

Spin-Off Technology

The Spinoff Games (can be done in 1 class period and combined with the presentation)

1. Spinoff: Yes or No?
 - a. The students are shown 10 items (see below) and are asked to guess which are spinoffs and which aren't
 - b. Students fill out a table with yes or no beside each item.
 - c. Each student gets one point for each correct answer.
 - d. The highest score wins!
2. Spinoff Trivia
 - a. Students split into groups of 2-3
 - b. Each group gets a whiteboard/paper and marker to record their answers
 - c. Students are asked questions about spin-off technologies (see below), and they are given 30s to write down the answer
 - i. Each correct answer is worth 10 points
 - d. The team with the highest number of points wins (in case of a tie, can use activity #3 for tie-breaker)
3. Spinoff memory game (skip if pressed for time)
 - a. <http://spaceplace.nasa.gov/spinoffs/en/>
 - b. Each student gets a chance to flip over two cards.
 - i. If the cards don't match, the next student goes
 - ii. If the cards do match, the student reads about the spin-off and then gets another turn.
 - c. The student with the most matches wins!

10 items with descriptions for activity #1

Tang	NO - In 1962, Astronaut John Glenn made Tang famous by drinking it as part of some eating experiments they were conducting in space. It was actually developed a few years earlier, in 1957, by General Foods.
Velcro	NO - This is actually a Swiss invention from the 1940s, but it was made famous because it was used during the Apollo missions to anchor equipment.
Cordless drill	NO - Cordless tools were not invented by NASA. They were actually developed by Black & Decker in 1961. However, NASA partnered with Black & Decker to develop zero-impact tools that could be used in space so the astronauts wouldn't spin around while using them. As a result, Black & Decker actually developed several spin-

	offs, such as cordless lightweight battery powered medical instruments and the Dustbuster.
Camera on Cell Phones	YES- JPL researchers explored ways to significantly miniaturize cameras on interplanetary spacecraft while maintaining scientific image quality. A team led by Eric Fossum developed an energy-efficient light sensor with all of its components integrated on a single chip. The NASA-derived sensors are now incorporated into digital cameras, automotive and surveillance cameras, and medical imaging devices. One of every three cell phone cameras worldwide features Aptina's sensors
Street View Mapping (i.e. a Google street image)	YES - JPL developed 3D data generation software and algorithms to allow the Mars Exploration Rovers to autonomously navigate the Martian terrain. Using the a vehicle-based camera array, the system can map an entire city in a few weeks. Applied for public works projects, commercial development, and navigation aids.
Ingestible Tooth Paste	YES - For anyone with limited access to a bathroom (such as astronauts or the physically impaired on Earth), a good tasting foamless toothpaste that can be swallowed makes life easier. NASA worked with a hospital to create the product, which tests equally effective compared to other varieties.
Infrared Ear Thermometers	YES - Astronomy technology once used to measure the temperature of distant stars and planets now measures the temperature of humans. Thanks to a hand-held, high-speed medical thermometer that measures energy emitted from the eardrum, a person's temperature can be measured in less than 2 seconds. Since it doesn't touch mucous membranes, cross infection is virtually eliminated.
Bike helmet	YES - Shock-absorptive foams, developed by NASA to prevent the negative affects of g-forces on astronauts, take the shape of impressed objects and return to their original shape after use. This material is critical in athletic helmets and protective padding for little leaguers to pro-football players alike. It is also found in medical beds, footwear, fighter jets, and furniture.
Golf club OR tennis racket	YES - NASA's research in the use of lightweight, ultra-strength metal alloys known as "metallic glass" has had a dramatic influence on how sports equipment is manufactured. More than twice the strength of titanium,

	these alloys are without weak spots and highly resistant to deforming. This allows for near-total energy transfer, lower vibration, greater comfort, and increased performance.
Paint chip sample(s)	YES - Heat generated during shuttle launches required a spray-on process to protect the craft. A private company commercialized the process and created an insulating additive for house paint to make homes more energy efficient. The product is environmentally friendly and is made from glass, cork, and epoxy.

Spinoff Trivia Questions

1. NASA knew some kinds of light can hurt your eyes. They made something to keep out the harmful light but let safe light through. This spinoff makes you look cool, even when you're hot. (ANSWER: Sunglasses)
2. Without leaving Earth, scientists can tell how hot a planet or star is. This spinoff can tell you if you have a fever or not (ANSWER: Infrared Thermometer)
3. This spinoff comes from the space shuttle simulators. Astronauts use it to practice landing and steering the shuttle, but you might use it to play video games (ANSWER: Joystick)
4. This spinoff was made in the same way that certain parts of NASA space suits were made. You can thank this spinoff for a great jump shot (ANSWER: athletic shoe)
5. What has dimples but doesn't smile? This idea came from the space shuttle's external tank. (ANSWER: golf ball)
6. Astronauts who went to the moon couldn't carry much water into space. NASA learned how to clean the water already in the spacecraft. This spinoff will clean your water too (ANSWER: water purifier)
7. Astronauts have to stay in shape while in space, or their bones and muscles will get very weak. This spinoff can be found at the gym (ANSWER: treadmill & other exercise equipment)
8. Scientists were working with tiny plants called algae and they discovered something in them that is good for babies. This spinoff gives babies extra nutrients (ANSWER: baby formula)
9. On spacewalks, astronauts need to be able to move and bend. This spinoff will make you a better skier (ANSWER: ski boot)
10. This spinoff makes computers easier to use. It often has a tail, but sometimes does not (ANSWER: mouse)
11. This spinoff gives us wonderful treats like astronaut ice-cream. What technique is used to create these foods? (ANSWER: freeze-drying)

12. Neil Armstrong's first words from the Moon were carried back using this technology. You might see it used with a cell phone or while playing interactive video games (ANSWER: cordless headset)
13. NASA created a camera to track movements during the construction of the International Space Station. The same technology is used by the car industry to determine injuries in accidents to these fake people (ANSWER: crash test dummies)
14. A powerful and flexible thermohydraulic analyzer was developed by NASA, which helps keep cars cool in the summer more efficiently using this technology (ANSWER: air conditioning)
15. NASA created special foams made to make astronauts safer, space vehicle parts last longer, and robotic space vehicles work better. You might use this technology if you've lost an arm or leg (ANSWER: artificial limbs)

Taking it Further

Do you want to go further into this topic? Here are a few ideas:

1. NASA @ Home & City (online)
 - a. This website gives a tour of the spinoff technologies found around the home and in the city. There's also a spinoff challenge students can take part in!
<http://www.nasa.gov/externalflash/nasacity/index2.htm>
2. Spinoff Bingo
 - a. Descriptions and history of a spinoff are given, and the students mark the correct answer.
 - b. Full instructions can be found here:
www.tsgc.utexas.edu/spaceexplorers/activities/Spinoffs.pdf
3. NASA spinoff search game (online)
 - a. Students use clues to find NASA spinoffs in a cartoon garage:
http://www.nasa.gov/audience/forkids/kidsclub/flash/games/levelfour/KC_Spinoffs_Hidden_Pictures.html
4. Life with spinoffs
 - a. Students list objects they use over the course of a day then research how many of those items are spin-offs
5. Spinoff research project
 - a. Students can search the NASA spinoff database -
<http://spinoff.nasa.gov/spinoff/database> - for an interesting spin-off and write a report and/or give a presentation about it