethunters.org/
- Habitable planet board game: http://www.lpi.usra.edu/education/explore/our_place/activity_glance.shtml
- New exoplanets discovery video: https://www.youtube.com/watch?v=bnKFaAS30X8&feature=youtu.be

What you'll need

- Access to laptops, tablets, and/or desktops for students' use
- Engineering-design process graphic organizer
- Engineering-design process vocabulary sheet
- Engineering-design process reflection sheet

Instructional Plan

ANTICIPATORY SET

1. Project the new exoplanets discovery video for lesson introduction. Have students discuss what they believe is shown in the video with a partner or small group. Then, give students the chance to share their thoughts with the entire class.

2. Brainstorm with students the possible requirements for humans to safely travel to and from one of the new planets. Write their ideas on the board. To expand upon this brainstorm, have students classify their ideas as constraints, problems, criteria, or tests.

3. Draw or project the engineering-design process vocabulary sheet on the board. Have students give vocabulary definitions in their own words and provide an example from their own experience that connects to each definition. For example:

Constraint: *something that makes solving a problem difficult*

Example from my experience: *I wanted to ride the roller coaster but didn't meet its height requirement.*

Then, have students fill in the actual definition of each word.

TEACHING STRATEGY

- Whole-group instruction: Read the press release to students or provide individual or shared copies for students to read independently.

- Small group, differentiated instruction: Create small groups based on students' reading levels and assign an appropriate section of the press release to each group.

1. With particular emphasis on how the exoplanets are or are not habitable, students will read the nonfiction text, while making any needed adjustments to their engineering-design process vocabulary sheets.

2. After reading, students will use their engineering-design process vocabulary sheets as a reference to complete the top portion of the engineering-design graphic organizers. There, they will complete steps of the engineering-design process, as well as explain the meaning of the lines that connect the steps within the process. Collect students' engineering-design process graphic organizers and review their responses.

CLOSING/SUMMARY

Option 1: Students can practice the seventh grade IXL skill P.2, Engineering practices: Going to the Moon! with a practice goal of completing stages one and two. For additional support, direct students to the sixth grade skill Q.2, Engineering practices: Going to the Moon! Review students' progress in the Skill Diagnostics report within IXL Analytics.

Option 2: In small groups, students can complete the engineering-design process reflection sheet, creating their own plan for a human to safely travel to and from one of the seven newly discovered planets. Collect students' engineering-design process reflection sheets and review their responses.

