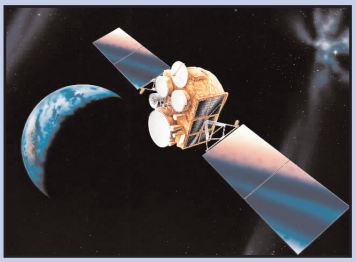
I² — Inspiring Innovations

IN  ATION

INNOVATI 

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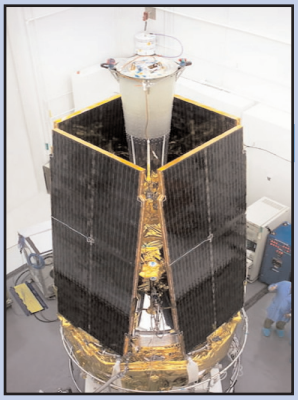
INNOV  ION

INNOVATION

LOCKHEED MARTIN

Dear Colleague:

Lockheed Martin and USA TODAY invite you to share your experiences and expertise with students and teachers in your community. The activities in this guide are designed to help you make the most of your visits to the *I² — Inspiring Innovations* classrooms that you are sponsoring. Included in this guide are:

- *introductory activities* that will help you present yourself to students in a fun, educational manner.
- *class activities* — longer, more in-depth lessons that you teach students.
- a *closing activity* — a worksheet you can leave with students to finish at their teacher's discretion. If you like, you can invite students to mail the completed activities to your office.

Of course, you can also create your own activities from scratch or modify a lesson that reflects your interests and skills.

Lockheed Martin is committed to strengthening America's science, technology, engineering and math excellence through education. We extend our sincere thanks to you for contributing to this vital mission.

USA TODAY Education

Cover photographs (clockwise from top): 1.) An F/A-22 Raptor heads out for an operational test mission, U.S. Air Force handout; 2.) Artwork of a communications satellite, Lockheed Martin Missiles & Space Defense; 3.) the Gravity Probe B, a $750-million satellite designed to put Albert Einstein's theory of relativity to the test, is shown under construction at Vandenburg Air Force Base, Calif., Lockheed Martin Space System handout; 4.) an F-22 Raptor, Lockheed Martin handout.

1. Clues

Select five items that literally or figuratively represent your area of expertise, the history of your company or some other relevant topic. Place the objects in a paper bag. After telling students your name, explain that you are about to display five items related to your career, company, a scientific topic, etc. Slowly hold up each item. Then, give students five minutes to explain in writing how the items are connected. Encourage them to be imaginative; their explanations can be either plausible of funny. Ask several students to share their ideas. Then, reveal the significance of each object. *Modification:* Choose five intriguing newspaper headlines that give clues to your identity. Follow the same procedures outlined above.

2. Imagination

Introduce yourself to students. Explain that Albert Einstein once said, "Imagination is more important than knowledge." Ask students if they can identify an invention or solution — either in history or in their own lives — that supports Einstein's notion. Then, tell students that you are going to test Einstein's statement by asking them to develop the most imaginative solution possible to a problem that you currently or frequently face in your job. Describe the problem, and ask student pairs (or groups) to devise a solution. Reiterate that you want to hear innovative (even crazy!) ideas, not standard ones. If you like, give an award for the idea that impresses you the most. After, explain a little more about your career, the challenges it poses and how you use your imagination on the job.

3. What am I?

Write a short story (a few paragraphs) from the perspective of a piece of unusual technology, a mathematical formula or other object or concept. (Don't choose something too obvious, like a computer.) Use the first-person voice and tell about a day in your life. After introducing yourself, read your story and ask students to guess what you are personifying. Then, explain the object or concept and why it intrigues you.

4. Jargon

Very briefly, introduce yourself. Next, write five aerospace, engineering or technological terms on the board. (Choose jargon that students will find interesting and that you can use as a springboard for entertaining anecdotes about your career.) Then, direct students to find a partner and develop a creative definition for each word or phrase. (This should take no more than 10 minutes.) After, ask a few pairs to share their definitions for the first term. Tell an anecdote about the term that explains its meaning. Do the same for the other jargon.

5. Truth is stranger than fiction

Very briefly, introduce yourself. Next, tell students that you are going to write five statements about yourself (related to your career) on the board. Two will be true and three will be false. (Choose true statements that are unusual and that make good conversation-starters.) Ask several students to identify the two true statements. After listening to all guesses, explain which statements are true, and tell an anecdote about each. If you wish, ask one or two students to write five statements on the board and have you guess which are true and which are false. (This will show that you are interested in them, too.)

