Driving Question
How would you design a rover for exploring Pluto?

Grade group
Kindergarten (Challenge can be adjusted for other grades)

Safety Considerations
Various household materials may be used. Parent discretion is advised when using glue, scissors, and other potentially dangerous tools or materials.

Materials
This project will require students to be creative with any recycled household materials like cardboard, paper, toilet paper tubes, yogurt cups, etc. Tape, glue, and scissors may be needed.

Lesson Standard:
AZ Science Standards
Kindergarten - Design and Evaluate a tool that helps people extend their senses.

NGSS
Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved by the development of a new or improved tool.

Vocabulary:
Rover - A spacecraft that can be driven around on the surface of a planet.
Instruments - Tools that scientists use to know more about the things around them.

Lesson Objective:
Students will be able to build a model of their rover using recycled household items and explain what each instrument on the rover does.

Instructions:
For this Science Challenge you will build a rover that would be able to explore the icy landscape of Pluto. Pluto is very cold because there is no atmosphere and it is very far away from the Sun. It is so cold on Pluto that water ice is not the only ice on the surface. Pluto has nitrogen ice, carbon monoxide ice, and methane ice just to name a few. In fact, the air you are breathing on Earth would freeze into a snow on Pluto. One big question scientists have is, “What makes Pluto’s surface change over time?” Pluto is so small and cold that scientists were surprised to find that Pluto had “new” surfaces without craters. Perhaps you can design a rover that would find out the answer to this question.
Science Challenge

Schedule:

March 25th: The Science Challenge: Roving on Pluto begins!

March 26th - 27th: Show off your drawings and plans.

March 28th - 30th: Building your rover. Show off your work in progress.

March 31st - April 1st: Submit a picture or video of your final project to our Facebook or email threads.

Step 1: 
Gather items from around the house that you might use to build your rover. Be sure to ask for permission when using tools or items that can be sharp or dangerous.

Step 2: 
Now that you have a collection of items. Get a piece of scratch paper and draw up a plan of what your rover will look like. Engineers always have a plan or drawing before they start building. Why do you think it is better to draw up a plan before doing a project? Feel free to submit your drawing and plan as a picture to our Science Challenge thread on Facebook or you can email it to sciencechallenge@lowell.edu. We would love to comment on your drawings and see what ideas you have.

Questions to think about as you draw up your plan:
1) How is your rover going to land without a parachute? (No atmosphere)
2) How will it move around the ice?
3) What experiments will it do? (What questions do you want to answer about Pluto?)
4) How will it do those experiments? (What special instruments will you come up with?)
5) How big or small will it be? (Models can be small but represent something big)
6) Can you label measurements you made with a ruler?

Step 3: 
Begin building your rover. Now that you have an AWESOME plan for your rover, you will need to put it together like it looks on your plan. If you decide to change the way your rover looks, that is okay! Scientists and engineers change their ideas too. Just remember to make the changes to your drawing. Keep building and remember to take breaks once in a while. It takes engineers and scientists time to get their designs done too. Don’t forget to add an instrument (tool) that will help you answer a question about Pluto.
Feel free to submit your works in progress to our Facebook thread or at sciencechallenge@lowell.edu.

Step 4:
You should now have a finished product! Time to present your work on Facebook or via email. We will highlight a few from various age groups on our next Facebook live event. Congratulations! You completed the Science Challenge: Roving on Pluto!

Resources:

NASA information about Pluto:
https://solarsystem.nasa.gov/planets/dwarf-planets/pluto/in-depth/

Example of a rover design built with recycled materials.

Taking it Further!

Pluto’s gravity is 1/12 that of Earth’s gravity. Once you have your model rover planned out, can you predict how heavy it would be on Earth using things around you. For example, if my rover was the size of a remote controlled car, maybe it would only weigh 5-10 pounds. If my rover was the size of a small car, maybe it would weigh close to 2,000 pounds.

1) What would your rover weigh if it were real?
2) What would it weigh on Pluto?

Hint: Pluto’s gravity is 1/12 that of Earth’s gravity. That fraction is a ratio! Contact us for more hints, or help working through the problem.