My NASA Data - GLOBE Connections

GLOBE Connections: Deforestation

This resource helps to identify and access GLOBE protocols and hands-on learning activities that complement the Deforestation phenomenon. Students conduct their own investigations and see how their data related to global patterns by using GLOBE and My NASA Data together.

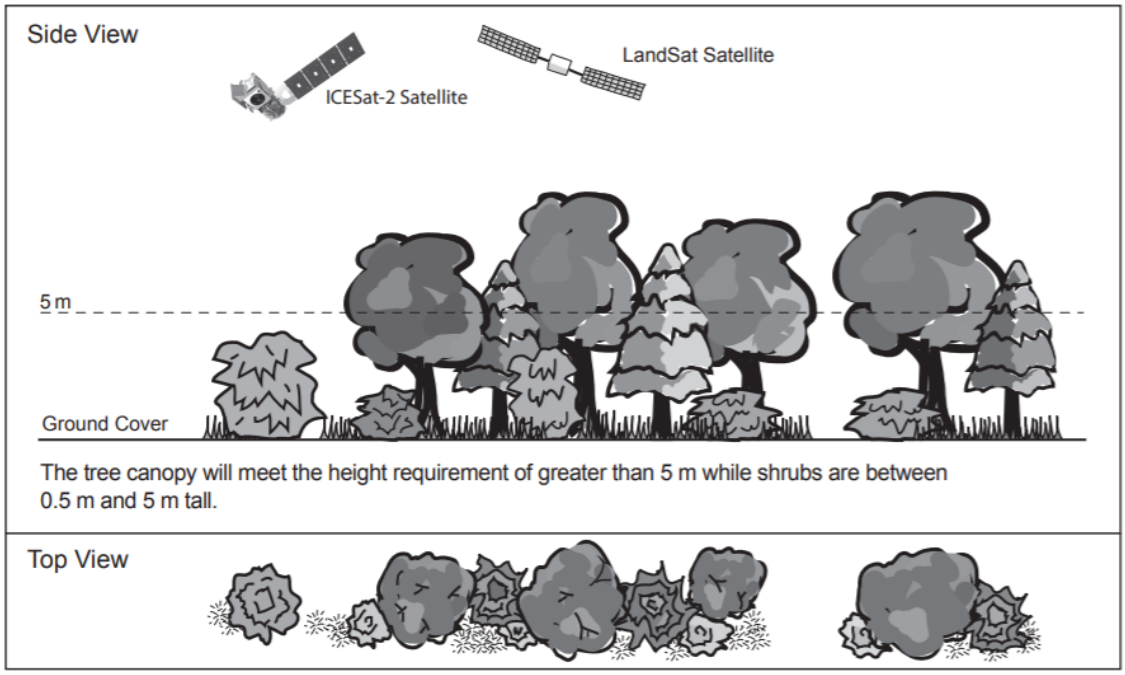
Visit the **GLOBE Biosphere Protocols & Related ESDE Datasets** page that outlines the datasets available in the Earth System Data Explorer. These data complement student GLOBE investigations using the following protocols.

Deforestation

Students can explore deforestation using a variety of GLOBE resources.

