



A Math and Science @ Work Special Series

# CELEBRATING APOLLO

AP\* HUMAN GEOGRAPHY



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## PREPARATORY ACTIVITY: DIFFUSION OF NASA TECHNOLOGY

### Exploring the Use of NASA Technology in the Home and Community

(A preparatory activity for use with the free-response problem, *Diffusion of NASA Technology*)

**Teacher Prep Time:** 15-20 minutes

**Duration of Activity:** 20 minutes (in-class) 40-60 minutes (homework)

**Materials Needed:** NASA Fact sheet (NASAFacts.pdf); internet access (homework)

**AP Course Topics and NCGE Standards:** A detailed list of each can be found in the related free-response question.

### Instructional Objectives

Students will

- identify examples from the real world that represent the different types of diffusion on multiple scales;
- discuss the diffusion and impact of NASA technology in the home and at different scales.

### Prerequisites

Students should have a good understanding of relocation diffusion and the different types of expansion diffusion: hierarchical, contagious, and stimulus. They should also understand the different scales of diffusion: local, regional, and global.

### Educator Instructions

#### Teacher Preparation

To be familiar with the aspects of this activity download and read the NASA Fact sheet (NASAFacts.pdf) and explore the website: [www.nasa.gov/city](http://www.nasa.gov/city).

#### Activity 1 – Types of Diffusion (*In-Class Group Activity*)

- To explore the concept of diffusion on different scales, divide students into four groups. Assign each group a different type of diffusion (relocation, hierarchical, contagious, or stimulus). Each group should come up with one example of diffusion for each of the four different types of scale: local, regional, and global.



- Redistribute the students into new groups each of which has one student that was assigned relocation diffusion, one student from hierarchical, one student from contagious, and one student from stimulus. Have each group member share their examples with the rest of the group.

### Activity 2 – Diffusion of NASA Technology (Homework)

- Make copies of the student activity pages and distribute them to your students to complete as homework.
- This activity requires the use of two resources:
  - The NASA Facts sheet, a NASA publication that highlights the technology that came from the Apollo Program, can either be downloaded to make copies and distribute to your students (NASAfacts.pdf) or can be viewed by the students at [http://www.nasa.gov/centers/ames/pdf/80660main\\_ApolloFS.pdf](http://www.nasa.gov/centers/ames/pdf/80660main_ApolloFS.pdf).
  - NASA @ Home and City ([www.nasa.gov/city](http://www.nasa.gov/city)) is an interactive website that will help students see how NASA technology is used in their homes and in their community.

### Solution Key for Activity 2

1. Use the NASA Facts sheet to list three examples of products that came from or were enhanced by Apollo technology, that impact your life personally. Describe how your life has been influenced by each product.

*Answers will vary but may include some of the following: non-fatiguing mid-soles for athletic shoes; intruder detectors in security systems; programmable pacemaker systems; cordless power tools; digital image analyzers: CAT scans, MRIs, radiology, etc.; metallic material used in car shades, emergency blankets, etc.*

2. Use the NASA Facts sheet to list three examples of products that came from or were enhanced by Apollo technology and have impacted our society or community as a whole. Describe how our society or community has been influenced by each product.

*Answers will vary but may include some of the following: retractable roofs for stadiums such as the Reliant Stadium in Houston; chemically treated fabric that does not burn used in fighting fires; Solar panels as a source of renewable energy; defibrillators used by emergency squads and hospitals; Quartz clocks providing greater accuracy of time; liquid methane as an energy alternative to gasoline for automotive vehicles—costs less and has cleaner emissions; “mechanical mother” that feeds piglets reducing death rates of piglets for swine farmers.*

3. From the website, NASA @ Home and City, view NASA @ Home. Identify at least 5 products that you use at home that have been created by NASA technology. How have these products affected your life at home?

