Once NASA funds a mission, there are still many challenges to solve. Check out this new module from McREL that covers the challenges of the A/B Phase (beginning phase) of the Deep Impact Mission.

The following classroom materials are available in Portable Document Format (PDF) for your browsing and printing convenience. The files are print-optimized, and should be printed to achieve maximum resolution. Adobe’s new Acrobat Reader 4.0 is required to view and/or print. To install the FREE reader, visit the Adobe Web site.

Collaborative Decision Making: NASA’s Deep Impact Mission

Collaborative Decision Making is designed to engage students in grades 7–12 in activities that focus on collaboration and communication strategies. These activities will strengthen student understanding of and ability to use collaborative processes and communication practices to clarify, conceptualize, and make decisions. Students will compare the risks of varying courses of action that confront scientists and engineers. After the risks are identified, they will gather and convey evidence supporting and refuting the viability of these actions, and reach consensus. The module strategies rely primarily on student investigation into the background information that is necessary to support arguments; make quantitative risk analyses; engage in debate, role-playing, and persuasive writing/communication processes; and practice group decision-making procedures.

Captivate

In “Capture the Issue,” students are introduced to a problem that mission planners dealt with during the planning phase of the mission. Students read about the problem, “How do we optimize our data collection?” from the perspective of the principal investigator. This introduction not only provides the “hook” for student interest, but will serve as a focus for the entire module. Students read a position statement from the Principal Investigator Dr. Michael F. A'Hearn, Department of Astronomy at the University of Maryland.
Research
In the activities of this module, the teacher’s primary role is Socratic. Through effective questioning, students should become aware of the different data collection methods for the Deep Impact mission.

Working individually, students will gather information on observing options (collecting data from spacecraft using the Deep Impact Spacecraft, Earth-based observatories, and the Hubble Space Telescope). Once students find out about each one, they then work in expert groups to compare the types of information they found. They will synthesize this information in order to make a recommendation to their home group. Students will work in their home groups to collect additional information about aspects of the collection mode they would like to emphasize. They will also identify lesser aspects and note which aspects of other strategies (given constraints) they would like to build into their response scenario. Students will need to defend their scenario based on cost, risk, scientific benefits, and data quality (meeting science objectives).

Student Mission
Student groups will use the information gathered from their research (collected in the second activity on their chosen strategy method) to prepare a presentation and defense that takes into account the risk, benefits, and quality of data (meeting science objectives). The case to be built by each group will include a specific plan with the following three components: 1) observing strategy, 2) specific details for implementing that method, and 3) advantages and disadvantages of that method.
Clarify
In “Clarifying the Issues,” students read interview summaries from Dr. Karen J. Meech, University of Hawaii, who specializes in Earth-based observations, Brian Muirhead, project manager at the Jet Propulsion Laboratory, and John Marriott, engineer at Ball Aerospace & Technologies Corp. These individuals represent very different work institutions and thus, varying priorities, but must all work together to reach an agreement in order for the mission to be successful. Students build and present a case for a particular observation scenario that is to be used to inform and convince others. In the Student Text “What Goes Around Comes Around,” students read about the reciprocal nature of science and technology using the development of the telescope as an example.

Refine
Students assume roles of various stakeholders of the mission including scientists, engineers, and the interested public including such as environmentalists, politicians, teachers, students, and others. General guidelines are provided for students to follow for each role, though they are encouraged to build the character of the person they are role-playing. Prior to the debate, students will view or listen to video or audio clips of some of the stakeholders in order to bring additional information into the mix. Students use the information from the presentations in order to prepare for a debate about the data collection methods at a public forum.

Decide
In the assessment activity, “The Decision,” students prepare written statements for the data collection method with which they personally agree. On the same page, students will support a position statement that advocates other viewpoints. As a large group discussion, the class comes to an agreement on which combination of data collection is best at this time, knowing that as more information or circumstances come into play, this can change. Students determine the method for coming to a consensus, and one upon which all students can agree.

Curriculum Connections
National Standards Addressed

Assessment Standard B
- Achievement and Opportunity to Learn
  Science must be Assessed

Assessment Standard C
- Assessment Tasks Are Authentic
This science module, *Collaborative Decision Making: NASA's Deep Impact Mission*, was developed by educators at:

Mid-continent Research for Education and Learning

Special thanks to the following reviewers:
- Dr. Lucy McFadden, University of Maryland
- Maura Rountree-Brown, Jet Propulsion Laboratory
- Gretchen Walker, University of Maryland
- Bill Bloom, Jet Propulsion Laboratory
- John McKinney, Jet Propulsion Laboratory
- Terry Brandhorst, Clear Creek I.S.D., Texas
- Tom Curley, Alta Loma High School, California
- Kathy Littlejohn, Commerce City Elementary, Colorado

Special thanks to the following interviewees:
- Dr. Michael A'Hearn, University of Maryland
- Brian Muirhead, Jet Propulsion Laboratory
- John Marriott, Ball Aerospace
- Dr. Karen J. Meech, University of Hawaii