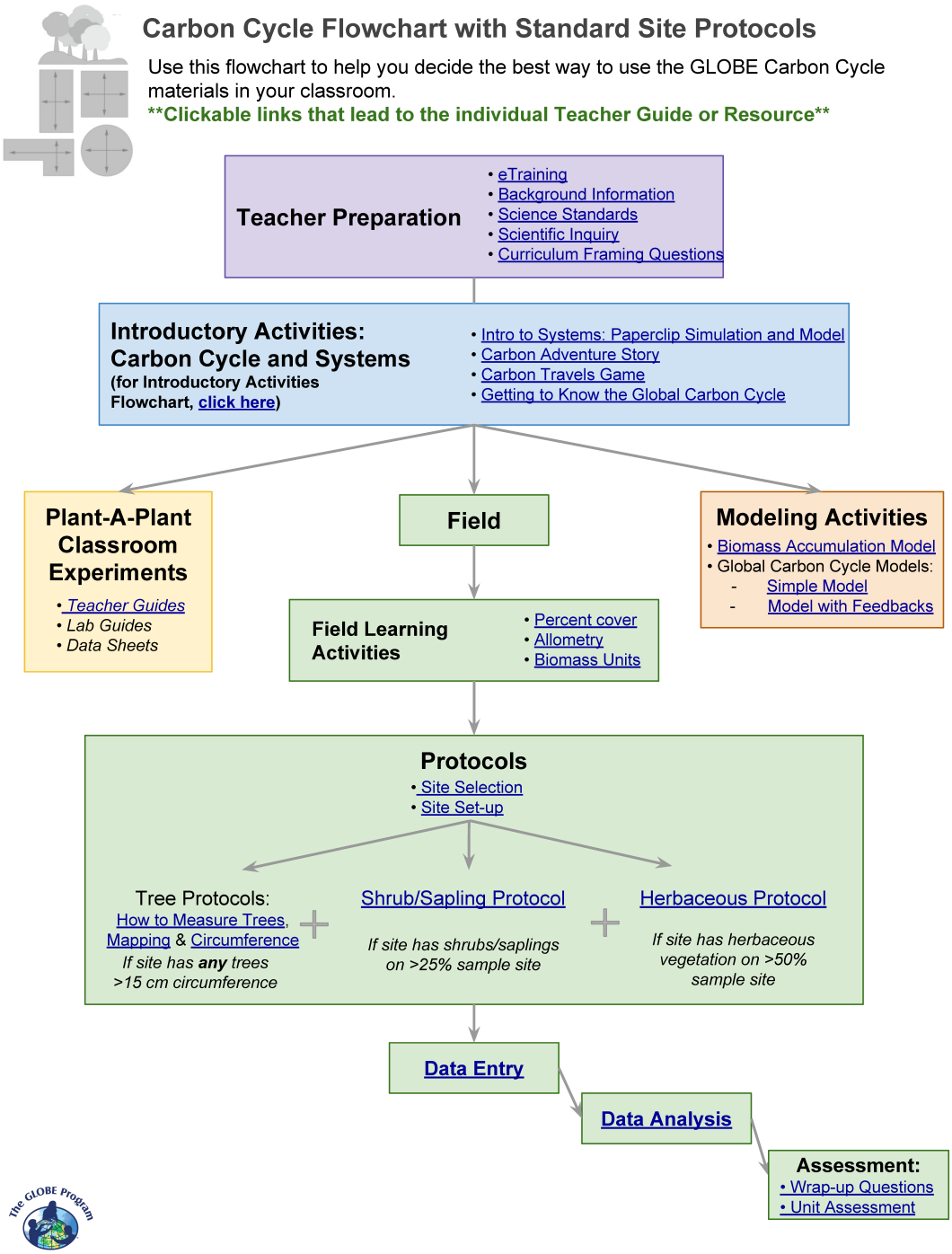
Protocols

GLOBE protocols can be used to collect many types of data to examine tree cover and deforestation. Students can use the protocols to collect data and share their data with other GLOBE students around the world. As scientists continue their study of deforestation, they can use these data.



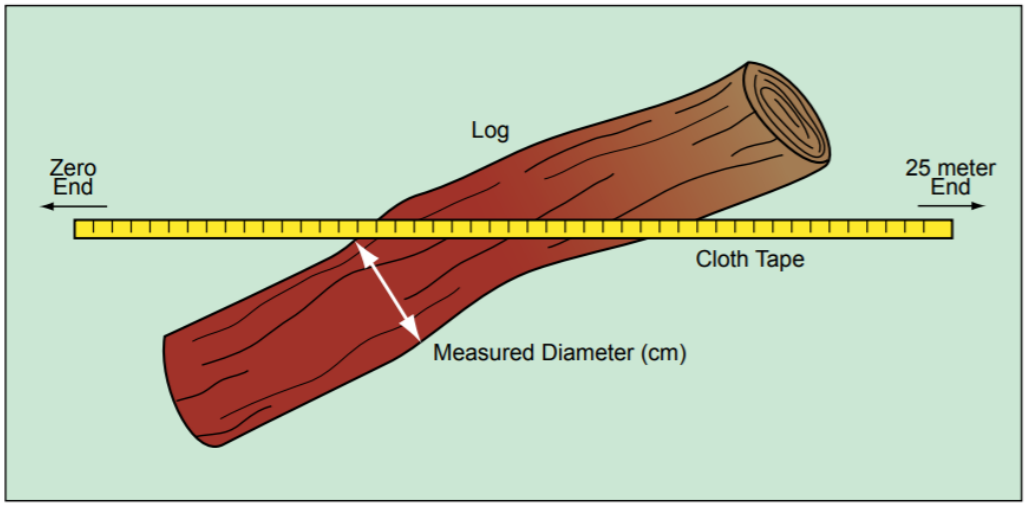
Multiple Layers of Vegetation: Tree Canopy, Shrub Canopy and Ground Cover
Source: (GLOBE Website)

Biometry: Measure and classify the plant life present at a Land Cover Sample Site to help determine the MUC classification.



Source: (GLOBE Website)

Carbon Cycle: Students learn the necessary skills and work in teams to set-up a carbon cycle site. They determine which vegetation types you will measure at your site. There are decision trees available to facilitate decision making as well as a variety of carbon cycle learning activities and protocols.



Measurement of Log Diameter Along Fuel Sampling Plane
Source: (GLOBE Website)

Fire Fuel: Students measure the different types of fuels (i.e., dead branches, logs, live shrubs and trees for fires in land cover sample sites.

Source: (GLOBE Website)

Land Cover Classification: Students determine the major land cover type at a Land Cover Sample Site.

Protocol Bundle

The following protocol bundle include protocols related to deforestation. Students can investigate links between urban development and deforestation.

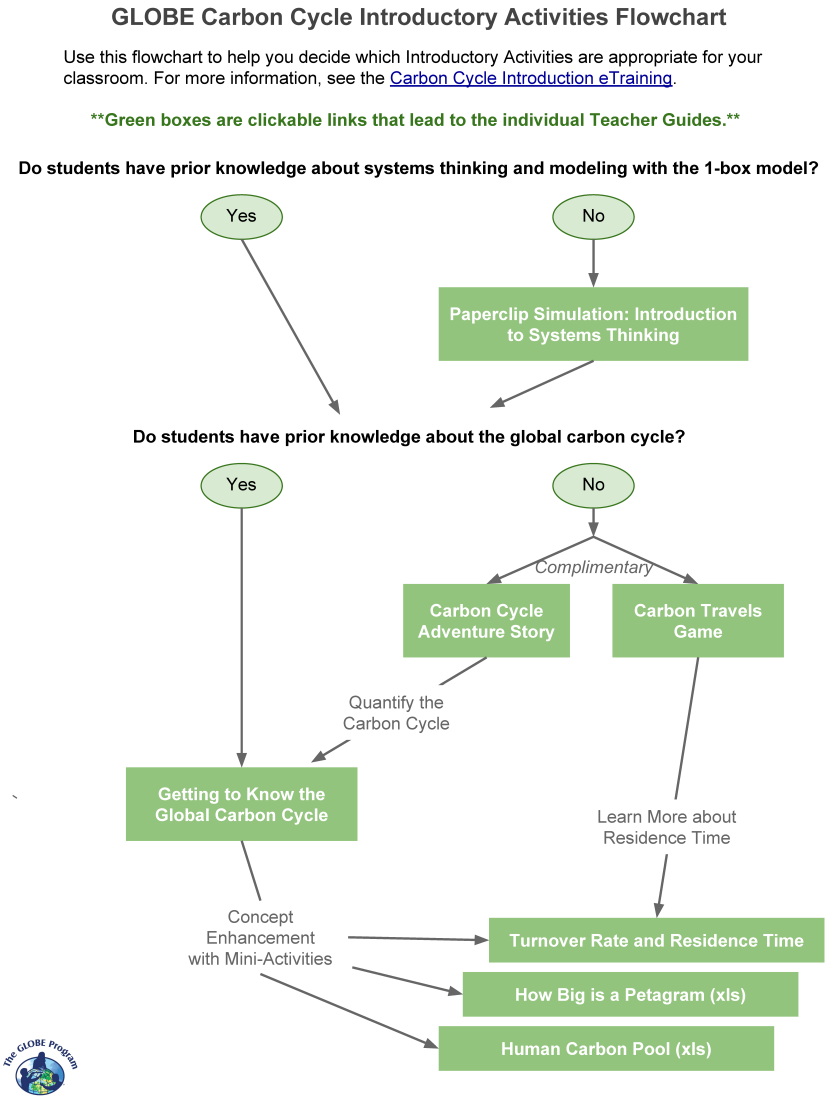
GLOBE Urban Protocol Bundle - The purpose of the Urban Bundle is to suggest a group of GLOBE protocols that can provide students and teachers with integrated knowledge of the environment in urban areas, including various processes and their interactions. Given the many small-scale variations caused by the built environment, such citizen science contributions are particularly needed to adequately characterize the urban environment.

Learning Activities

Check out the three learning activities to help prepare students for collecting data and to support the integration of MND with *GLOBE* in your curriculum.