6. Top 10 list

Introduce yourself to students. Then, in the style of David Letterman, present students with a "Top 10" (or five) list — e.g, "Top 10 things you should know about computer scientists" (or your area of expertise). Some of the items on your list should be serious, and others humorous. As you count down your list, tell students a short anecdote about each item. Later, when you are leaving the class, you can ask students to create a top five or 10 list that details what they learned about the topic you examined together.

1. Invention and innovation

Lockheed Martin's website states that the company's "continued tradition of innovation … has propelled us into space, helped protect the freedoms of people around the world and made our lives safer, easier, more productive and more secure." Ask students to explain the difference between invention and innovation. Next, direct pairs to identify a specific invention that has accomplished each of the feats noted above (e.g., propelled humans into space, protected freedom, enhanced safety/security, made life easier and helped people become more productive). Then, challenge students to list at least one innovation that improved each technology. Finally, ask each pair to develop an entirely new way to enhance one of the inventions on their list. Invite students to share their ideas.

2. "Traveling Time and Space"

Prior to your visit, go to the Lockheed Martin website and print the *Traveling Time and Space* chronology. (From the home page, go to "About Us" and click on "History.") Print one copy of the first page "History" for each student, and three copies of the information from each decade. In the classroom, divide students into 10 groups. Give each group the introductory page, plus the information on a particular decade. Ask them to identify several ways that the achievements listed have personally affected their generation. Finally, direct groups to develop a rap, poem, dance, mime, abstract artwork or other creative product about a particular event on the timeline or the decade as a whole. After 20-30 minutes, have each group share their work.

3. STEM - Science, Technology, Engineering and Math

(Before visiting the class, make copies of the graphic organizer and the two USA TODAY articles on the following pages.) Explain to students that while many schools teach subjects in separate classes, disciplines in the work world are interconnected. Moreover, it would be impossible for a company to be truly innovative without close collaboration between experts from many fields. Tell students that they will be examining the connections between four disciplines that are vital to your industry — science, technology, engineering and math. Divide the class into small groups of three or four. Give half of the groups the Mars rover article, and the other half, the story on designing future cities. (Distribute one graphic per group.) Then, direct groups to read their assigned story and work together to complete the graphic organizer. Emphasize that students will need to make inferences about the information in the article. The stories will not spell out the answers for them. Give students approximately 30 minutes to complete their work. Then, ask groups to share their answers and ideas.

AS SEEN IN USA TODAY, MARCH 1, 2004

Kids engineer a bright future for our cities

Unearthly alternatives abound, too

By Charlotte E. Tucker

WASHINGTON — In the future, people of Earth will teleport from place to place. They'll take elevators into space, and high-tech plastics will instantly rehabilitate injured organs.

In fact, they might no longer even be "the people of Earth." If the ideas presented by some student engineers at National Engineers Week's Future City Competition are any indication, people of the future will inhabit Mars.

The students, seventh- and eighth-graders from 33 schools across the USA, showed off their designs for cities of the future — the culmination of a year's work for some — at the competition finals last week in Washington, D.C.

Events like these help kick off the season of school competitions, when students show off their expertise in many areas — spelling and math among them — to bring home national prestige for themselves and their schools.

Tensions ran high as the students presented their ideas in the three-day competition. Speeches were practiced, dog-eared notes were reviewed and teachers stood by nervously, some reciting presentations under their breath along with their students.

But there was little time for nerves once the judging began. Each group of judges had five minutes to fire questions about the smallest details of the cities.

By H. Darr Beiser, USA TODAY

A city with heart: A team of home-schooled students from Vincennes, Ind. — Katie Blemker, 12, Nathan Peacock, 14, and Josh Brown, 12 — envisioned a state-of-the-art medical metropolis called Cardiopolis.

"What's your supply chain? How do the products get from the plant to the stores? Can you explain the heating and cooling system? Where is waste material stored?"

Not surprisingly, many of the cities of the future bore little resemblance to metropolises of today.

► Team Fantasia, an all-girl group from Harding Middle School in Cedar Rapids, Iowa, designed a floating city complete with entertainment, recreation and a medical research center. Built of concrete with air pockets that allow it to float, the city harnesses solar energy as it floats in the Pacific.

► A group of home-schooled students from Vincennes, Ind., created Cardiopolis and made their presentations in white lab coats. They imagined a city powered by hydrogen fuel cells where citizens in need of heart transplants could get artificial hearts made of state-of-the-art plastic.

► Students at St. Barnabas Catholic School in Chicago imagined their outpost on Mars as a new frontier and named it Lewis & Clark. Their idea had its genesis months before President Bush announced his goal to send a manned mission to the Red Planet. "Hopefully in our lifetime and our children's lifetime we will get to Mars," eighth-grader Meg Hlousek said.

The students considered every aspect

of living on another world, including energy — they plan to use wind, solar power and fusion — and diminished gravity. The city's domed buildings use an artificial magnetic force to anchor people and objects.