*Answers will vary but may include some of the following: fiberglass guitar; scratch resistant and UV blocking glasses; wireless headsets; insulated house paint; carbon monoxide detector; thermal fabric used in jackets, blankets, mattresses, etc.; computer software that learns a user’s preference; reading light bulbs; temper foam used in mattresses, pillows, sports gear, etc.; shock absorbing foam used in sports equipment like helmets and padding; enriched baby food; water purification; cordless vacuums; polished brass finish on plumbing fixtures; bacteriostatic water softeners; infrared ear thermometers; safer skin treatments and cosmetics.*



4. Choose one specific NASA technology and trace its diffusion into your home. What type of diffusion do you think was used to get this technology into your home? Is this technology used on a global scale? Why or why not? If not then what scale is this technology being used on and why do you think that is?

*Answers will vary.*

5. View *NASA City* from *NASA @ Home and City*. What scale do you think most of this technology is used on? What type of diffusion does most of it spread through? Why?

*Most of this technology is now used on a global scale, but may have started on a national level. These products have been spread through expansion diffusion simply going from one industry to another. Specifically they have been spread by both hierarchical and stimulus diffusion. It is hierarchical because the technology went from being used in space exploration, a noble and important endeavor, to being used for common activities. It is stimulus because the technology was adapted to meet the needs common activities.*

6. Find a NASA technology that has affected people on all three different types of scale. Explain your answer.

*Answers will vary.*

7. Choose a specific NASA technology that is used on a global scale. How is the product used and how does it benefit the people who use it? What types of diffusion do you think this technology was spread by? What indicators did you use to determine the type of diffusion?

*Answers will vary.*

8. List at least five NASA influenced technologies that are used in our school and explain their use.

*Answers will vary but may include: space gardens used in science classes; infrared ear thermometers used by a school nurse; shock absorbing material used in athletic shoes, helmets and padding; defibrillators used for emergencies; self illuminating materials used on exit signs.*

## Contributors

This activity was developed by Stephanie Cardona, AP Human Geography Teacher at Clear Brook High School in the Clear Creek Independent School District, Texas with support from NASA's Human Research Program Education and Outreach Team.



Name \_\_\_\_\_

Date \_\_\_\_\_

**Activity 1 – Types of Diffusion** (*In-Class Group Activity*)

**Instructions:** Each group will be assigned a different type of diffusion. Discuss within your group and determine an example of the assigned type of diffusion for each type of scale. Groups will then be redistributed. Share your examples with your new group.

Type of Diffusion & Scale		Example	Type of Diffusion & Scale		Example
Relocation	Local		Contagious	Local	
	Regional			Regional	
	Global			Global	
Hierarchical	Local		Stimulus	Local	
	Regional			Regional	
	Global			Global	

**Activity 2 – Diffusion of NASA technology** (*Homework*)

**Instructions:** Use the resource specified to answer the following questions.

**Resources:**

NASA Facts sheet ([http://www.nasa.gov/centers/ames/pdf/80660main\\_ApolloFS.pdf](http://www.nasa.gov/centers/ames/pdf/80660main_ApolloFS.pdf))

NASA @ Home and City ([www.nasa.gov/city](http://www.nasa.gov/city))

1. Use the NASA Facts sheet to list three examples of products that came from or were enhanced by Apollo technology, that impact your life personally. Describe how your life has been influenced by each product.
  
2. Use the NASA Facts sheet to list three examples of products that came from or were enhanced by Apollo technology and have impacted our society or community as a whole. Describe how our society or community has been influenced by each product.



3. From the website, *NASA @ Home and City*, view *NASA @ Home*. Identify at least 5 products that you use at home that have been created by NASA technology. How have these products affected your life at home?
  
4. Choose one specific NASA technology and trace its diffusion into your home. What type of diffusion do you think was used to get this technology into your home? Is this technology used on a global scale? Why or why not? If not then what scale is this technology being used on and why do you think that is?
  
5. View *NASA City* from *NASA @ Home and City*. What scale do you think most of this technology is used on? What type of diffusion does most of it spread through? Why?
  
6. Find a NASA technology that has affected people on all three different types of scale. Explain your answer.
  
7. Choose a specific NASA technology that is used on a global scale. How is the product used and how does it benefit the people who use it? What types of diffusion do you think this technology was spread by? What indicators did you use to determine the type of diffusion?
  
8. List at least five NASA influenced technologies that are used in our school and explain their use.