Carbon Cycle Introductory Activities Flowchart

Use this flowchart to help you decide which Introductory Activities are appropriate for your classroom. For more information, see the Carbon Cycle Introduction eTraining.



Source: (GLOBE Website)

Land Cover Change Detection

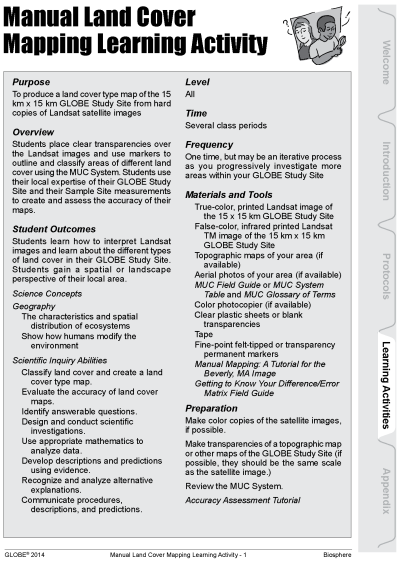
Overview: Using Multispec software, students evaluate and investigate changes that have occurred in the major land cover types of your GLOBE Study Site by examining the digital files of two Landsat satellite images that were acquired a few years apart.

Student Outcomes:

- Earth has many different environments that support different combinations of organisms
- All organisms must be able to obtain and use resources while living in a constantly changing environment
- All populations living together and the physical factors with which they interact constitute an ecosystem
- Humans can change ecosystem balance
- How to use maps (real and imaginary)
- The characteristics and spatial distribution of ecosystems
- Use land cover data and appropriate tools and technology to interpret change
- Gathering spatial data and historical data to determine the validity of change hypotheses

GLOBE Observer Land Cover
Image Credit: NASA

Manual Land Cover Mapping



Manual Land Cover Mapping Learning Activity

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Purpose

To produce a land cover type map of the 15 km x 15 km GLOBE Study Site from hard copies of Landsat satellite images

Overview

Students place clear transparencies over the Landsat images and use markers to outline and classify areas of different land cover using the MUC System. Students use their local expertise of their GLOBE Study Site and their Sample Site measurements to create and assess the accuracy of their maps.

Student Outcomes

Students learn how to interpret Landsat images and learn about the different types of land cover in their GLOBE Study Site. Students gain a spatial or landscape perspective of their local area.

Science Concepts

Geography

- The characteristics and spatial distribution of ecosystems
- Show how humans modify the environment

Scientific Inquiry Abilities

- Classify land cover and create a land cover type map.
- Evaluate the accuracy of land cover maps.
- Identify answerable questions.
- Design and conduct scientific investigations.
- Use appropriate mathematics to analyze data.
- Develop descriptions and predictions using evidence.
- Recognize and analyze alternative explanations.
- Communicate procedures, descriptions, and predictions.

Level

All

Time

Several class periods

Frequency

One time, but may be an iterative process as you progressively investigate more areas within your GLOBE Study Site

Materials and Tools

- True-color, printed Landsat image of the 15 x 15 km GLOBE Study Site
- False-color, infrared printed Landsat TM image of the 15 km x 15 km GLOBE Study Site
- Topographic maps of your area (if available)
- Aerial photos of your area (if available)
- *MUC Field Guide* or *MUC System Table* and *MUC Glossary of Terms*
- Color photocopier (if available)
- Clear plastic sheets or blank transparencies
- Tape
- Fine-point felt-tipped or transparency permanent markers
- *Manual Mapping: A Tutorial for the Beverly, MA Image*
- *Getting to Know Your Difference/Error Matrix Field Guide*

Preparation

Make color copies of the satellite images, if possible.

Make transparencies of a topographic map or other maps of the GLOBE Study Site (if possible, they should be the same scale as the satellite image.)

Reviewv the MUC System.

Accuracy Assessment Tutorial

GLOBE® 2014 Manual Land Cover Mapping Learning Activity - 1 Biosphere

[Source: (GLOBE Website)]

Overview: Students produce a land cover type map of the 15 km x 15 km GLOBE Study Site from hard copies of Landsat satellite images.