But the Future City competition isn't just an exercise in engineering. It's also about teamwork.

"It's interesting to watch the interplay of personalities and seeing them work together," said judge William Rohrer, a supply-chain director for Kimberly-Clark. "You can just feel all that eighth-grade energy in the room."

Judge Betty Shanahan, executive director and CEO of the Society of Women Engineers, said she sees the competition as a chance for students to see that engineering is not an isolating profession.

"What they're experiencing firsthand is that doing engineering is a team effort," she said.

Some team's ideas were more real life than science fiction. Team Fin Fjorden of King Middle School in Oceanside, Calif., designed one of its residential buildings on a giant spring that could withstand the force of an earthquake.

Another problem almost every team grappled with was transportation. Many included environmentally friendly magnetically levitated trains, but some took their ideas further.

Transportation on Glacius, which was built by a team from Drexel Hill Middle School outside Philadelphia, featured gyroscopic technology akin to a hamster wheel.

"You're hooked in and it spins really fast, but you stay stable in the center," eighth-grader Daniel Matarazzo said.

But despite all the technology, teams didn't forget the other joys of city life. On a hilltop overlooking a reef-filled river in Fin Fjorden sits a Krispy Kreme store.

"Every city needs a doughnut shop," eighth-grader Sara Dianish explained.

AS SEEN IN USA TODAY, MARCH 3, 2004

Mars rover finds evidence of ancient water

NASA/JPL

NASA image: Close-up of the rock "El Capitan," which has generated much interest.

By Dan Vergano

WASHINGTON — One of NASA's robotic rovers has found evidence that part of Mars was once soaked with enough water to sustain life, scientists said Tuesday.

"Opportunity has landed in an area of Mars where water once drenched the surface," said Ed Weiler, a NASA space science administrator.

The conclusion is based in part on salts found in ancient bedrock. Scientists hope to tell in coming weeks whether saltwater once filled an open sea or simply percolated through the rock as groundwater.

At a Tuesday briefing at the space agency's headquarters, scientists released results from the rover's investigation of a bedrock outcrop. A piece of the outcrop, named "El Capitan," has caused much interest among the scientists.

Now dry, the rock shows evidence of having been submerged in water, conditions friendly to the existence of microbial life.

"This was a habitable place in Mars at one point in time," said rover science chief Steve Squyres of Cornell University. However, he cautioned, "that doesn't mean there was life."

The rover landed inside the small crater crowned with layered rock on Jan. 24. NASA designed the $820 million twin rover mission, Opportunity and the Spirit probe on the other side of Mars, to investigate the possible existence of long-ago habitable conditions. Scientists have long known that Mars holds water ice in its poles and likely under its surface, but they have been uncertain about the role water played in the planet's geology.

The NASA team tested the chemistry of two holes drilled into the bedrock. The rocks hold sulfur and bromine salts in as much as 40% of their material, an unmistakable sign of water weathering the rock, Squyres said. Also, the rock showed signs of crystals left by water and spherical "blueberry" rocks left in the bedrock that precipitated in place, like pearls formed by oysters.

Another rover team scientist, Benton Clark of Lockheed Martin Space Systems in Denver, remarked that salt-eating microbes exist now on Earth that are capable of living in the water-drenched conditions that once existed at Opportunity's landing site, so it's possible that similar microbes existed on Mars.

Discovery of the salt-laced rocks came as a surprise at Meridiani Planum, the Oklahoma-size plain where Opportunity's crater resides, said geologist Victoria Hamilton of the University of Hawaii, who is not on the rover team. Orbiting spacecraft had seen no signs of the material, she said.

Deposits of hematite, an iron mineral associated with hot springs, appear to lie on the broader plain above Opportunity's crater, and will be explored in coming weeks.

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class activities — graphic

Directions: After reading your assigned article, decide what scientific, technological, engineering and mathematical problems the researchers needed to solve in order to accomplish their tasks. List these in the appropriate boxes below. Then, identify an important but unusual problem that would require collaboration among scientists, technology experts, engineers and mathematicians to solve. Write your idea in question format in the box at the bottom of the page. Be prepared to explain how each expert would contribute to the solution.

Scientific

Technological

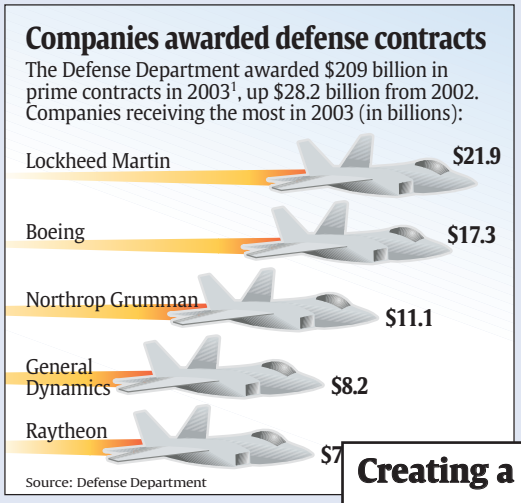
Engineering

Mathematical

?

