SPACE PROGRAM SPIN-OFFS

Performance Standard 13 B/12F.D

Students will research and evaluate the interactions of societal decisions in science and technology innovations and discoveries accordingly:

- *Knowledge*: Identify intended and spin-off purposes and products that have resulted from the space program.
- *Application*: Trace the original design from the space program which led to a spin-off product to public use.
- *Communication*: Present research about impact of space program in current and future public life.

Procedures

1. ***In order to understand the relationships among science, technology and society in historical and contemporary contexts (13B) and know and apply concepts that explain the composition and structure of the universe and the Earth's place in it (12F),*** students should experience sufficient learning opportunities to develop the following**:**
   - Outlining the kinds of space research advances, risks and benefits,
   - Explain the changes in society brought about by the space program,
   - Research how space travel scientists and engineers identified problems to solve, how they tested their possible solutions and prototypes, what parameters they had to use and how they improved their designs progressively,
   - Determine how space travel products and processes were used beyond their original purposes in public life, and
   - Project new space spin-offs that may eventually be used in everyday life.

1. Have students review and discuss the assessment task and how the rubric will be used to evaluate their work.
2. Consult NASA resources for background information and for student use: **http://thespaceplace.com/nasa/spinoffs.html** and **http://www.sti.nasa.gov/tto** The first site provides an overview listing of some basic categories of products which can be useful if modified in different classrooms; the second site provides online access to the past years' Spinoff publications.
3. Brainstorm the kinds of accommodations that must be arranged for space travel. What did scientists and engineers have to consider in order to protect or maintain the lives of the astronauts or allow them to do their research? Create a table of categories for these accommodations. Divide students into groupings to research the categories. Assign five-minute (approximately, as applicable in classroom situation) presentations which may include the historical perspectives of the original space accommodation (its purpose or original risk; when, where and how it was used), sketches or photographs of the original accommodation and the eventual usefulness of this accommodation in everyday life. A worksheet with general student suggestions for research questions is provided.
4. Allow for sufficient research and preparation time. Discuss how space research is continuing currently and project the possible risks and benefits that continue to present problems to solve for scientists and engineers. Consider new spin-offs that may become a part of everyday life in the future.
5. Evaluate each student's work using the Science Rubric as follows and add the scores to determine the performance level:
   Knowledge: Intended purposes and spin-off products that have resulted from the space program were distinguished,
   Application: Individual (or group) research about original design and eventual spin-off was complete and accurate, and
   Communication: Individual (or group) presentations about space program impact were complete and ideas for future spin-offs were creative and integrative.

Examples of Student Work not available

Time Requirements

- 30-40 min Introduce and discuss spin-off technology and assignment
- 3 Class periods for research
- 2-3 class periods for presentations

- **Resources**
- Access to intenet resources, such as:
  - http://thespaceplace.com/nasa/spinoffs.html
  - http://www.sti.nasa.gov/tto (online publication of current spinoff technology)
- Science Rubric

SPINNING OFF FROM SPACE

Research a spin-off product from your teacher's list. Find the following information for your five-minute report. You may be able to add sketches or photographs which can help others understand your spin-off. These questions may help you get started with your report. You may find more information that you want to share.

- What was the original purpose of this idea? What were the scientists and engineers trying to develop that would help astronauts or their research?

- What kinds of risks were the astronauts facing that needed to be eliminated?

- When, where and how was the design first used?

- Are any sketches or photographs available?

- What is the spin-off? How has the original idea changed to be useful on Earth?

- Who first changed the design? When? Where? How?

- How useful is the spin-off now?

- Are there any dangers associated with the spin-off now?