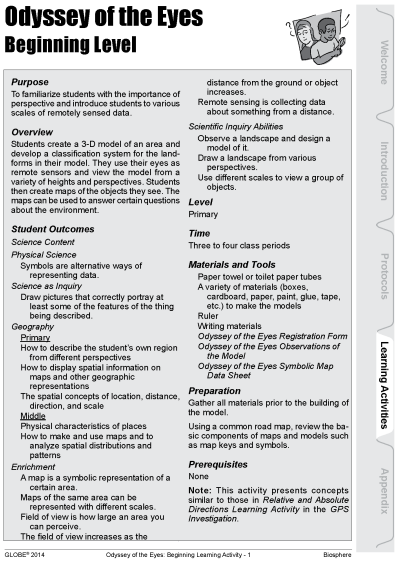
Student Outcomes:

- The characteristics and spatial distribution of ecosystems
- Show how humans modify the environment
- Classify land cover and create a land cover type map
- Evaluate the accuracy of land cover maps
- Use appropriate mathematics to analyze data
- Develop descriptions and predictions using evidence

Odyssey of the Eyes

[Beginning]

Overview: Students explore the importance of perspective and are introduced to various scales of remotely-sensed data.



Odyssey of the Eyes
Beginning Level

Purpose
To familiarize students with the importance of perspective and introduce students to various scales of remotely sensed data.

Overview
Students create a 3-D model of an area and develop a classification system for the landforms in their model. They use their eyes as remote sensors and view the model from a variety of heights and perspectives. Students then create maps of the objects they see. The maps can be used to answer certain questions about the environment.

Student Outcomes
Science Content
Physical Science
Symbols are alternative ways of representing data.
Science as Inquiry
Draw pictures that correctly portray at least some of the features of the thing being described.
Geography
Primary
How to describe the student's own region from different perspectives
How to display spatial information on maps and other geographic representations
The spatial concepts of location, distance, direction, and scale
Middle
Physical characteristics of places
How to make and use maps and to analyze spatial distributions and patterns
Enrichment
A map is a symbolic representation of a certain area.
Maps of the same area can be represented with different scales.
Field of view is how large an area you can perceive.
The field of view increases as the distance from the ground or object increases.
Remote sensing is collecting data about something from a distance.
Scientific Inquiry Abilities
Observe a landscape and design a model of it.
Draw a landscape from various perspectives.
Use different scales to view a group of objects.

Level
Primary

Time
Three to four class periods

Materials and Tools
Paper towel or toilet paper tubes
A variety of materials (boxes, cardboard, paper, paint, glue, tape, etc.) to make the models
Ruler
Writing materials
Odyssey of the Eyes Registration Form
Odyssey of the Eyes Observations of the Model
Odyssey of the Eyes Symbolic Map Data Sheet

Preparation
Gather all materials prior to the building of the model.

Using a common road map, review the basic components of maps and models such as map keys and symbols.

Prerequisites
None

Note: This activity presents concepts similar to those in *Relative and Absolute Directions Learning Activity* in the *GPS Investigation*.

GLOBE® 2014 Odyssey of the Eyes: Beginning Learning Activity - 1 Biosphere

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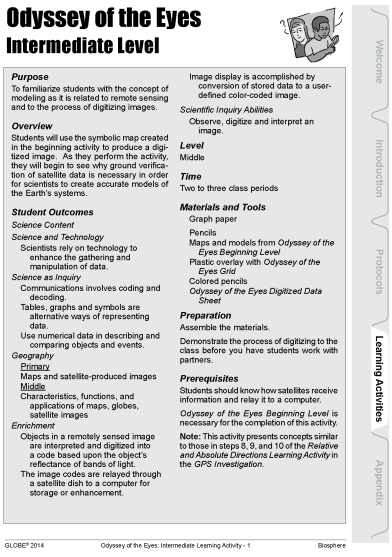
[Source: (GLOBE Website)]

Student Outcomes:

- Symbols are alternative ways of representing data
- Draw pictures that correctly portray at least some of the features of the thing being described
- How to describe the student's own region from different perspectives
- How to display spatial information on maps and other geographic representations
- The spatial concepts of location, distance, direction, and scale
- Physical characteristics of places
- How to make and use maps and to analyze spatial distributions and patterns

[Intermediate]

Overview: Students explore the concept of modeling as it relates to remote sensing and to the process of digitizing images.



Odyssey of the Eyes
Intermediate Level

Purpose
To familiarize students with the concept of modeling as it is related to remote sensing and to the process of digitizing images.

Overview
Students will use the symbolic map created in the beginning activity to produce a digitized image. As they perform the activity, they will begin to see why ground verification of satellite data is necessary in order for scientists to create accurate models of the Earth's systems.