OPTIONAL HOMEWORK

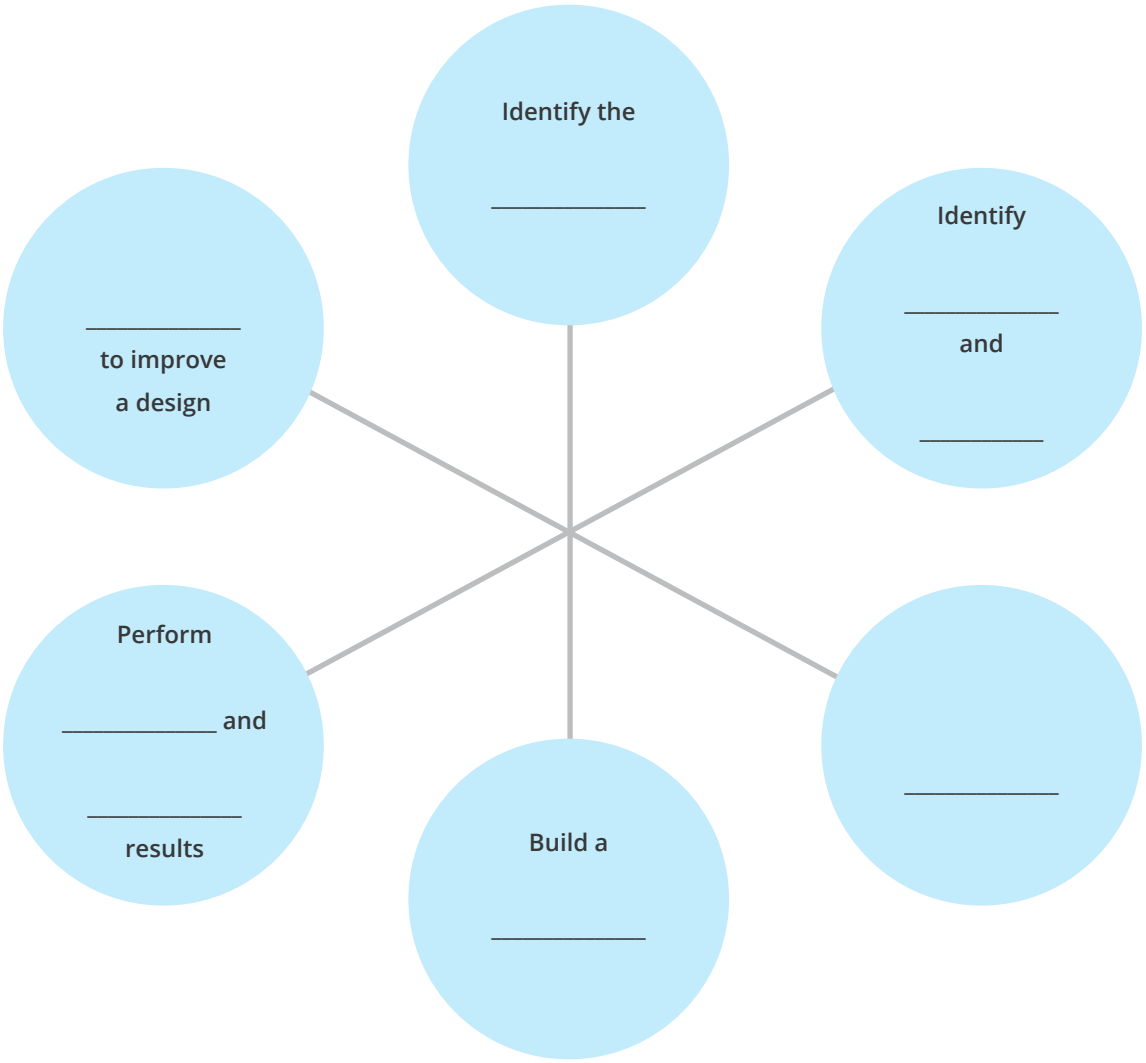
Option 1: Students can practice the seventh grade IXL skill P.2, Engineering practices: Going to the Moon! with a practice goal of completing stages three and four. For additional support, direct students to the sixth grade skill Q.2, or for those needing enrichment, the eighth grade IXL skill P.2, both entitled Engineering practices: Going to the Moon!

Option 2: By visiting https://www.planethunters.org/, students can help discover new exoplanets using visual classification techniques. There, they will find a short tutorial that involves visualizing how the brightness of a star changes over time.

NAME: _____ DATE: _____

Engineering-Design Process Graphic Organizer

1. Fill in the blanks to complete the steps within the engineering-design process model.



2. In this model, lines connect each step to every other step in the process. What do these lines represent?

_____

_____

_____

NAME: _____ DATE: _____

Engineering-Design Process Vocabulary Sheet

For each vocabulary word listed, write out the definition in your own words. Then, give an example of the definition using an experience from your own life. Finally, write out the actual definition of the word.

1. CRITERIA:

Example from my experience:

Actual definition:

2. CONSTRAINT:

Example from my experience:

Actual definition:

3. EVALUATE:

Example from my experience:

Actual definition:

4. OPTIMIZE:

Example from my experience:

Actual definition:

5. PROTOTYPE:

Example from my experience:

Actual definition:

NAME: _____ DATE: _____

Engineering-Design Process Reflection Sheet

In a small group, develop an engineering-process plan for a human to safely travel to and from one of the seven newly-discovered exoplanets. Fill in every section of the plan below.

What is the problem you will attempt to solve?

Brainstorm what you will need to make this plan a reality. What criteria and possible constraints should you include?

Describe the prototype you will build for travel.

What tests will you perform to evaluate the success of your plan?

How will you optimize your plan for implementation?

Give your plan a name: