



A Math and Science @ Work Special Series

CELEBRATING APOLLO

AP* HUMAN GEOGRAPHY Educator Edition



DIFFUSION OF NASA TECHNOLOGY

Instructional Objectives

Students will

- recognize how locations are connected through different scales;
- characterize and analyze interconnections among locations;
- describe the different types of diffusion and identify examples of the different types of diffusion in the real world; and
- discuss the diffusion of NASA technology and its impact on a global scale.

Preparatory Resources

In order for students to be successful in answering this question they will need to be knowledgeable about NASA technology and how it has been diffused into society.

A preparatory activity that integrates NASA technology with the concept of diffusion (DiffusionActivity.pdf) is available for download with this problem. This activity has students explore a NASA publication that highlights Apollo technology (NASAFacts.pdf) and an interactive website highlighting NASA technology in the home and in the community (www.nasa.gov/city). It is suggested that the teacher go through the preparatory activity prior to presenting this question. Additional supporting materials and information can be found at <http://www.sti.nasa.gov/tto/>.

Background

This problem is part of a series of Social Studies problems celebrating the contributions of NASA's Apollo Program.

On May 25, 1961, President John F. Kennedy spoke before a special joint session of Congress and challenged the country to safely send and return an American to the Moon before the end of the decade. President Kennedy's vision for the three-year old National Aeronautics and Space Administration (NASA) motivated the United States to develop enormous technological capabilities and inspired the nation to reach new heights.

Eight years after Kennedy's speech, NASA's Apollo program successfully met the president's challenge. On July 20, 1969, the world witnessed one of the most astounding technological achievements in the 20th century. Neil Armstrong and Edwin "Buzz" Aldrin became the first humans to set foot on

Grade Level

9-12

Key Topic

Diffusion of Technology

Degree of Difficulty

Moderate

Teacher Prep Time

1 hour

Problem Duration

Preparatory Activity:

20 minutes (in-class)

40-60 minutes (homework)

Free-Response Question:

25 minutes

AP Course Topics

- Geography: Its Nature and Perspectives
- Cultural Patterns and Processes

NCGE Geography Standards

- Human Systems

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the Moon, while Mike Collins orbited the Moon in the Command Module. Armstrong's words, "That's one small step for [a] man, one giant leap for mankind," were heard around the world and inspired a generation. This amazing accomplishment required the collaboration of hundreds of thousands of determined individuals and the committed resources of our nation.

Through the Apollo program, humans were able to explore the Moon. Since then, NASA's space program has expanded, enabling people to explore our solar system and to create the International Space Station. This orbiting research facility has allowed an uninterrupted human presence in space since November 2000. But how does the NASA space program affect you? How does NASA improve the lives of people on Earth?

For more than 40 years NASA technology has been adapted to meet the needs of the private sector, benefiting global competition and the economy. Commercial advancements in health, medicine, industry, consumer goods, transportation, public safety, computer technology, and environmental resources have all been impacted by NASA technology. Products such as artificial limbs, cordless power tools, water purification, and solar energy have all been created or enhanced using NASA technology. Can you think of ways that the diffusion of NASA technology affects you personally in your home?

For more information about NASA's Apollo program visit www.nasa.gov.

AP Human Geography Course Goals

- Understand and interpret the implications of associations of phenomena in places
- Recognize and interpret at different scales the relationship among patterns and processes

AP Course Topics

Geography: Its Nature and Perspectives

- Key geographical skills
 - How to recognize and interpret at different scales the relationships among patterns and processes

Cultural Patterns and Processes

- Concepts of culture
 - Diffusion

Industrialization and Economic Development

- Growth and diffusion of industrialization
 - The changing roles of energy and technology
- Contemporary patterns and impacts of industrialization and development
 - Variations in levels of development
 - Globalization and international division of labor

NCGE Geography Standards

Human Systems

- The characteristics, distribution, and complexity of Earth's cultural mosaic.
- The patterns and networks of economic interdependence on Earth's surface.



Free-Response Question

Directions

You have 25 minutes to answer all parts of the following question. While a formal essay is not required, it is not enough to answer a question by merely listing facts. Your answer should be based upon your critical analysis of the question posed. It is recommended that you spend 5 minutes of your allotted time to plan or outline your response. Make sure you letter each of your answers with the corresponding question.

Question

Diffusion is an important concept in Human Geography:

- A. Define diffusion and explain the differences between relocation diffusion and expansion diffusion.
- B. Explain how diffusion has led to globalization and give an example of the diffusion of NASA technology on a global scale.
- C. List and define the three types of expansion diffusion. Provide one example of each type as it applies to the history of the United States from the mid to late 20th century.

Scoring Guide:

Suggested 7 points total to be given.

Question	Distribution of points
<p>A <i>2 points</i></p>	<p>1 point for correctly defining diffusion as the spread of an idea or innovation from one place to another.</p> <p>1 point for explaining the differences between relocation diffusion and expansion diffusion.</p> <p>Relocation diffusion is when people move and take ideas or innovations with them. Expansion diffusion is the spread of ideas and innovations from a focal point, where it grows strong and spreads to a larger area.</p>
<p>B <i>2 points</i></p>	<p>1 point for explaining how diffusion has led to globalization.</p> <p>The diffusion of ideas, innovations, and values has led to interconnections and interdependence among places all over the world. When people take their ideas and spread them to different places they are adopted. Locations all over the world begin to have similar businesses, products, clothing, food, etc.</p> <p>1 point for giving an example of the diffusion of NASA technology on a global scale.</p> <p>Some acceptable examples include: solar panels, wireless headsets, flame retardant material, protective sport padding, and cordless power tools.</p> <p>Some unacceptable example include: Tang, Teflon, and Velcro. They were used in the space program but not NASA developed technology.</p> <p>More examples can be found at http://www.sti.nasa.gov/tto/.</p>



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- C** *3 points* 1 point for identifying, providing the correct definition, and providing an example of hierarchical diffusion.

Hierarchical diffusion occurs when an idea starts with someone of importance or power and then trickles down to common people or vice versa. *Examples could include:* the spread of hip hop or rap music from low income to higher income families; industrialization in cities and the trickle down to towns and local communities; NASA technology transferred from use in space to use for common activities.

1 point for identifying, providing the correct definition, and providing an example of contagious diffusion.

Contagious diffusion is the process of an idea being spread rapidly throughout the population; all places and individuals in the region are affected. *Examples could include:* the spread of AIDS prevention; the spread of disease; the use of the internet.

1 point for identifying, providing the correct definition, and providing an example of stimulus diffusion.

Stimulus diffusion is when part of an idea is adopted by a society and then changed to meet their needs. *Examples could include:* foreign food that has been Americanized like Tex-Mex; NASA technology being adapted for use in the private sector.



Contributors

Thanks to the subject matter experts for their contributions in developing this problem:

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Celebrating Apollo – Diffusion of NASA Technology

Feedback Form

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Fax the completed form to: (281) 461-9350 – Attention: Natalee Lloyd

Or type your responses in an email and send to: natalee.lloyd@tietronix.com

Please circle the appropriate response and include an explanation where desired.

1. This problem successfully accomplished the stated instructional objectives. YES NO

2. The problem was at an appropriate level of rigor to be used in an AP class. YES NO

3. The problem will help prepare students to answer free-response questions on the AP exam. YES NO

4. I will use this problem again. YES NO

5. Please provide suggestions for improvement of this problem and associated material:

Thank you for your participation.