



Charting the Progress of New Horizons

Elementary grades

Lesson Summary

Students learn about the long distances and timescales involved in space travel by measuring distances on a scale map of the solar system and tracking the progress of New Horizons (once it has been launched.)

Prior Knowledge & Skills

- Measuring with a ruler
- Understanding scale maps

AAAS Science Benchmarks

The Physical Setting

The Universe

Common Themes

Scale

NSES Science Standards

- **Earth and space science:** Objects in the sky
- **Science and technology:** Abilities of technological design

NCTM Mathematics Standards

- **Measurement:** Recognize and understand attributes such as length and select the appropriate type of unit for measuring each attribute, Understand how to measure using standard units
- **Number and operations:** Multiply and divide numbers, Understand commonly used fractions
- **Problem Solving:** Solve problems that arise in mathematics and other contexts

Teaching Time: One 45-minute period, with periodic (monthly) follow-up

Materials

To share with the whole class:

- Access to computer with internet connections
- New Horizons growth chart poster

Each student will need:

- Ruler with cm divisions
- Pencil
- Student Activity Sheet

Advanced Planning

Preparation Time: 30 minutes

1. Copy Student Activity Sheet
2. Check the New Horizons web site to see if the spacecraft has launched and how far along it is in its journey
3. Print growth chart poster
4. Review lesson plan

Science context

Even though New Horizons is one of the fastest spacecraft ever to travel to another planet, its journey to Pluto will still take at least 9 ½ years! Why? At its *closest*, Pluto is 2.7 billion miles from the Earth, and New Horizons doesn't take a straight path to the planet. So even at speeds up to 50,000 miles per hour, New Horizons has a long trip ahead!

*Source: NASA's New Horizons Program
Education and Public Outreach*

NEW HORIZONS



TO PLUTO AND BEYOND

<http://pluto.jhuapl.edu>



CHARTING THE PROGRESS OF NEW HORIZONS

Level

Grades 2 – 5

Learning Goals

Understanding the long distances and timescales involved in space travel.

National Science Education Standards

Standard D: Objects in the Sky

Standard E: Abilities of Technological Design

National Council of Teachers of Mathematics Standards

Measurement: Recognize and understand attributes as length and select the appropriate type of unit for measuring each attribute; understand how to measure using standard units

Number and Operations: Multiply and divide numbers; understand commonly used fractions

Problem Solving: Solve problems that arise in mathematics and other contexts

Materials per class

Access to computer(s) with internet connection

New Horizons growth chart poster (one per group of students)

Materials per student

Ruler with cm divisions

Pencil

Student Activity Sheet

Teacher Overview

1. Students will track the progress of the New Horizons spacecraft. They will access the New Horizons website to discover the distance of the spacecraft from the Sun, then convert the true distance to the scaled-down distance represented on the New Horizons poster
2. The scale used on the poster is 2 centimeters = 1 Astronomical Unit (AU). One AU is defined as the distance from the Sun to the Earth.
3. Students will calculate the approximate distances of the planets from the Sun using the poster and enter their data into a table.
4. The New Horizons website, <http://pluto.jhuapl.edu>, provides the current distance of the spacecraft from the Sun. If you have classroom access to the internet, students can look up the distance themselves, and if you do not have access to the internet in your classroom, just print out the screen showing the distance in advance.
5. Students must convert the distance of the spacecraft from the Sun in AU to a distance in cm according to the scale on the poster. Students will then paperclip the small picture of the New Horizons spacecraft (found on the bottom left corner of the poster) at the appropriate distance. Make sure they use the scale located on the right side of the poster.
6. After students have clipped the picture of the NH spacecraft to its current location on the poster, encourage them to periodically check the website and advance the spacecraft on the poster. You might assign this activity as a fun homework activity to do with parents/guardians periodically and at the end of the school year. No need to check more often than every month!
7. To wrap up the activity have a discussion with your class asking them about their impressions of the New Horizons mission and what challenges engineers and scientists faced when designing and building it. Some questions that might help spark a discussion are:

Q: We found out that New Horizons is going to travel a really long distance, and also a really long time. What do you think will be important to the spacecraft to accomplish its mission?

A: Here are a few, but you'll find many more... Insulation from the cold, Computer systems that last a long time, Ability to communicate with Earth (antennae), Power systems that last a long time, etc.

Q: It will take at least 9 years for New Horizons to reach Pluto once it leaves Earth, what sorts of things can you do in that time period to be a part of the mission when the spacecraft arrives? Realize that some of the people working on the mission now might have changed jobs or retired by then!

A: Study math and science in school and in college; Keep tracking New Horizons' progress on your growth chart poster until the spacecraft reaches Pluto; Apply for a job working on the mission when you are older!

NOTE: You can find a discussion of careers on the New Horizons website. There are even video clips of mission scientists and engineers answering career-related questions!

Charting the Progress of New Horizons Student Activity Sheet

Pluto is the farthest planet from the Sun in the Solar System and it has never been visited by a spacecraft before. In 2006, NASA's New Horizons is set to launch and begin its journey toward Pluto. Since Pluto is so far away, it will take a long time for the New Horizons spacecraft to get there.

You can use the New Horizons growth chart poster to track New Horizons' progress through the Solar System and follow your growth as the spacecraft zips into space.

Directions:

1. Carefully cut off the bottom strip of the poster. Use the long strip as a bookmark for your favorite book. You will need the picture of the New Horizons spacecraft for this activity.
2. The poster is a **scale drawing** of the orbits of the planets which means that if the picture were expanded with a giant copy machine, the orbits would perfectly match the orbits of the real planets in space! All scale drawings, like maps, have a scale on them. Find the scale on the poster to find the **scale**: _____ cm = 1 AU The abbreviation "cm" is for centimeters and "AU" is for **Astronomical Units**. The distance from the Sun to the Earth equals 1 AU.
3. Using a cm ruler, measure the distances of the planets to the nearest cm. On a separate sheet of paper, make a table and record your measurements and your calculations for all nine planets. The information for the first planet has been filled in for you. The scale on the map helps us change measurements in cm to distances in AU.

Planet	Distance from Sun (cm)	Scale Factor	Distance from Sun (AU)
Mercury	0.8 cm	× 1/2	= 0.4 AU
Venus		× 1/2	=

4. To find out where New Horizons is today, log onto the New Horizons web site at <http://pluto.jhuapl.edu/>.
5. New Horizons' distance from the Sun is given in AU. To change the distance in AU to a distance in cm, multiply the distance in AU by 2.
6. Use a paperclip to fasten the picture of the New Horizons spacecraft onto the poster at the correct distance from the Sun.