

Lesson Plan Grades K-16: Interactive Introduction to Remote Sensing Imagery focusing on Land Cover Change Detection

An Interactive Memory Game

Image – an image is a *representation of reality*. It can be a sketch, a painting, a photograph, or some other graphic representation such as satellite data. Satellites capture and store electromagnetic waves that are reflected or emitted from features on the Earth, somewhat like a camera.

Remote Sensing – remote sensing can be defined as the scientific and technical discipline that involves acquiring information of various Earth features from a distance. Sometime the distance is great, such as satellite-based remote sensing where the satellites are in orbit high above the Earth; other times the distance is much less, such as aircraft-based remote sensing where the airplane is much closer to Earth.

Land Cover Change Detection –Using change detection techniques (analyzing satellite remote sensing data at different spatial, spectral, and temporal resolutions by using the appropriate combination of bands) to bring out the geographical and manmade features for detecting changes in a predefined specified area.

Learning Objectives:

The following computer based memory game has 3 difficulty levels to choose from. The **K-5** level requires matching of same image pairs while the number of tiles increases in the **6-8** level and additionally requires students to match imagery from the exact same location but taken over two different time periods. The difference between the **6-8 (middle school)** and the **9-16 (high school)** level game is the number of tiles to be matched. Depending on that level different learning objectives can be addressed.

Upon successful completion of this learning game, student will:

- be familiar with remote sensing imagery from various locations throughout the world.
- visualize land cover change over a certain time period.
- learn about specific locations on earth and their characteristics.
- stimulate and train their memory through pattern recognition.

K-5 Introduction:

Learn more about how specific locations on the Earth look like if taken images by a satellite from space.

6-8 Introduction:

The Earth is comprised of a wide variety of landscapes. These landscapes, like the landscape where you live in, are all unique - no two are alike. Some are forested, others are deserts, and still others are grasslands, agricultural areas, cities or towns, or are



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covered in permanent snow and ice. Think about your landscape where you live, and describe it in a paragraph.

These are no 'right' or 'wrong' descriptions, but be as detailed as you can, *and break the landscape down into **land cover groups, or classes***. Think about what vegetation is around you. Is it natural vegetation, or has it been planted? What type of vegetation is it? Is it forested, or are there shrubs, or grasses, or a mixture? Is the landscape mountainous or rolling hill, or is the landscape flat? Is it highly developed, largely undeveloped, or a mixture of development and natural areas? Landscapes change over time, and these changes can have significant affects on those who live in the landscape, including humans, animals, and plants. Also, the water quality and water quantity are greatly influenced by the landscape, as is the quality of the air that we breathe. Some land cover classes' change, while others remain more or less the same. Scientists study how the landscape changes, using remotely sensed images from satellites. They study the changes in land cover because these changes affect many things, including the air and water, the climate, and human health. In this exercise (game), you will explore changes in land cover using remotely sensed images from around the world.

9-16 Introduction:

The Earth is comprised of a wide variety of landscapes. These landscapes, like the landscape where you live, are all unique - no two are alike. Some are forested, others are deserts, and still others are grasslands, agricultural areas, cities or towns, or are covered in permanent snow and ice. Think about your landscape where you live, and describe it in a paragraph. These are no 'right' or 'wrong' descriptions, but be as detailed as you can, *and break the landscape down into **land cover groups, or classes***. Think about what vegetation is around you. Is it natural vegetation, or has it been planted? What type of vegetation is it? Is it forested, or are there shrubs, or grasses, or a mixture? Is the landscape mountainous or rolling hill, or is the landscape flat? Is it highly developed, largely undeveloped, or a mixture of development and natural areas?

Landscapes change over time, and these changes can have significant affects on those who live in the landscape, including humans, animals, and plants. Also, the water quality and water quantity are greatly influenced by the landscape, as is the quality of the air that we breathe. Some land cover classes' change, while others remain more or less the same. Scientists study how the landscape changes, using remotely sensed images from satellites. They study the changes in land cover because these changes affect many things, including the air and water, the climate, and human health. In this exercise (game), you will explore changes in land cover using remotely sensed images from around the world.

Teacher Prep time: 30 minutes to become familiar with the game rules and to familiarize with the imagery and its characteristics.

Class Time Requirement: 50 minutes



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Materials needed: Computer with internet connection and access to the website <http://earthobservationday.com/>

Teacher Prep Instruction: One internet enabled computer per student to access the desired memory gaming level on the EOD website <http://earthobservationday.com/>

