Comparing the Earth to an Exoplanet

Grade: 6-8

Subject Integrated: Science

Rationale:
In this lesson, students will compare Earth to one of the many exoplanets found by the Kepler spacecraft.

Objectives:
Students will be able to compare Earth’s characteristics to those of a specific exoplanet.

Materials:
- Computer
- Google Slides
- Notebooks
- Pencils
- Whiteboard
- Worksheet (Appendix 2)

Learning Activities:

a) Instructional Materials and Resources
- [https://www.nasa.gov/kepler/discoveries](https://www.nasa.gov/kepler/discoveries)

b) Procedure
- Teacher asks the class if they have heard of any exoplanets and what they are.
- Teacher will write what the students have heard of on the board.
- Teacher should have previous knowledge on Kepler exoplanets, their characteristics, and how they are similar to and different from Earth (research websites beforehand).
- Students are given time to turn to a neighbor and talk about exoplanets.
- Teacher will re-ask the questions about exoplanets.
- Students will be given an opportunity to research on chromebooks or computers to see what they can discover.
- After 15 minutes of researching, students are to choose a specific exoplanet to research.
- To limit competition and encourage a breadth of learning, students should not choose the same exoplanet unless they are working collaboratively.
Students are responsible for researching what is known (or estimated) about the mass, location, host star, constellation, distance, temperature, orbit of the exoplanet.

Once information is found and recorded, students are to create a class combined Google Slide for each for each of the exoplanets researched to use to learn about each one.

**OPTIONAL EXTENSIONS:**
- Students might discuss how we would plan for a trip to visit one of these exoplanets.
- Learners might write about a mission to explore one of their exoplanets.
- The class could create a skit about visiting exoplanets and perform it for younger students.
- The class could have a costume party, dressing up as exoplanet residents and banqueting on brainstormed exoplanet foods.

c) **Instructional Groups**
- Lesson will be taught to the class as a whole.
- One Google Slide per planet, per student or small group.

d) **Discussion**
- What is an exoplanet?
- What is the Kepler spacecraft?
- What is a habitable zone?
- What can we compare and contrast between Earth and your selected exoplanet?

e) **Assessment**
- Summative assessment will be used.
- Teacher will guide students to resources and/or plausible answers if they are having trouble.
- Teacher will take notes on students with trouble with the skills for further assistance.
- The teacher will assess the students’ based on their completion of the assignment and participation in the discussion.
- Optional: Rubrics can be made to score the completion of the requirements on the Google Slide as summative assessment.

**Closure:**
a) **Ending the Lesson**
- Google slide presentation can be presented slide by slide.
- Google slide can be posted on class webpage for study purposes.
b) Evaluating and Reflection of the Lesson
   ● Evaluation of lesson will be done by thorough summative assessment.
   ● Teacher will observe to make sure each student understands the concept introduced in the lesson.
   ● Teacher will make sure all requirements and guidelines are met by giving specific instructions to students who struggle with the skills.
   ● Teacher will self-critique on what worked well and what did not work well in the lesson.
   ● Optional: Rubrics can be used for evaluation of oral presentation.

Standards:
   ● NGSS: MS-ESS2-2. (supportive fit) Construct an explanation based on evidence for how geoscience processes have changed Earth’s surface at varying time and spatial scales.

Teacher References:
   ● Dr. Nicolle Zellner (nzellner@albion.edu)
   ● Dr. Melissa Mercer-Tachick (melissa@museconsulting.info)
   ● https://www.nasa.gov/kepler/discoveries: This is a website about how many exoplanets Kepler has discovered.
   ● http://kepler.nasa.gov/: This is a website about the Kepler spacecraft.
   ● http://www.nasa.gov/ames/kepler/nasa-keplers-hall-of-fame-small-habitable-zone-exoplanets: This is a website about small exoplanets in their star’s habitable zone.
   ● http://exoplanetarchive.ipac.caltech.edu/: This is a website with an exoplanet archive.
   ● http://kepler.nasa.gov/Mission/discoveries/candidates/: This is a website with exoplanet candidates found by the Kepler spacecraft.