This is a Feel the Impact Student Activity called “Comet on a Stick".
The Deep Impact mission encountered Comet Tempel 1 on July 4th of 2005.

The Stardust mission collected particles from Comet Wild (pronounced Vilt) 2.

Before these missions were launched, scientists and engineers use modeling to research and test some of their theories about comets. They also use modeling to find solutions to some of their mission challenges.

Modeling takes place throughout the life of a mission as challenges arise. You will try modeling by making a “Comet on a Stick” and use it to test the influence of the Sun on these small bodies.

This is a good model for some of the attributes of a comet. For others, it is not.

Your challenge is to design a model to communicate what you know or need to know if you are going to develop a mission to a comet.

Before you start, as a class, discuss what you know about comets. What are some theories about comets?

Make one class list of these theories.

Add to that list the things you wonder about comets or don’t know.

Then try to incorporate them as you build a stick comet.

These facts will help you build a model to study this major question.
If you have to send a spacecraft to a comet, what will you need to consider about the way the Sun affects a comet?

The purpose of this activity is to develop a model of a comet and use the same thought processes as a science and engineering team do to design and build missions.

You will use the Comet on a Stick to test your theories about comets. You will then evaluate the strengths and weaknesses of this comet model.

The importance of the activity is not the initial model, but your evaluation of the initial model and what you can do to improve or design a better model.

When you are ready, go to the next page for a list of materials you will need for this activity.

Collect the materials your team will need

One 2-inch Styrofoam or other ball

Four strips of Mylar or thin ribbon

Two 5-inch strip of tape

One wooden skewer

Small amount of modeling clay

Three inch piece of pipe cleaner

When you have collected all the materials, go to the next page.

Follow these directions for making a Comet on a Stick

Make a tiny hole in the ball so it can be mounted on the skewer. The skewer should fit tight.

Mount the ball on the skewer.

Place the Mylar or ribbon strips on top of the ball so the pieces cross each other and the lengths of all sides of the strips hang down evenly.

Attach the strips to the ball with the 5” strips of tape or narrow masking tape wrapped over the strips and around the circumference of the ball.

Press a small amount of modeling clay onto the Styrofoam ball to assign a “front” for your comet representing the head.

Bend the pipe cleaner in half.

Push the two ends into the Styrofoam ball opposite the side from the clay. This will represent the tail of your comet.

You are now ready to test your model. Go to the next page.

Use a hairdryer to simulate a portion of the Sun’s solar energy (the solar wind) as it meets the comet. Have someone be the “Sun” and stand in place with the hairdryer.

The “Sun” should aim the hairdryer at the comet as it approaches and as it moves away. The “Sun” will have to turn in place to keep the “solar wind” flowing to the comet.

Observe what happens to the Mylar or ribbon strips as you hold the comet by the stick and walk in an elliptical orbit around the Sun.

In this model, the hairdryer simulates the solar wind causing the comet tail, the Mylar or ribbon strips, to form and trail behind the comet.

The heat from the Sun causes gas, ice, particles and rocky debris of various sizes to burst from the comet and form the coma. The solar wind causes these substances to form a “tail” behind the comet.

As the comet gets closer to the Sun, the solar heating and solar wind affects the comet so that the tail forms and so that it stays in opposition to the Sun. As it travels away, the lost solar heating of the Sun causes the tail to diminish.

Determine the strengths and weaknesses for this model by answering the following questions:

1. How does this model succeed in showing the influence of the Sun on a comet?

2. How is this model unsuccessful at showing the proper influence of the Sun?

3. What other elements of a comet can be seen using this model?

4. Which elements of a comet are not well shown by this model?

5. The Stardust mission takes a comet sample by flying near the front of Comet Wild 2 instead of the trailing tail. Why? Can your model show the reason for their decision? Why or Why Not?

6. The Deep Impact mission made a crater in the nucleus of Comet Tempel 1 with a copper projectile. A sister spacecraft nearby took optical and spectrometer data during the encounter and for 14 minutes after impact.

What did the engineers and scientists need to consider about a comet in order to successfully gather their data?

Can you improve the stick comet model by changing it or making an entirely new model?

Can you design your own model to communicate what you know or need to know if you are going to design a mission to a comet?

Use the extra materials your teacher has gathered to improve or build a new model by:

1. Forming new teams and choosing three facts about comets you would like to show through modeling.

2. Making a new model or improve the Styrofoam comet to illustrate these comet facts.

3. Evaluating your new model. Did it successfully demonstrate these facts? Why or why not?