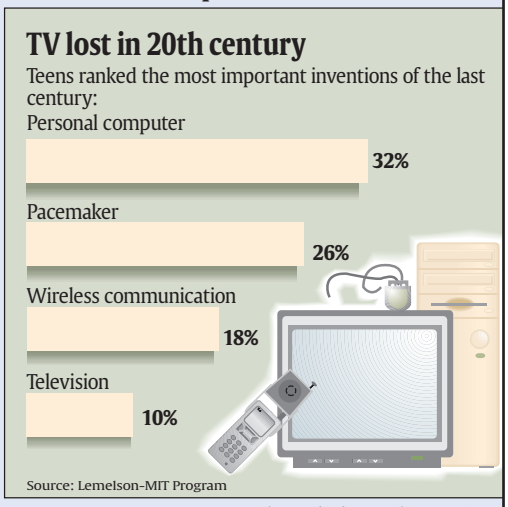
?

USA TODAY Snapshots™



By William Risser and Aleja

USA TODAY Snapshots™



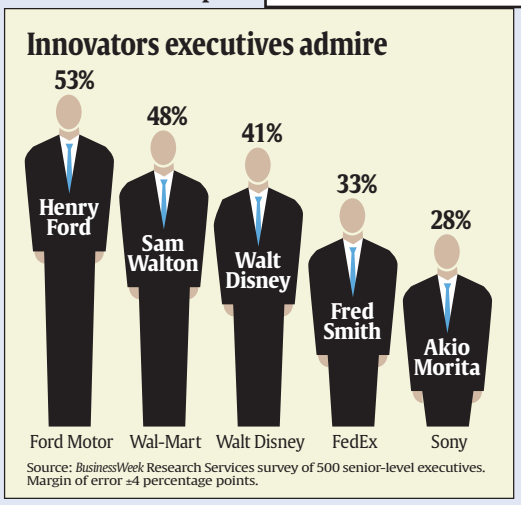
By Mary M. Kershaw and Robert W. Ahrens, USA TODA

Creating a Snapshot

Give each student a copy of the "Snapshots" worksheet on the following page. As a group, discuss the USA TODAY Snapshot shown. What are the implications of the statistics it describes? Direct individuals to write one conclusion about the Snapshot and make one prediction based on it.

Finally, ask students to write a question about a given topic (e.g., national defense, the Internet, scientific careers, etc.), and poll at least 10 females and 10 males for their answers. After compiling the results, students can create their own Snapshot. Their graph should include all the elements of a USA TODAY Snapshot™ — a headline, description, graph or chart, source and byline. If you are willing, have the class send you their completed Snapshots.

USA TODAY Snapsho



By Darryl Haralson and Alejandro Gonzalez, USA TODAY

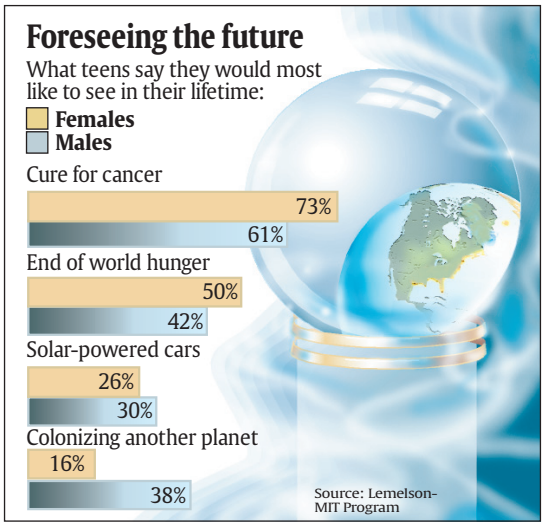
I^2 — Inspiring Innovations

closing activity

Name: _____ **Date:** _____

MAIN IDEA:
Graphs help people clarify, organize and summarize numerical information. Graphs also help us to communicate and classify data.

USA TODAY Snapshots™



By Mary M. Kershaw and Suzy Parker, USA TODAY

Draw one conclusion from the Snapshot at right:_____

_____

_____

_____

Make one prediction based on the information in the graph.

_____

_____

_____

Question for my survey:_____

_____

RESPONSES

	YES		NO		UNDECIDED		TOTALS	%
Females								
Males								
TOTALS	Number	Percent	Number	Percent	Number	Percent	Number	

Draft

FINAL