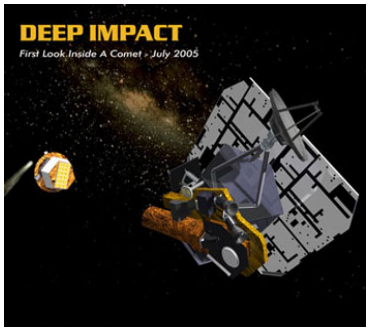

Exploring Comets and Modeling for Mission Success

Activity Overview for Educators

Created for Deep Impact, A NASA Discovery mission
Maura Rountree-Brown and Art Hammon
Educator-Enrichment

A. FIRST, TELL THEM A LITTLE AND FIND OUT WHAT THEY KNOW.

1. Past Beliefs - Consider This!
What did people think about comets throughout history and in different cultures? Show a picture of a comet. You'll find one on our Why Study Comets? page.

Use the "Consider This" page. Educators may want to look at the Science and Mission Results portions of the Deep Impact web site for more updated information on comet science discoveries. You can use the Deep Impact Questions included with this activity to get your students started.

2. Where are comets in the Solar System?
Find a picture of the Solar System and see where the Kuiper Belt and Oort Cloud are in relationship to all the other bodies. Use the "A Comet's Place in the Solar System" page.

3. Elicit #1 - What are your ideas about comets?
Use the "Exploring Comets" page to discuss questions and ideas about the composition and behavior of comets. Record students' answers on a list to re-check later. You might also encourage your students to record their thoughts as journals, graphics or other written reflection on a separate handout.

B. ADD TO THEIR KNOWLEDGE OF COMETS.

1. Activity - Make a Comet and Eat it!
Build a representation of a comet with ice cream and candy "debris" using "Make a Comet and Eat it!" Page. Discuss with students what is taking place as the ice cream forms.
Extension: Stardust's "Cookin' up a Comet", Deep Impact's "Chemistry of Ice Cream"

2. Explore More - Discussion:
Educator input: Discuss results of student "data" testing. Gather visuals of comets from web sites. Begin with less detailed visuals of comets and then show

those with more detail (a picture of a comet, a comet with an ion tail, Shoemaker Levy 9 breaking apart, Giotto views of Borrelly and Stardust views of Wild 2). Finish with the images from the Deep Impact encounter. Make a drawing as a group showing components of a comet the students now recognize. It should have a nucleus, coma and tail. Use "Ten Important Comet Facts" and "C-O-M-E-T-S".

3. Student Elicit #2 - What new ideas do you have about comets, their origin and their composition?
Return to the list of original comet theories and questions the students recorded in Elicit #1. Confirm or modify their original ideas. Add new information. Which ideas are still questions within the science community?

4. Student Elicit #3 - What ideas do you have about why scientists explore comets? What effect could comets have for and against us in the future? What questions do you still have about comets?

C. NOW IT'S THEIR TURN TO WORK WITH SCIENCE THEORIES FOR THE DESIGN OF A MISSION.

1. Think about modeling for the success of a mission:
Elicit #4 - Pick one thing scientists don't know about comets and design a model around finding the answer.
As a group or individually, pick one goal for a mission and discuss how it might be met. Have students describe how the mission would work and what kind of real or imagined technology they would use in their design.

Use the introduction to modeling "Deep Impact Comet Models". Why do mission teams have to prepare models of cometary environment on Earth in order to assure the success of their mission in space?

2. Activity: Comet on a Stick!
Make and evaluate the comet on a stick from the beginning of the Comet on a Stick activity. Ask students how it succeeds as a comet model. Ask them how they would improve it? How would they make a whole new model? Do the rest of the activity with the class.

Additional extension activities: "Paper Comet with a Deep Impact" (option to "Comet on a Stick") or "Comet Models based on the Deep Impact Mission".

3. Elicit #5 - What kind of modeling can you do to test a mission's design and the comet's possible environment?
Have students discuss what they would need to know about cometary environment in order to continue design on their mission. What kind of model can they make here on Earth to test both the mission and the cometary environment?

4. Elicit #6 - What kinds of comet missions is NASA funding?
Use Deep Impact - Interesting Facts. What kinds of technologies are comet

missions using? Why? Check out the Deep Impact and Stardust websites. Use "Questions from Past Workshops" as discussion or testing tool for students.

Further information about comets: "Maura Rountree-Brown" Maura.Rountree-Brown@jpl.nasa.gov
Classroom concerns: "Art Hammon" Virgil.A.Hammon@jpl.nasa.gov