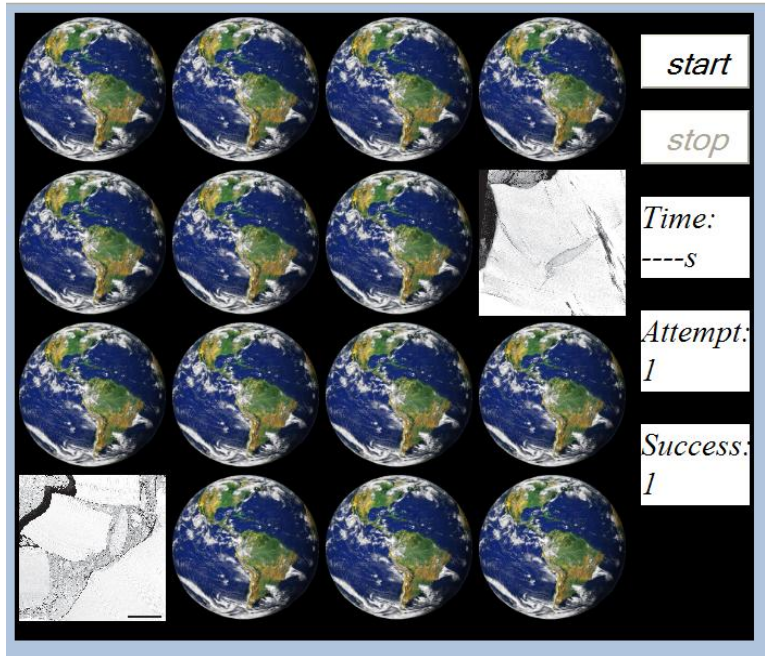
Classroom Instructions: Go to the website click onto 'HELP' and read together with the students the game rules. Explain the rules of the game. On each turn, the player will first turn one card over by clicking onto the earth logo, then a second by doing the same. If the two cards match (K-5 same location, same year; 6-8 and 9-16 same location taken over two different time periods), the player scores one point, the two cards stay image side turned up on the game board and the player continuous. If the images do not match, the cards are turned back over. The objective of the game is to locate two images from the same location out of the possible tiles. Continue this process until time runs out or students collected all sets. The winner is the one with the least amount of time needed to locate all pairs. At the end of the game the matching images reveal information about its location and characteristics. The game can be used as a basis for classroom discussion for higher grade levels. To play the game again with different image locations, please reload the website.

- 1.) Start the game by double-clicking the 9-16th grade memory game link.
- 2.) Read the game instructions by clicking on 'HELP' (bottom right of the game).
- 3.) Click on the START button to start the game.

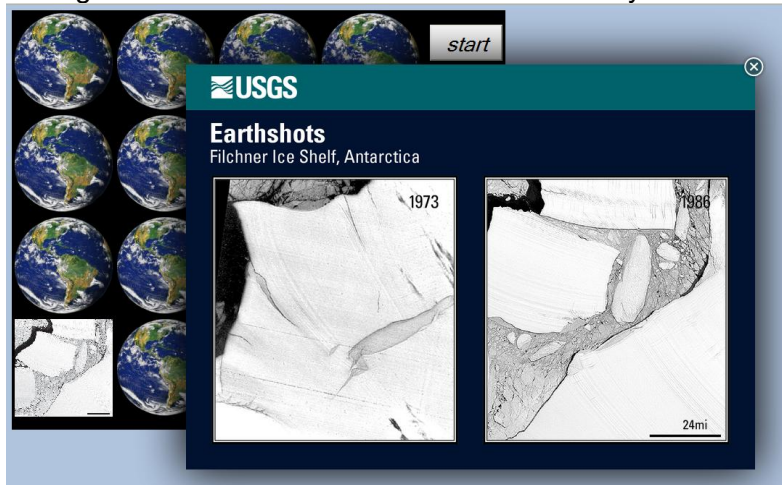


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4.) Click on a globe image to reveal its underlying remote sensing image. Click on another globe image to find the matching remote sensing image. Continue until you matched all pairs.

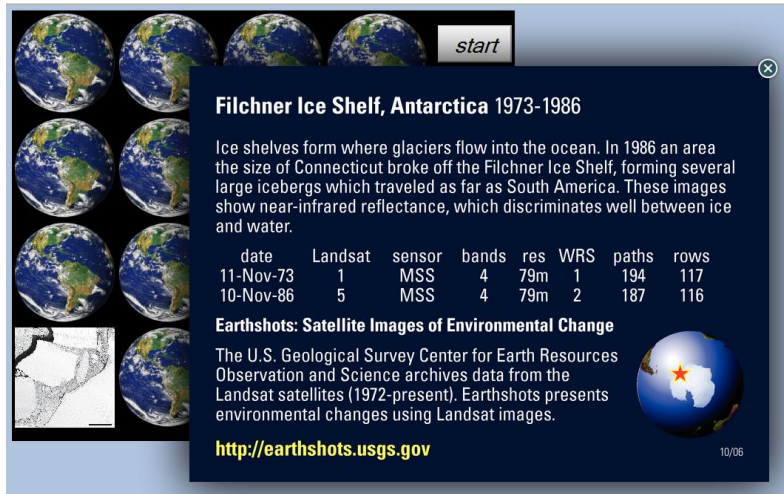


5.) Click on the image once to learn about its location and the year it was taken in.



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6.) Click on the image again to learn more about its characteristics. Discuss these in your classroom.



Filchner Ice Shelf, Antarctica 1973-1986

Ice shelves form where glaciers flow into the ocean. In 1986 an area the size of Connecticut broke off the Filchner Ice Shelf, forming several large icebergs which traveled as far as South America. These images show near-infrared reflectance, which discriminates well between ice and water.

date	Landsat	sensor	bands	res	WRS	paths	rows
11-Nov-73	1	MSS	4	79m	1	194	117
10-Nov-86	5	MSS	4	79m	2	187	116

Earthshots: Satellite Images of Environmental Change

The U.S. Geological Survey Center for Earth Resources Observation and Science archives data from the Landsat satellites (1972-present). Earthshots presents environmental changes using Landsat images.

<http://earthshots.usgs.gov>

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