Student Outcomes
Science Content
Science and Technology
Scientists rely on technology to enhance the gathering and manipulation of data.
Science as Inquiry
Communications involves coding and decoding.
Tables, graphs and symbols are alternative ways of representing data.
Use numerical data in describing and comparing objects and events.
Geography
Primary
Maps and satellite-produced images
Middle
Characteristics, functions, and applications of maps, globes, satellite images
Enrichment
Objects in a remotely sensed image are interpreted and digitized into a code based upon the object's reflectance of bands of light.
The image codes are relayed through a satellite dish to a computer for storage or enhancement.
Image display is accomplished by conversion of stored data to a user-defined color-coded image.
Scientific Inquiry Abilities
Observe, digitize and interpret an image.

Level
Middle

Time
Two to three class periods

Materials and Tools
Graph paper
Pencils
Maps and models from *Odyssey of the Eyes Beginning Level*
Plastic overlay with *Odyssey of the Eyes Grid*
Colored pencils
Odyssey of the Eyes Digitized Data Sheet

Preparation
Assemble the materials.

Demonstrate the process of digitizing to the class before you have students work with partners.

Prerequisites
Students should know how satellites receive information and relay it to a computer.

Odyssey of the Eyes Beginning Level is necessary for the completion of this activity.

Note: This activity presents concepts similar to those in steps 8, 9, and 10 of the *Relative and Absolute Directions Learning Activity* in the *GPS Investigation*.

GLOBE® 2014 Odyssey of the Eyes: Intermediate Learning Activity - 1 Biosphere

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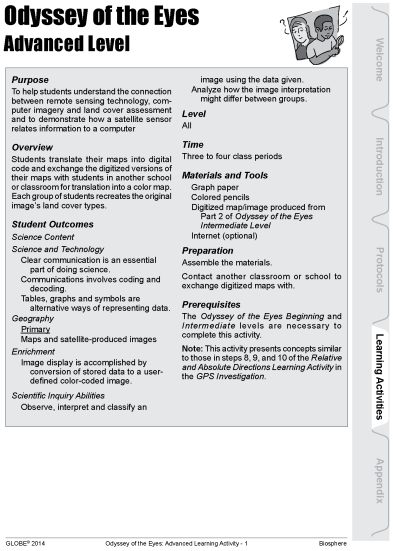
[Source: (GLOBE Website)]

Student Outcomes:

- Scientists rely on technology to enhance the gathering and manipulation of data
- Tables, graphs, and symbols are alternative ways of representing data
- Use numerical data in describing and comparing objects and events
- Maps and satellite-produced images
- Characteristics, functions, and applications of maps, globes, satellite images

Advanced

Overview: Students investigate the connection between remote-sensing technology, computer imagery, and land cover assessment as well as demonstrate how a satellite sensor relates information to a computer.



Odyssey of the Eyes
Advanced Level

Purpose
To help students understand the connection between remote sensing technology, computer imagery and land cover assessment and to demonstrate how a satellite sensor relates information to a computer

Overview
Students translate their maps into digital code and exchange the digitized versions of their maps with students in another school or classroom for translation into a color map. Each group of students recreates the original image's land cover types.

Student Outcomes
Science Content
Science and Technology
Clear communication is an essential part of doing science.
Communications involves coding and decoding.
Tables, graphs and symbols are alternative ways of representing data.
Geography
Primary
Maps and satellite-produced images
Enrichment
Image display is accomplished by conversion of stored data to a user-defined color-coded image.
Scientific Inquiry Abilities
Observe, interpret and classify an image using the data given.
Analyze how the image interpretation might differ between groups.

Level
All

Time
Three to four class periods

Materials and Tools
Graph paper
Colored pencils
Digitized map/image produced from Part 2 of *Odyssey of the Eyes Intermediate Level*
Internet (optional)

Preparation
Assemble the materials.
Contact another classroom or school to exchange digitized maps with.

Prerequisites
The *Odyssey of the Eyes Beginning* and *Intermediate* levels are necessary to complete this activity.

Note: This activity presents concepts similar to those in steps 8, 9, and 10 of the *Relative and Absolute Directions Learning Activity* in the *GPS Investigation*.

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GLOBE® 2014 Odyssey of the Eyes: Advanced Learning Activity - 1 Biosphere

Source: (GLOBE Website)

Student Outcomes:

- Clear communication is an essential part of doing science
- Communications involve coding and decoding
- Tables, graphs, and symbols are alternative ways of representing data
- Maps and satellite-produced images
- Observe, interpret and classify an image using the data given
- Analyze how the image interpretation might differ between groups